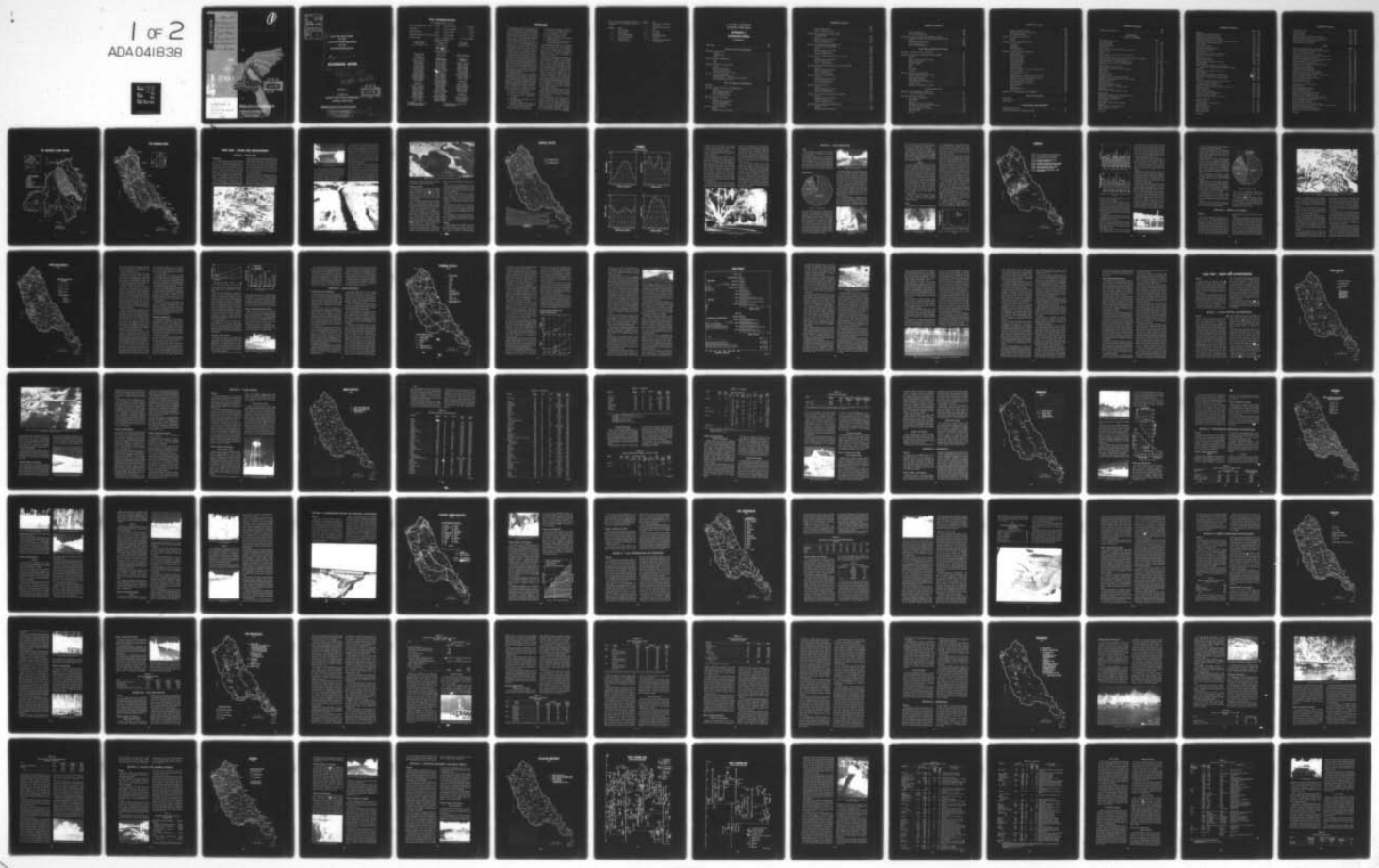
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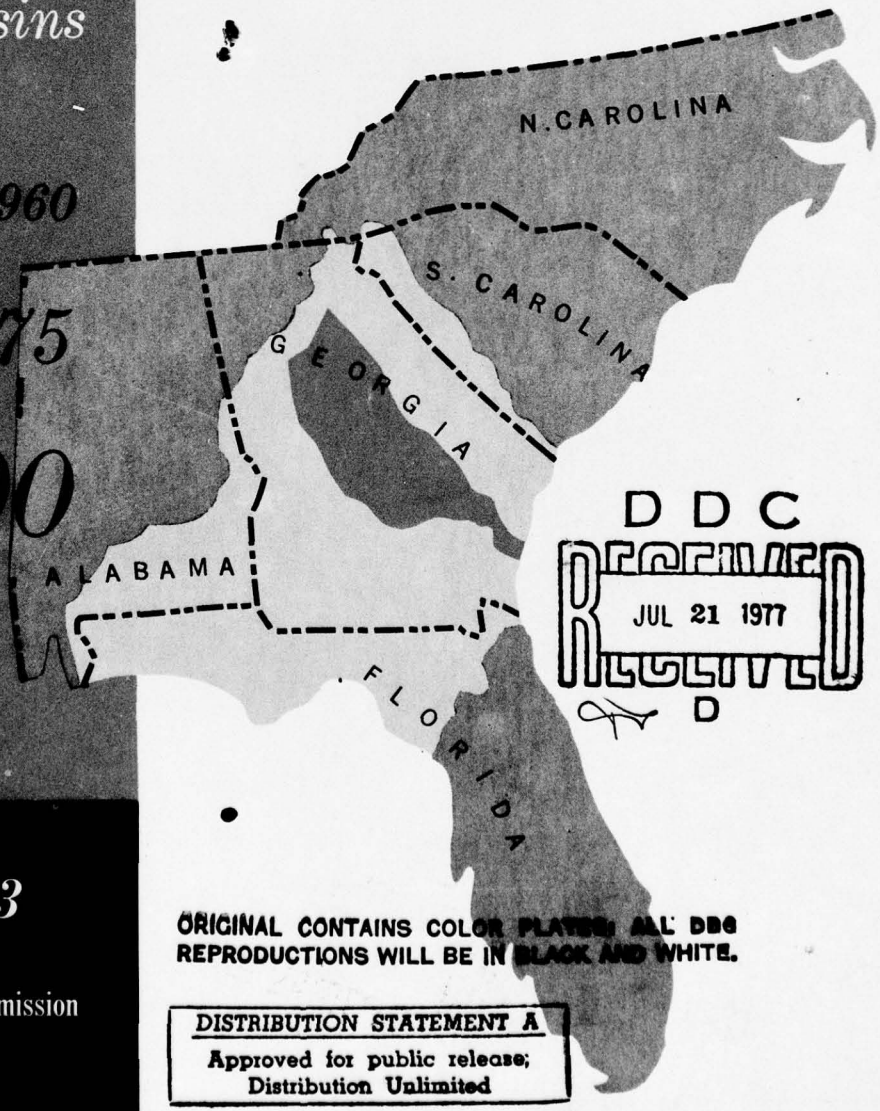
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ALTAMAHA BASIN

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APPENDIX 3

To report of...

United States Study Commission

Southeast River Basins

1963

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Appendix 3.

ALTAMAHA BASIN.

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APPENDIX 3

TO REPORT OF

UNITED STATES STUDY COMMISSION

SOUTHEAST RIVER BASINS

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FOREWORD

This Appendix summarizes the results of studies made in formulating a comprehensive plan for the conservation, utilization, and development of the land and water resources of the Altamaha basin. The plan for the Altamaha basin is a part of the comprehensive plan for the development of the land and water resources of the Southeast River Basins.

Data relevant to the development of the land and water resources of the Altamaha basin are summarized in six interrelated parts. The matter contained in each part is pertinent to the comprehensive plan. The reader is urged to consider the report in the aggregate rather than to consider selected material out of context.

Part One includes a description of the area, a discussion of its resources, and a presentation of the present and future population and economy. Part Two presents the level of needs by purpose. Part Three describes planning procedures as applied to this study. Part Four presents the comprehensive plan, including improvements requiring early action, for the Altamaha basin; Part Five contains the conclusions; and Part Six acknowledges the assistance of public and private agencies and individuals.

The Report of the United States Study Commission summarizing the plan for the Southeast River Basins is made in response to the provisions of Public Law 85-850 (72 Stat. 1090) dated August 28, 1958, which established the United States Study Commission, Southeast River Basins. Public Law 85-850 is reproduced in Appendix 13.

The authorizing Act provides for an integrated and cooperative investigation to formulate a comprehensive and coordinated plan for:

(1) Flood control and prevention;
(2) domestic and municipal water supplies;
(3) the improvement and safeguarding of navigation;
(4) the reclamation and irrigation of land, including drainage;
(5) possibilities of hydroelectric power and industrial development and utilization;
(6) soil conservation and utilization;
(7) forest conservation and utilization;
(8) preservation, protection, and enhancement of fish and wildlife resources;
(9) the development of recreation;
(10) salinity and sediment control;
(11) pollution abatement and the protection of public health; and,
(12) other beneficial and useful purposes not specifically enumerated in the Act.

The comprehensive plan for the Southeast River Basins is formulated to meet the needs of the area for land and water resources development to the year 2000. Projects and programs existing and under construction in 1960 are reflected in the plan, but only 1960-2000 developments are analyzed.

The plan for the development of the resources of the Southeast River Basins and the Altamaha basin is the result of cooperative work of Federal, State, and local and private agencies having interest in the area and knowledge of its needs and requirements. Public hearings were held early in the planning process to obtain firsthand knowledge of conditions and problems in the study area and to secure suggestions for their solution. Throughout the study, liaison was maintained with interested groups and agencies by means of conferences and committee and advisory group meetings. When a tentative plan was developed, public presentations were made by the Commission to inform interested persons and organizations and to request comments. These comments were considered in preparing the final plan and Report.

Although many individuals, groups, and agencies have participated in the studies, the Commission takes full responsibility for the plan and for the projections, assumptions, and analyses on which it is based.

The Commission plan for the Southeast River Basins is supported by data contained in 13 appendixes. Data on the plan for development of the resources in the eight geographic areas studied in the Southeast River Basins are contained in Appendixes 1 through 8. Technical data and information applicable to both the entire study area and the several geographic

areas are contained in Appendixes 9 through 13. The appendixes to the Commission Report are as follows:

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1	Savannah Basin
2	Ogeechee Basin
3	ALTAMAHA BASIN
4	Satilla-St. Marys Basins
5	Suwannee Basin
6	Ochlockonee Basin
7	Apalachicola-Chattahoochee-Flint Basins
8	Choctawhatchee-Perdido Basins
9	Economics
10	Hydrology
11	Engineering and Cost
12	Planning
13	History and Organization of the Commission

U. S. STUDY COMMISSION
SOUTHEAST RIVER BASINS

APPENDIX 3
ALTAMAHA BASIN

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*Photograph

THE SOUTHEAST RIVER BASINS

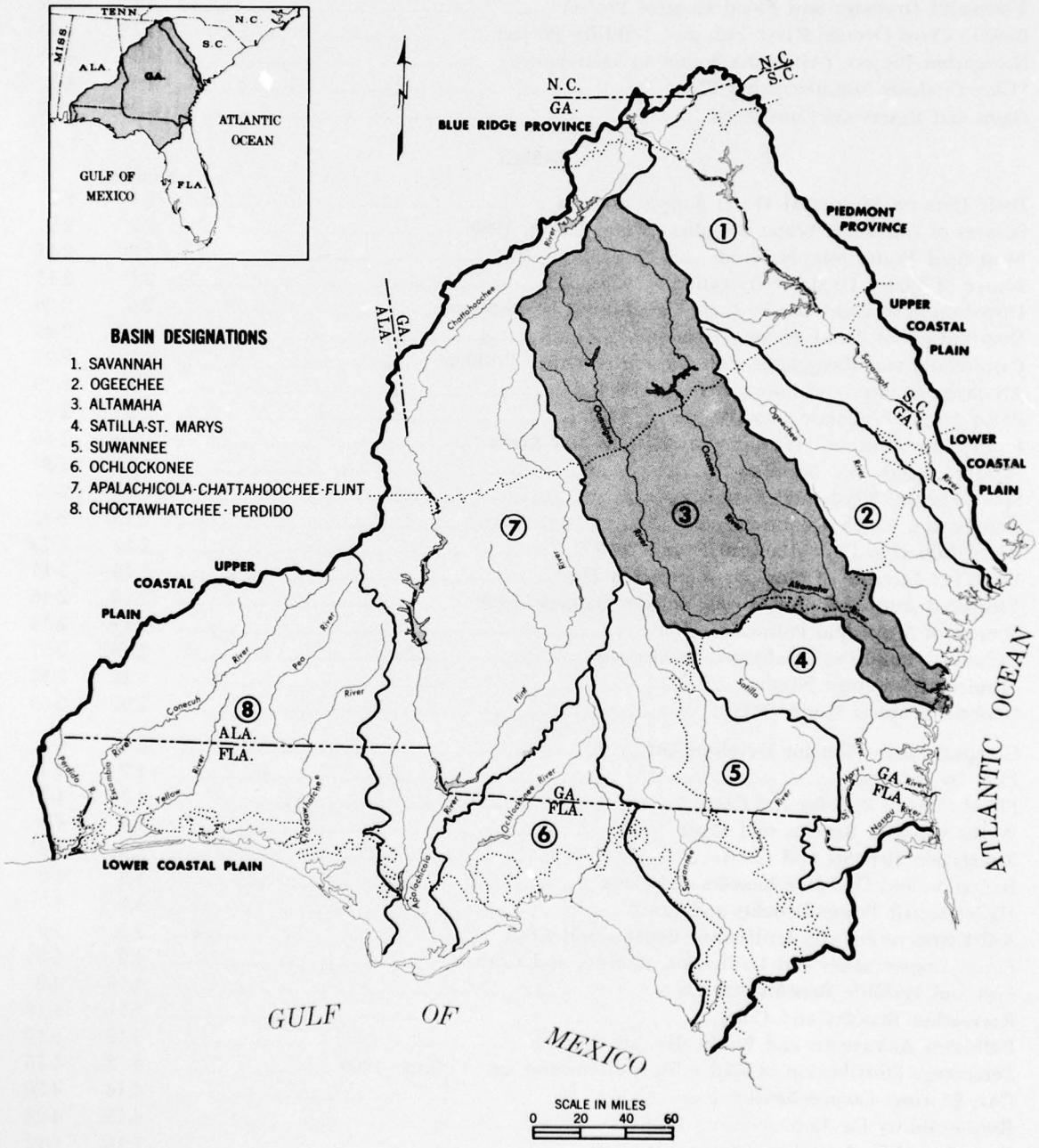


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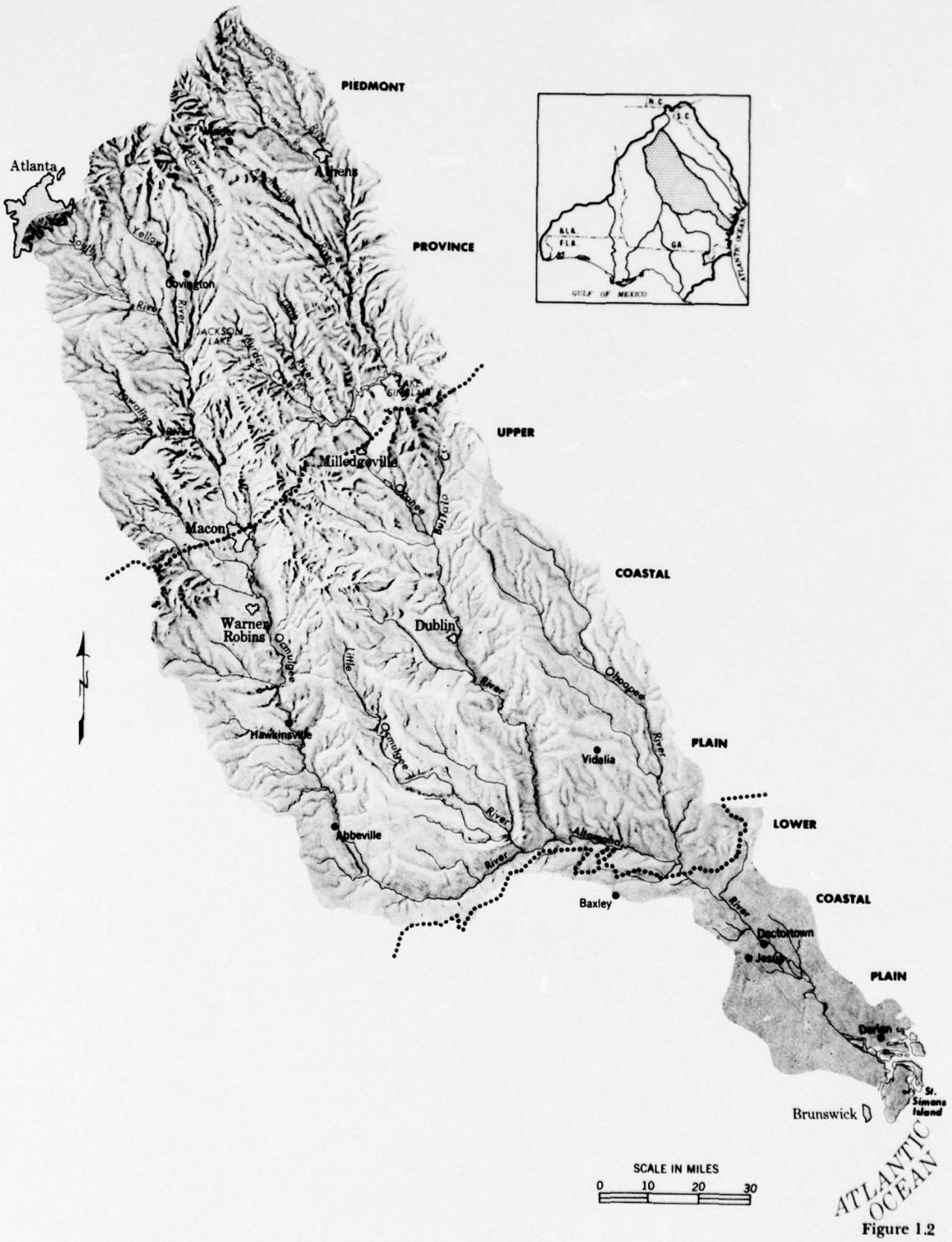

THE ALTAMAHA BASIN
PIEDMONT
PROVINCE
UPPER
COASTAL
PLAIN
LOWER
COASTAL
PLAIN
Atlanta
Athens
Covington
Milledgeville
Macon
Warner Robins
Dublin
Hawkinsville
Vidalia
Abbeville
Baxley
Doctortown
Jesup
Darien
St. Simons Island
Brunswick
ATLANTIC OCEAN
SCALE IN MILES
0 10 20 30
N
N. C.
S. C.
ALA.
FLA.
GA.
GULF OF MEXICO
ATLANTIC OCEAN

Figure 1.2

Approved for public release;
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PART ONE – STAGE FOR DEVELOPMENT

SECTION 1 – BASIN AREA

Description

The Altamaha basin in south central Georgia has an area of 14,564 square miles. About 39 percent of the area is in the Piedmont province, 52 percent in the Upper Coastal Plain, and 9 percent in the Lower Coastal Plain. The land area of the basin, which includes small water bodies, is 14,477 square miles. The Altamaha River drains all the basin area except 36 square miles which are contiguous to the Atlantic coast estuaries. The principal tributaries of the Altamaha are the Ocmulgee and the Oconee Rivers.

The Altamaha River is formed by the confluence of the Ocmulgee and Oconee Rivers 137 miles above the mouth and flows southeasterly across the Coastal Plain until it empties into the Atlantic Ocean near Darien, Georgia. Above the limit of tidal action, the river has an average slope of 0.7 foot per mile and the flood plain is about 89 miles long and varies in width from one to four and one-half miles. With the exception of about 6,000 acres of cleared land, the flood plain is covered with a dense growth of timber and underbrush.

The headwaters of the Ocmulgee River are in the vicinity of Atlanta at an elevation of about 1,000 feet above mean sea level. The Ocmulgee flows southeasterly to Macon, Hawkinsville, and Abbeville and thence to its junction with the Oconee River. The drainage area of the Ocmul-

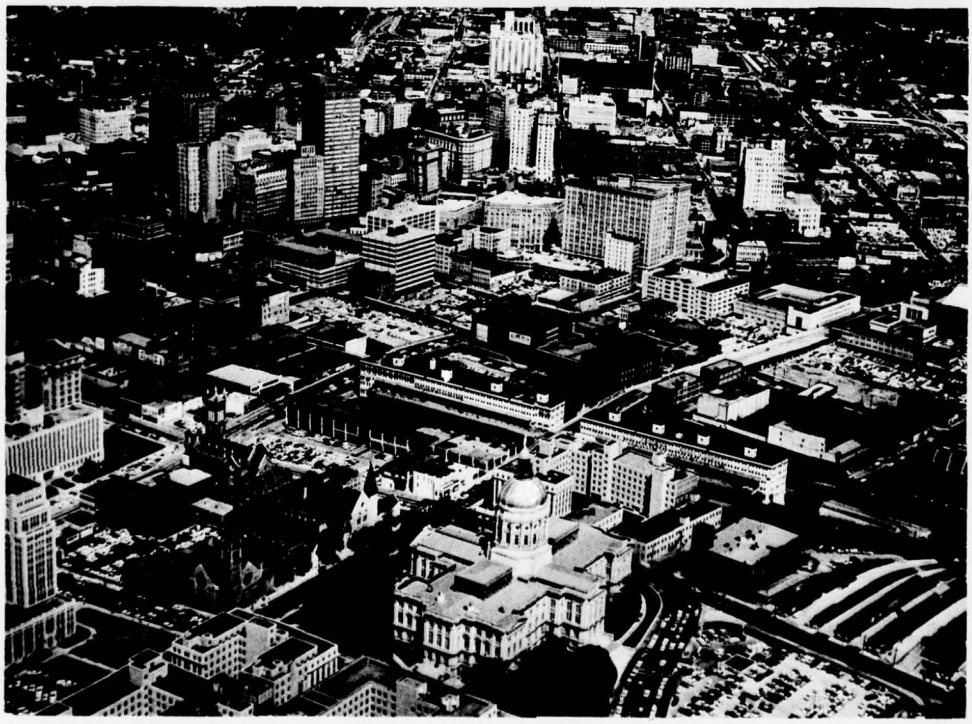


Figure 1.3 *Downtown Atlanta Is in the Headwaters of the Altamaha River System.*

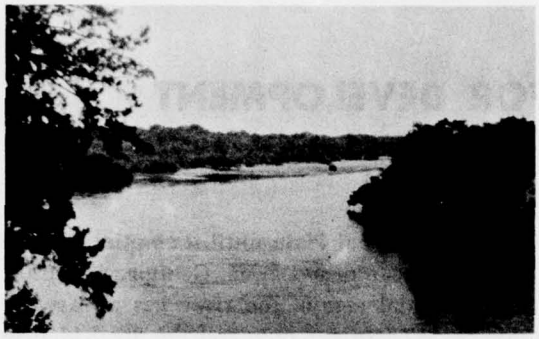


Figure 1.4 *The Altamaha River at U. S. Highway No. 1 at About Mile 120.*

gee is 6,080 square miles. From the junction to Macon, the Ocmulgee is 205 miles long and has an average low-water slope of 1.0 foot per mile. The flood plain between the same points is 124 miles long and varies in width from one-half to two and one-half miles. It is covered with dense growth of timber and underbrush.

The Oconee River headwaters rise about 35 miles northwest of Athens. They flow southeasterly through Milledgeville and Dublin. The drainage area is 5,250 square miles. From its confluence with the Ocmulgee River to Milledgeville, the river is 145 miles long and has an average low water slope of 1.1 feet per mile. The flood plain is 96 miles long and varies from one-fourth to four and one-half miles in width. The flood plain is covered with a dense growth of timber and underbrush.

The main tributaries of both the Ocmulgee and Oconee Rivers rise in the Piedmont province. Generally, they are well entrenched and flow through narrow flood plains. The gradients are steep, ranging from 4.5 to 7.4 feet per mile. There are numerous shoals and rapids. The South, Yellow, Alcovy, and Towaliga Rivers are the principal tributaries of the Ocmulgee system. The Apalachee, Middle, North Oconee, and

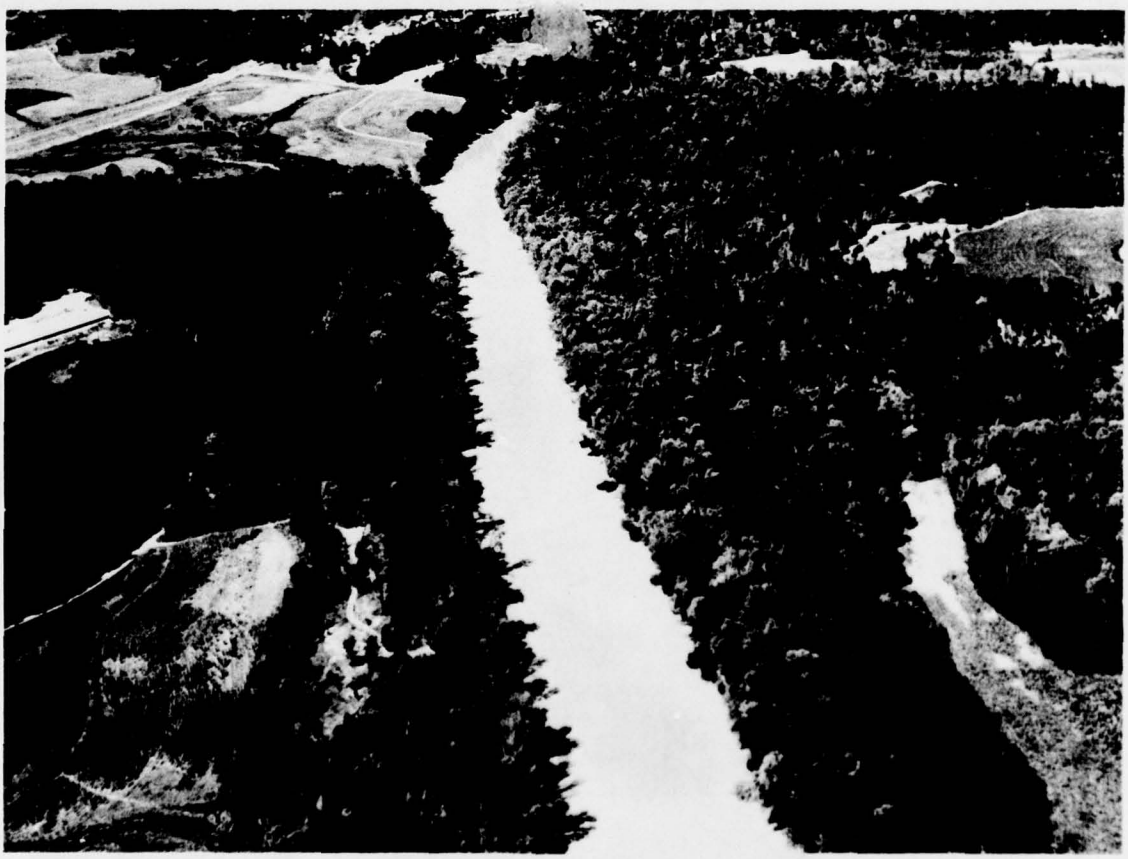


Figure 1.5 *Oconee River, South of Milledgeville, Georgia.*

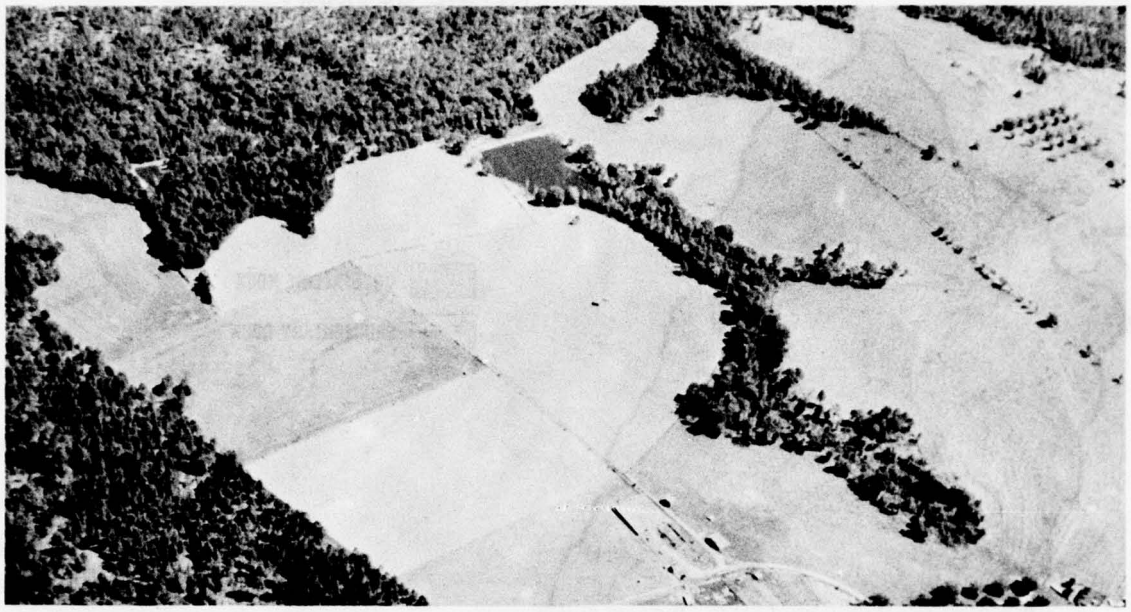


Figure 1.6 *Farm Land and Farm Ponds Are Important Basin Assets.*

Little Rivers and Murder Creek are the principal tributaries of the Oconee system.

Geology and Soils

The basin is in the Piedmont and Coastal Plain physiographic provinces with differing physical characteristics. Elevations up to about 1,000 feet above mean sea level occur in the Piedmont province where the terrain ranges from rolling to hilly and contains a few scattered small mountains.

The Piedmont province has deeply weathered igneous and metamorphic bedrock. The metamorphics, largely quartzites, schists, and slate predominate. Granites and basic and ultra-basic igneous rock are interspersed. Soils are generally red with sandy clay and silty clay textures.

Where the Piedmont and Coastal Plains merge, there is a transition zone, about 20 miles wide, known as the Fall Line. The soils of this area are derived from thin layers of Coastal Plain material and the underlying residuum from rock of the Piedmont. There are steep valleys and slopes caused by the descent of the streams through the area. The Fall Line is an ancient shoreline of the Atlantic Ocean.

Rock in the Coastal Plain is composed of stratified silts, sands, limestones, and clays which outcrop in wide bands parallel to the Fall Line. These strata dip and thicken as they near the ocean.

The surface soils range from sandy loams to silt loams, with subsoils ranging from sandy clay loams to silty clays and clays. These have moderate to rapid external drainage and moderate internal drainage.

The Upper Coastal Plain is the most intensively cultivated area in Georgia. The gently rolling topography and soil properties lend themselves to many types of crops. The friable soils are easy to cultivate and respond readily to fertilizer.

Both dry and wet soils occur in the Lower Coastal Plain. The largest areas are generally flat or depressed and they have a slow surface runoff and poor internal drainage. Many large and small swamps occur throughout this part of the basin.

The topography of both the Piedmont province and the Upper Coastal Plain is well adapted to development and conservation of surface water supplies.

Climate

The basin climate is mild. The coastal areas are slightly warmer in the winter and receive more rain in the summer and fall than the interior parts, but rainfall is usually plentiful

GENERAL GEOLOGY

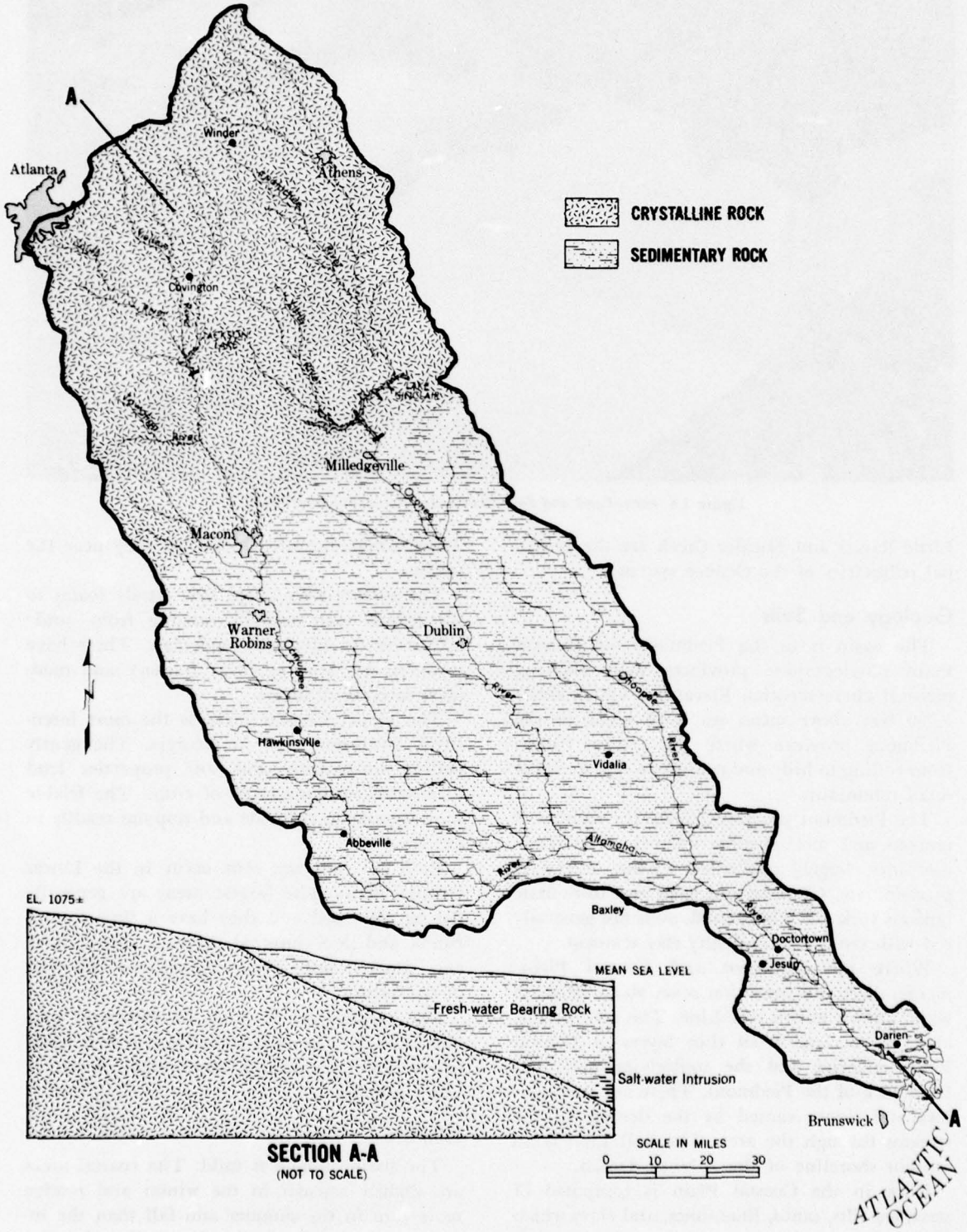


Figure 1.7

CLIMATE

MACON, GEORGIA

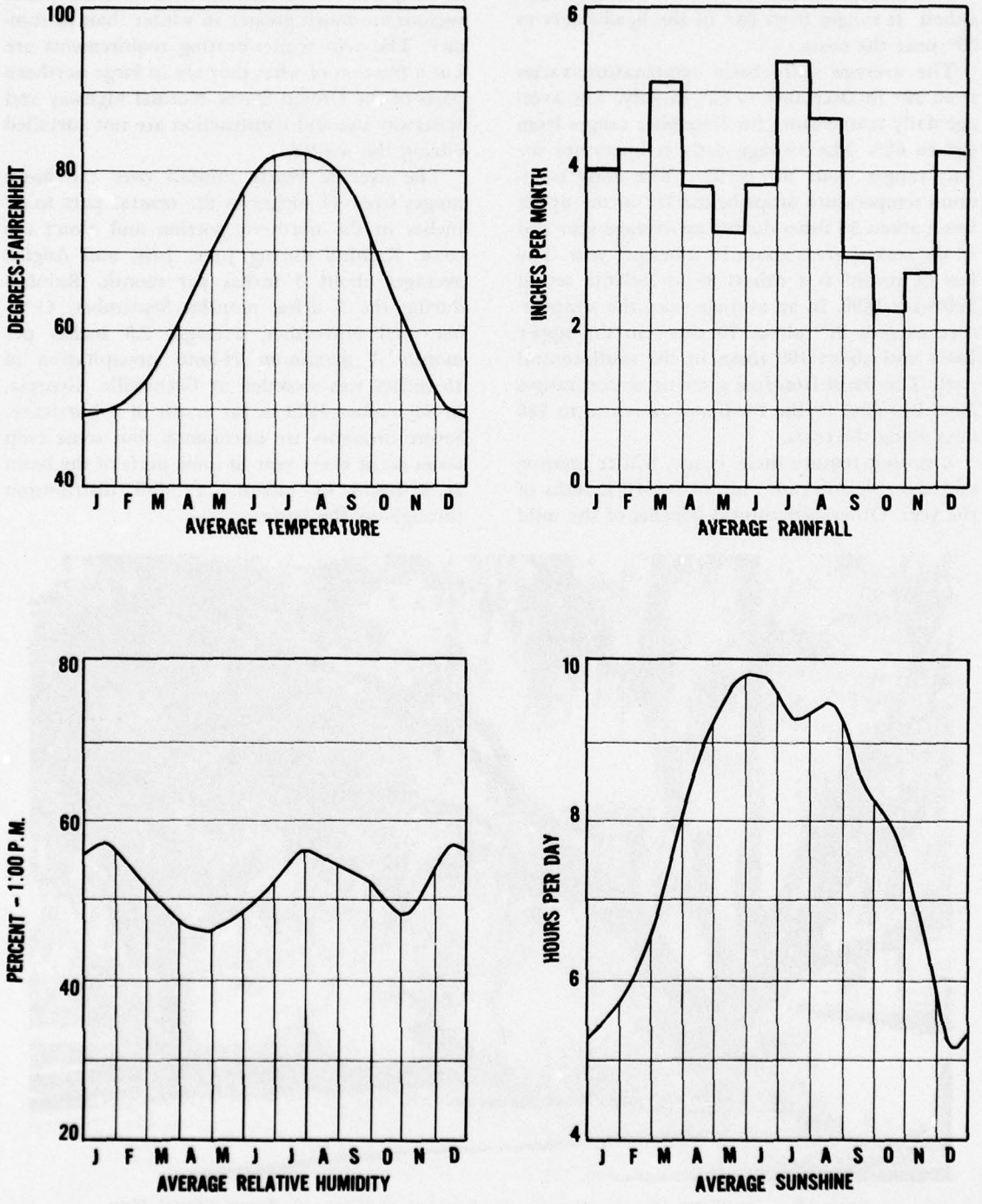


Figure 1.8

throughout the basin. Snowfall is rare. Figure 1.8 shows average temperatures, rainfall, humidity, and sunshine for Macon, Georgia.

The average annual temperature is 66° Fahrenheit. It ranges from 60° in the headwaters to 69° near the coast.

The average daily basin temperature varies from 50° in December to 82° in July. The average daily temperature for December ranges from 40° to 62°. The average daily temperature for July ranges from 70° to 92°. The daily minimum temperature drops below 32° in the upper basin about 50 times during an average year and in the coastal areas about 10 times per year. The low of record is a minus 8° at Atlanta set in February 1899. In an average year, the temperature exceeds 90° about 70 times in the upper basin and about 100 times in the south-central part. The basin frost-free growing season ranges from 210 days in the Piedmont province to 280 days along the coast.

Livestock require little, if any, winter housing and are able to graze nine to twelve months of the year. Other agricultural benefits of the mild climate include diversification of crops and rapid production of timber. Industry and commerce also benefit from the mild climate. Differences in temperature between the Southeast and other regions are much greater in winter than in summer. The area winter-heating requirements are but a fraction of what they are in large northern parts of the United States. Normal highway and waterway use and construction are not curtailed during the winter.

The average yearly rainfall over the basin ranges from 44 inches in the central part to 52 inches in the northern portion and along the coast. Rainfall during June, July, and August averages about 5 inches per month. Rainfall during the 3 driest months, September, October, and November, averages 2.5 inches per month. A maximum 24-hour precipitation of 15 inches was recorded at Glennville, Georgia, in September 1929 as the result of a hurricane. Severe droughts are uncommon, but some crop losses occur every year in some parts of the basin as a result of unequal rainfall distribution throughout the basin.



Figure 1.9 *The Warm Climate Enhances the Potential of Streams in Lower Coastal Plain for Recreation Developments.*

SECTION II – BASIN RESOURCES

Land

Of the 9,265,000 acres of land in the Altamaha basin, 69 percent, or 6,347,000 acres, are in some type of forest cover.

Although woodlands occupy the largest segment of land, crop and livestock products also are very important in the basin. Croplands occupy 1,543,000 acres or the second largest segment of land, and farming interests generally have selected the better lands. Corn is grown on about 38 percent of the cropland. Cotton, the next major agricultural land use, occupies 188,000 acres. The Coastal Plain counties form an important general farming and livestock area. Some 758,000 acres are in pasture. Other crops, in the decreasing order of land use are small grain, hay, peanuts, fruits and nuts, and soybeans. Tobacco is not a major crop in acreage, but it is the leading cash crop in some counties.

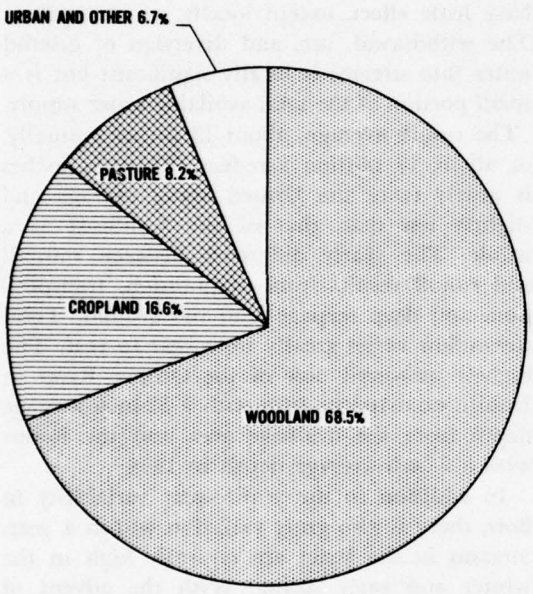


Figure 1.10 *Land Use—1959.*

The Upper Coastal Plain is the most important general farming area in the basin, although the Lower Coastal Plain has untapped agricultural potentials, particularly in the Townsend area a few miles northwest of Darien.



Figure 1.11 *Improved Road Affords Access to Physical and Social Assets of the Basin.*

Although declining as a general farming area, much of the Piedmont province is well suited for livestock production. The area has long been important in poultry production. Both the Upper and Lower Coastal Plains have climate and soils well suited to truck crops, melons, fruits, and nuts. This area has a good potential for expanded freezing and canning enterprises and for contract growing of fruits and vegetables.

Approximately 617,000 acres of land in the basin are classed as special use or other land. This classification includes lands used for urban use, transportation, industry, and for other uses. Rights-of-way for highways occupy about one-fourth of this area.

An excellent network of improved county, State, and Federal highways provide access to most of the physical and social assets of the basin. There are three commercial airports and several small company and privately owned air-

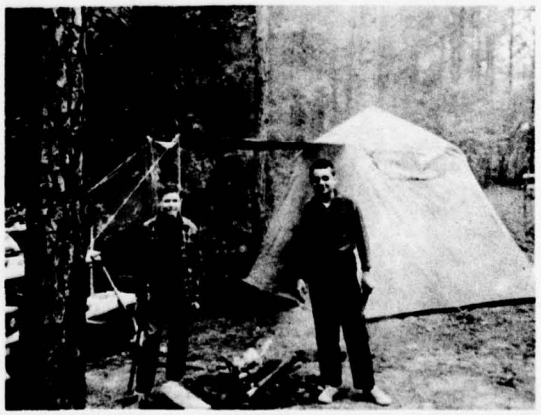


Figure 1.12 *State Parks Provide Recreational Opportunity.*

ports in the basin. In addition, the Atlanta airport, one of the largest in the United States, is just outside the upper border of the basin.

Existing public recreation areas include two national forests, five State parks, Stone Mountain, a National Monument, and two national wildlife refuges, all of which total about 143,000 acres. There are also wayside and local parks, boating and swimming areas, and numerous scenic and historic sights.

Minerals

Forty-four commercial minerals are found in the State of Georgia. Many of these are found in the Altamaha basin. The most important are granite, ceramic and brick clays, fuller's earth, kaolin, sand and gravel, and bauxite. The minerals mined in the basin in 1959 had a value of $48.7 million. Seventy-five percent of the kaolin mined in the United States is produced in Georgia and most of this is mined in the Altamaha basin. Twiggs County ranked first and Wilkinson County ranked fourth in the State in the value of mineral production in 1959. The products mined were kaolin and fuller's earth. Bauxite and iron ore occur in the basin, but these are not mined extensively at present. Explorations for oil are being carried out near Soperton in Treutlen County.

Other minerals found in the basin are asbestos, chlorite, corundum, feldspar, graphite, quartz, kyanite, shales, and several varieties of semiprecious stones.

Water

The combination of climate and physical features usually provides an amply supply of surface and ground water throughout most of the basin. The Piedmont province with its dense underlying rock contributes about 50 percent more surface runoff per square mile than the Coastal Plain province.

The storage reservoirs in the basin for hydroelectric generation are Jackson Lake on the Ocmulgee River and Lake Sinclair on the Oconee River. The combined usable storage of these reservoirs is about 300,000 acre-feet. About 45 cubic feet per second of the water taken from the Chattahoochee River for the Atlanta metropolitan area is ultimately discharged into the South River, a tributary of the Ocmulgee River. The many small lakes, reservoirs, and farm ponds have little effect, except locally, on streamflow. The withdrawal, use, and diversion of ground water into streams is locally significant but is a small portion of the total available water supply.

The runoff averages about 13 inches annually, or about 10 million acre-feet. Thirteen inches is nearly twice the United States average and slightly less than that of the Southeast as a whole. The yearly difference between rainfall and runoff results from evaporation, transpiration, and deep seepage into the ground. Total streamflow varies greatly from year to year. The highest measured flow of the Oconee River at Dublin occurred in 1929 with a 32-inch average depth from the drainage area and the lowest with a 6-inch average depth in 1954.

In addition to the year-to-year variability in flow, there is also great variation within a year. Streams in the basin are typically high in the winter and early spring. With the advent of



Figure 1.13 *Upstream Tributary of the Altamaha River System.*

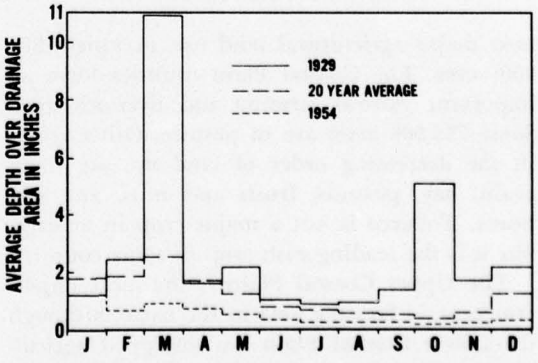


Figure 1.14 *Monthly Runoff, Oconee River at Dublin, Georgia.*

MINERALS

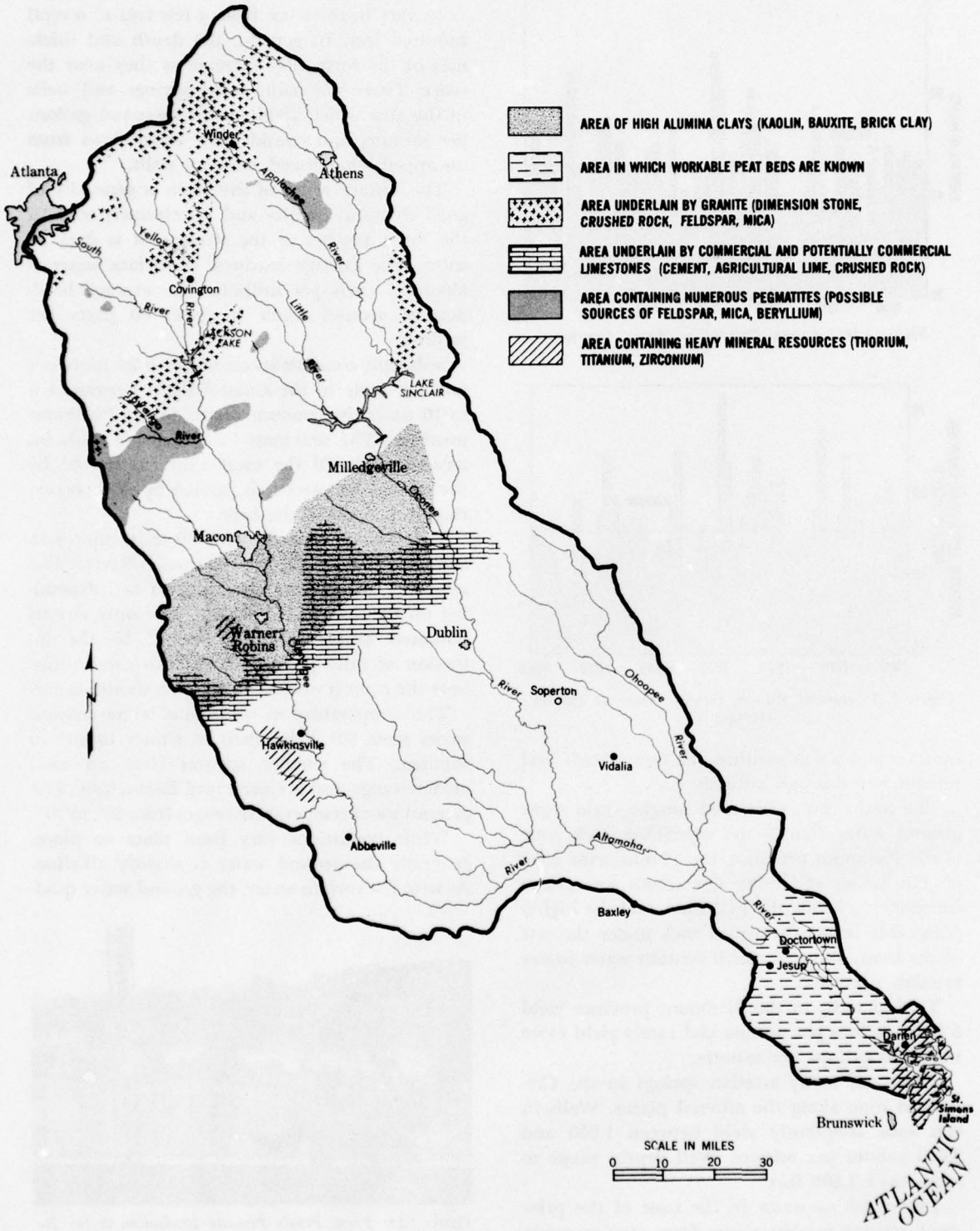


Figure 1.15

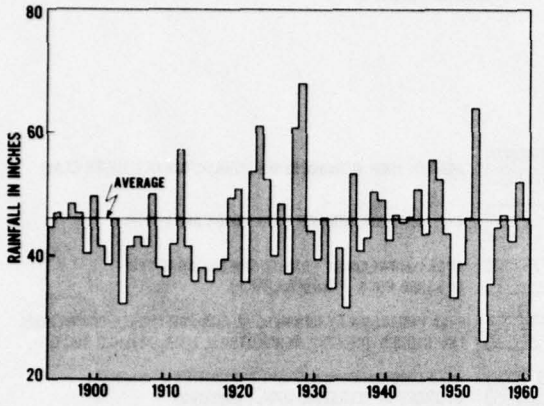


Figure 1.16. *Annual Rainfall at Macon, Georgia.*

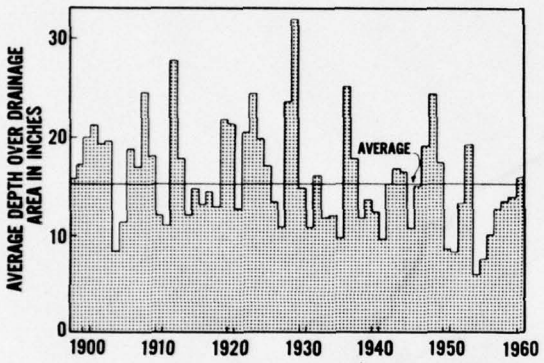


Figure 1.17 *Annual Runoff, Oconee River at Dublin, Georgia.*

summer and warm weather, the flows recede and remain low through autumn.

The basin can be divided roughly into three ground water zones – the crystalline rock zone of the Piedmont province, the 40-mile wide zone of Tuscaloosa and other Cretaceous formations immediately below the Fall Line, and the highly permeable beds of stratified rock under the rest of the basin, some of which contain water under artesian pressure.

Typical wells in the Piedmont province yield 5 to 25 gallons per minute and rarely yield more than 100 gallons per minute.

There are many artesian springs in the Cretaceous zone along the alluvial plains. Wells in this zone frequently yield between 1,000 and 2,000 gallons per minute. Well depths range to more than 1,500 feet.

The depth to water in the zone of the principal artesian aquifer varies from zero to rarely more than 700 feet. The water-bearing formations vary in thickness from a few feet to several hundred feet. In general, the depth and thickness of the formation increase as they near the coast. There are many large springs and wells in the area which yield several thousand gallons per minute, and considerable water flows from uncapped, abandoned, artesian wells.

The surface water of the basin is generally of good chemical quality and is extremely soft. In the lower reaches of the streams, it is dark in color. The average hardness of surface water is about 25 parts per million. The average hardness of ground water is about 60 parts per million.

Sediment concentrations of 10 to 20 parts per million occur in the Coastal Plain streams. Up to 10 times this amount occurs in the Piedmont province. The sediment load increases with increased flows. Of the total sediment moved by the stream, 90 percent is carried by flows occurring 10 percent of the time.

Tidal effects extend about 30 miles upstream from the mouth of the Altamaha River. The salt-water wedge extends nearly as far, depending on the flow of the stream. The only serious potential salinity problem would be the intrusion of salty ground water into the aquifer near the coast if excessive pumping should occur.

The temperature in the basins larger streams varies from 50° Fahrenheit in winter to 80° in summer. The smaller streams have an even greater range and a more rapid fluctuation. The ground water temperature ranges from 60° to 70°.

While conditions vary from place to place, generally the ground water is slightly alkaline. As with the surface water, the ground water qual-



Figure 1.18 *Farm Ponds Provide Environment for Relaxation and Water for Utilitarian Uses.*

ity is better than that of most other regions in the Southeast or the United States.

The 65 billion gallons of water withdrawn from wells and streams in the basin each year represent about 2 percent of the average sustained supply available from both surface and ground water sources.

Rural residents use about 17 million gallons of water per day or an average of about 50 gallons per person per day. Reports show that about 8 percent of the rural shallow well supplies has water shortages from early July through September. About one-half of the rural supplies fails to meet acceptable sanitary standards because of inadequate well construction or equipment.

Farm withdrawal for irrigation, in 1960, amounted to 16,000 acre-feet and approximately 12 million gallons daily were used for watering livestock.

Water uses for all rural purposes total about 48,900 acre-feet per year, or approximately an average of 44 million gallons a day which is about 24 percent of the water used. Municipal uses, including 15 million gallons a day for industrial purposes, total 57 million gallons a day, or about 28 percent of the water used.

Municipal water use in the basin averages about 107 gallons per day for each person, while that for the Southeast totals 116 gallons a day per person and that for the Nation, 147 gallons a day.

The basin industries use about 94 million gallons of water a day of which 15 million gallons per day is furnished by municipalities.

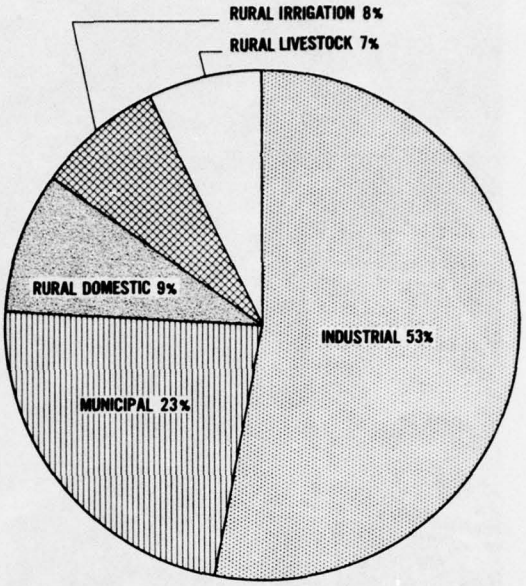


Figure 1.19 *Water Use — 1960.*

The rivers have considerable natural beauty and are used for both boating and fishing, particularly in the lower reaches.

The Altamaha River is navigable by shallow-draft pleasure boats below Doctortown with a controlling depth of 3 feet about 80 percent of the time. During late summer when the flow is less than 4,500 cubic feet per second, the controlling depth is less than 3 feet.

SECTION III – PEOPLE IN THE BASIN

History

The earliest occupants of the basin, as evidenced by relics, were the wandering hunters of the Folsom age, about 5000 B.C. Later inhabitants were the Indian mound builders who inhabited the valleys in about 1000 A.D., and were succeeded by the Creeks who occupied some of the same village sites. Hernando de Soto crossed the basin in his explorations between 1539 and 1542. The basin came under Spanish domination in about 1567, and the Spanish dominated the region with the sword and the cross for over a century.

In 1735, General Oglethorpe brought over 150 Scottish Highlanders who settled the town of New Inverness, now Darien, near the mouth of the Altamaha River. These hardy Scots reestablished Fort King George and dug a canal now known as Generals Cut across Generals Island. They later cut a road through the wilderness from New Inverness to Savannah. These settlers routed the Spanish in the battle of Bloody Marsh and laid the foundations for economic prosperity

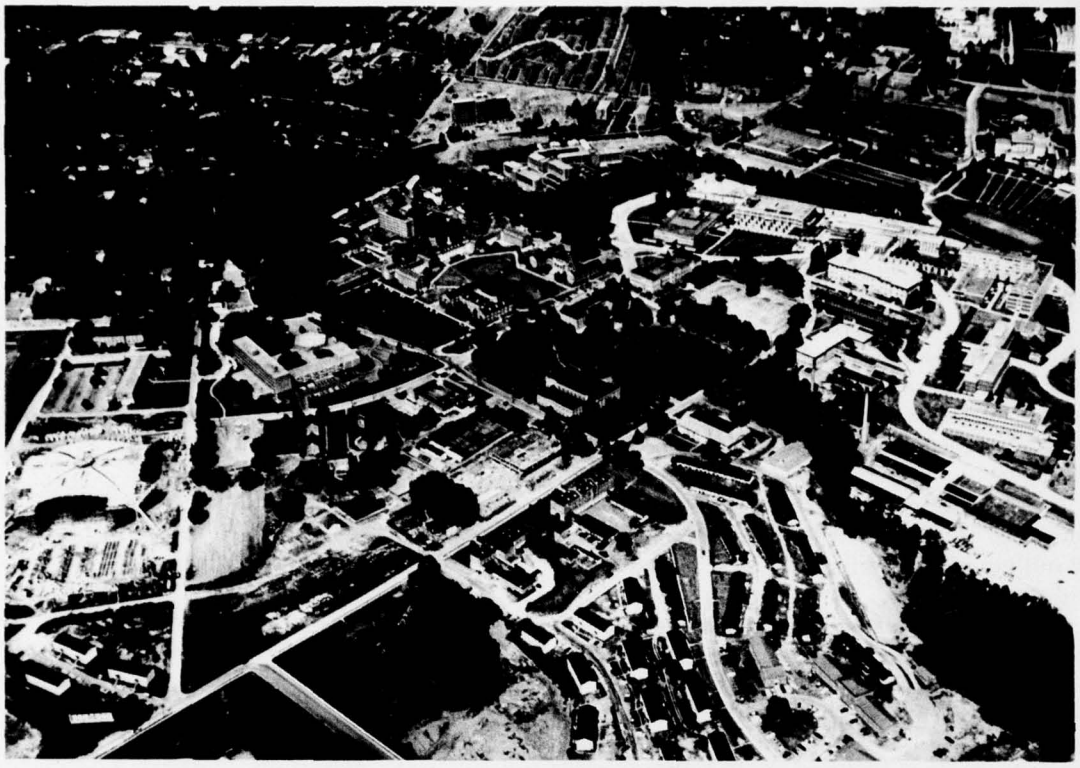


Figure 1.20 *University of Georgia, in Athens, Was Incorporated in 1785 and Is the Oldest State Supported University in the United States.*

of their area. Georgia became a royal colony in 1754 and by that time the main tide of immigration from Virginia and the Carolinas had set in. Soon settlements were established all along the coast and the gradual removal of the Indians began.

The tide of the Revolutionary War ebbed and flowed in Georgia. The coastal areas changed hands several times and the Altamaha basin shared in the events taking place.

After the Revolution, the original owners returned and reestablished a flourishing plantation life. Roads made the port of Darien more accessible, and the town became the shipping and banking center of the area. The principal crops of these coastal plantations were rice, cotton, and sugar cane. Lumber, with its related resin industry, was a sustaining product of the interior.

After the Revolutionary War, the people began pushing against the Indian frontiers, and by 1790, Georgia extended down the coast to the St. Marys River, west to the Oconee River, and north along the Savannah to its tributary, the Tugaloo. In the late 1790's a road system led from Darien to Savannah and Augusta. However, travel within the Altamaha basin was limited to the waterways and a few Indian trails. Milledgeville was declared the new seat of the government in 1804 in step with the westward movement of the people.

From 1800 to 1839, the colonists were expanding and pushing farther into the wilderness. This necessitated pushing the Creeks farther back and forcing them to cede their lands. In February 1825, General William McIntosh, Chief of the Lower Creek Indians, ceded the remainder of the Creek lands in Georgia at a conference at Indian Springs near Jackson.

Milledgeville, which was settled in 1803, was one of the earlier settlements in the basin. Other early towns in the basin were Fort Hawkins, Macon, and Tigertown. Athens was selected as the site for the University of Georgia in 1801. Macon grew rapidly. The population increased from 750 to 3,000 between 1826 and 1834. The

POPULATION DENSITY

1960

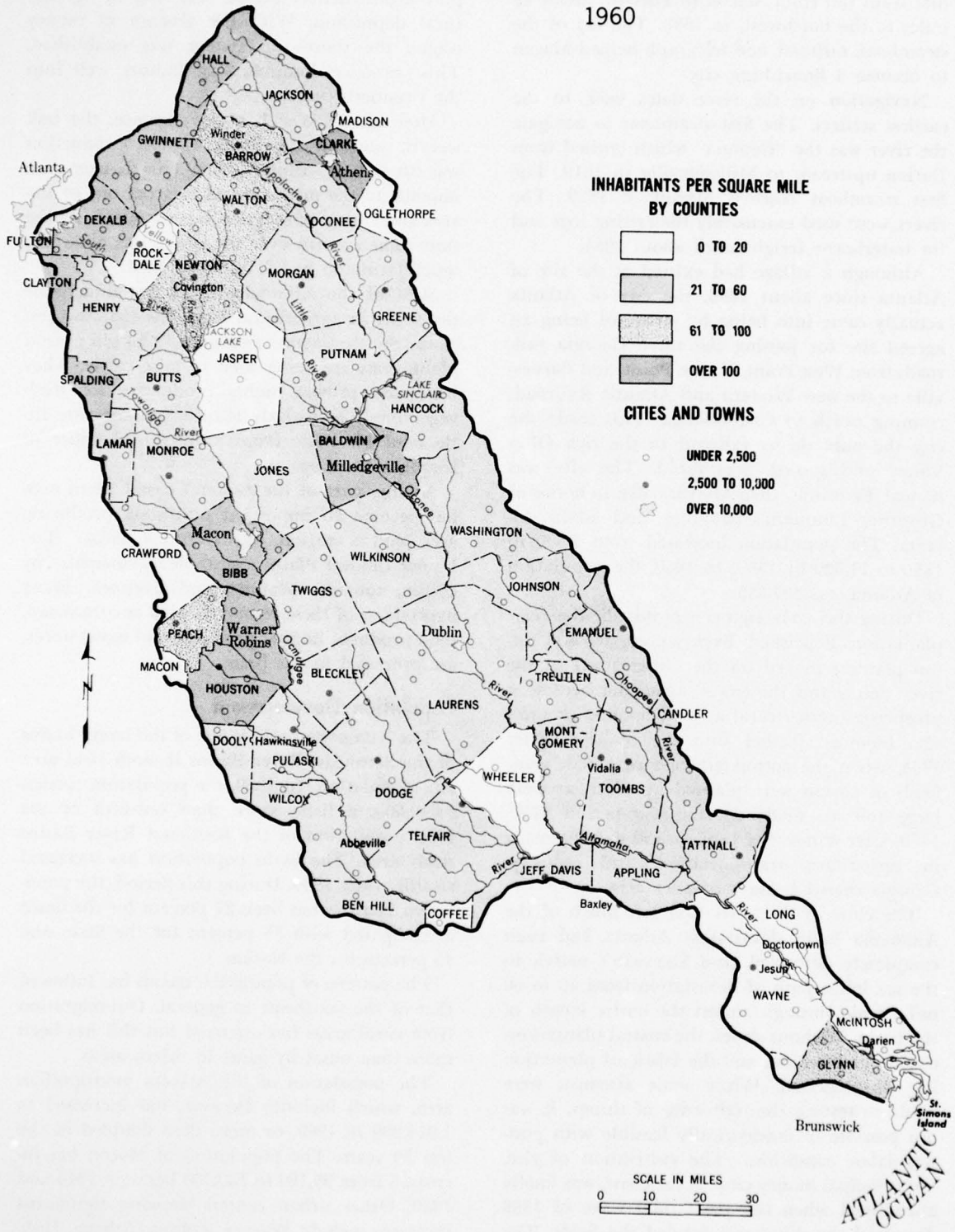


Figure 1.21

first train ran from Macon to Forsyth, about 25 miles to the northwest, in 1838. The era of the steamboat, railroad, and telegraph helped Macon to become a flourishing city.

Navigation on the river dates back to the earliest settlers. The first steamboat to navigate the river was the "Georgia" which cruised from Darien upstream to Milledgeville in 1819. The first steamboat reached Macon in 1829. The rivers were used extensively for rafting logs and for waterborne freight until about 1934.

Although a village had existed at the site of Atlanta since about 1836, the city of Atlanta actually came into being by virtue of being an agreed site for joining the three Georgia railroads from West Point, Union Point, and Barnesville to the new Western and Atlantic Railroad, running north to Chattanooga. This made the city the only tie by railroad to the rich Ohio Valley and growth was rapid. The city was named Terminus, then Marthasville, in honor of Governor Lumpkin's daughter, and finally Atlanta. The population increased from 2,500 in 1850 to 11,500 by 1859. In 1960, the population of Atlanta was 487,455.

During the early eighteen hundreds, the river plantations flourished. Experienced rice and cotton planters moved on the alluvial soil of the river deltas and the lower Altamaha became a prosperous agricultural area. Economic progress also bloomed farther into the interior. After 1793, when the cotton gin was invented, great fields of cotton were planted up river, as were large tobacco fields. During the period 1790-1860, after removal of Indians and developments in agriculture, transportation, and industry, Georgia ceased being a frontier area.

The close of the Civil War left much of the Altamaha basin devastated. Atlanta had been completely destroyed, and Sherman's march to the sea left a path of devastation from 40 to 60 miles wide through almost the entire length of the basin. Without slaves, the coastal plantations could not function, and the fabric of plantation life disintegrated. While some attempts were made to restore the old order of things, it was not possible or economically feasible with post-war labor conditions. The cultivation of rice, the principal money crop of the coast, was finally abandoned when the great tidal wave of 1898 destroyed the dikes and flooded the fields. The post-reconstruction period was one of agricultural depression. With the absence of money wages, the share-crop system was established. This practice dominated agriculture well into the twentieth century.

After World War I, a new menace, the boll weevil, plagued the State. Cotton production was cut in half within 3 years. This disaster gave impetus to the migration of Negroes out of the area and cotton production was curtailed. By the time some control over the insect was obtained, much farmland had been abandoned.

Most of the Altamaha basin has undergone the shifts in agricultural emphasis that the rest of the Southeast has undergone. The old coastal plantations are being used to raise cattle. They have also proven highly productive for fresh vegetables, particularly lettuce, but they are little used for these crops at present because of frequent flooding.

A large part of the Lower Coastal Plain area has become an important pulpwood producing area and a region of diversified farms. The Upper Coastal Plain is sustained principally by cotton, tobacco, peanuts, and livestock. Many byproducts of these resources, such as cottonseed, food products, lumber products, and naval stores, are processed in the basin.

Population Development

The Altamaha basin is one of the larger basins of the Southeast River Basins in both land area and population. In 1960, the population totaled 1,040,000, a little more than one-fifth of the total population of the Southeast River Basins study area. The basin population has increased steadily since 1930. During this period, the population increase has been 27 percent for the basin as compared with 35 percent for the State and 45 percent for the Nation.

The pattern of population trends has followed that of the Southeast in general. Out-migration from rural areas has occurred but this has been more than offset by gains in urban areas.

The population of the Atlanta metropolitan area, which includes Decatur, has increased to 1,014,200 in 1960, or more than doubled in the last 30 years. The population of Macon has increased from 95,100 to 180,400 between 1940 and 1960. Other urban centers showing significant increases include Warner Robins, Athens, Dub-

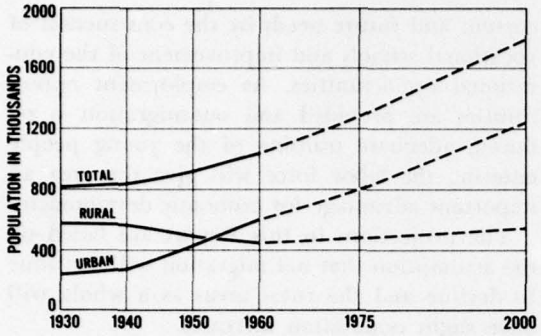


Figure 1.22 *Population Trends and Projections, 1930-2000.*

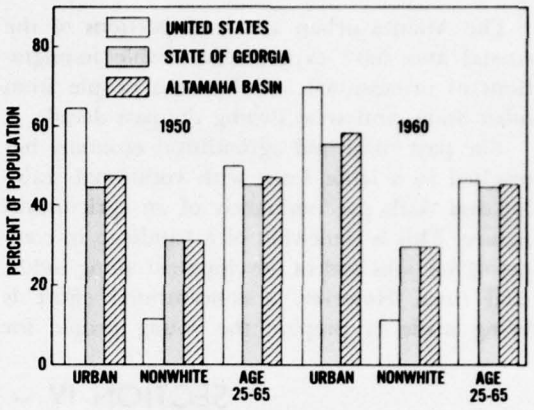


Figure 1.23 *Comparative Population Characteristics, 1950 and 1960.*

lin, Milledgeville, Jesup, Covington, and Vidalia. Many others showed a mild increase in population.

The rural farm population is expected to continue to decline and some migration from rural areas will continue. However, substantial growth is expected in rural nonfarm areas, particularly around the fringes of the metropolitan areas. In addition, the trend in out-migration from the Southeast River Basins is expected to reverse by about 1980. Such a reversal will influence the population growth of individual basins, particularly the Altamaha. As a consequence, the basin rural population is projected to cease declining and to increase slowly but gradually for the next 40 years. Total basin population is projected to increase from 1,040,000 in 1960 to 1,289,000 in 1975, and to 1,785,000 by the year 2000.

The population of Atlanta is expected to almost triple in the next 40 years. Much of this growth will be in the Altamaha basin. Similar growth in other metropolitan areas, particularly Macon, Warner Robins, Jesup, and Athens, has and will continue to influence basin population development.

Population Characteristics

Population characteristics and characteristics of the social and economic environment are interdependent. The characteristics of the present population of the Altamaha basin are a consequence of the social and economic forces of the past. The future development of the economy will be directly influenced by the characteristics of the present population.

The basin population is about three-fourths white and one-fourth nonwhite. This percentage of nonwhite is over twice the national average. The whites are predominantly native born. The nonwhites are almost all native-born Negroes. The median age of the basin population is over 25, which is about the same as for the State but less than the average of nearly 30 for the Nation.

Factors Affecting Population Change

Migration from rural areas, part of which has been to urban centers in and adjoining the basin and part of which has been to industrial centers outside the basin, has left a large proportion of the county population in the under-25 and over-65 year age group. From 1950 to 1960, a six-county rural area in the basin lost more than 6,000 persons in the 20 to 44 age group.

Total basin population is 58 percent urban. The Piedmont province is three-fourths urban and the Coastal Plain is two-thirds rural.



Figure 1.24 *Abandoned Farm Houses Mutely Testify to Changes in Tenancy Practices and Migration from Rural Areas.*

The Atlanta urban area and portions of the coastal area have experienced sizable in-migrations of professional and business people from other States and areas during the past decade.

The past rural and agricultural economy has resulted in a labor force with vocational training and skills predominantly of an agricultural nature. This is somewhat of a handicap in competing for jobs and in development along industrial lines. However, a concentrated effort is being made to prepare the young people for current and future needs by the construction of vocational schools and improvement of the educational opportunities. As employment opportunities are provided and out-migration is reduced, adequate training of the young people entering the labor force will give the area an important advantage for economic development.

The projections in this Report are based on the assumption that net migration will continue to decline and the rural areas as a whole will have slight population increases.

SECTION IV – BASIN ECONOMY

Existing Economic Development

The economic pattern of the basin ranges from the heavily populated and industrialized Atlanta area to the sparsely populated midbasin and coastal areas where there is little industry. The economic activity encompasses manufacturing, mining, government, agriculture, forestry, transportation, utilities, communication, and trades and services.

Current economic activity is reflected by a wide distribution of employment. In 1960, about 367,900 people were employed in the basin. About 12 percent, or one-eighth, of these were employed in agriculture. About 23 percent were employed in manufacturing. Most of the remaining two-thirds were employed in nonagricultural and nonmanufacturing activities. Only some 3 percent of the employment were in forest and forest products, although the basin was 69 percent in forest cover.

A recent study of employment in the whole State of Georgia indicated that more than one-half of the manufacturing employment in the State was concentrated in only 10 of the 159 Georgia counties. Four of these 10 counties—DeKalb, Fulton, Bibb, and Hall—are located wholly or partially in the Altamaha basin. At the same time, 26 counties lying wholly or partially in the basin each had less than 500 people employed in manufacturing.

In 1960, about 84,000 people were employed in manufacturing activities in the basin. Over 20,000 were employed in textiles. These textile activities were most heavily concentrated in DeKalb, Fulton, Hall, Newton, Spalding, Upson, and Bibb Counties.

The apparel industries were next in basin manufacturing employment with over 15,000 people. These activities were most heavily concentrated in and adjacent to the Atlanta metropolitan area and in Clarke, Jackson, Barrow, Walton, Spalding, Bibb, Bleckley, Emanuel, Toombs, and Jeff Davis Counties.

A little over 10,000 people were employed in the food and food processing industries, mostly near the metropolitan areas of Atlanta, Gainesville, Macon, Athens, and Brunswick.

The metal industries in the basin also employed a little more than 10,000 people. Less than 10,000 people were employed in each of the other major categories of manufacturing. In the order of magnitude of employment, these were lumber and wood; pulp and paper; stone, clay, and glass; printing and publishing; and chemicals.

The three cities of Athens, Macon, and that part of Atlanta in the basin account for about 36 percent of the total number of manufacturing plants. The pulp and paper products industries have about 70 percent of their establishments in Macon and Atlanta. Most of these industries process paper products and are located in a few large plants. Over half of the metals group, including transportation, is in the three larger cities. Many of these plants are service-type operations, with textile, apparel, and food industries being the major customers. The chemical industries are agriculturally oriented. About 40 percent of the plants is located within the three large cities in the basin. The textile; apparel; lumber and wood products; and stone, clay, and glass industries are, in general, located in smaller

ECONOMIC ACTIVITY

1960

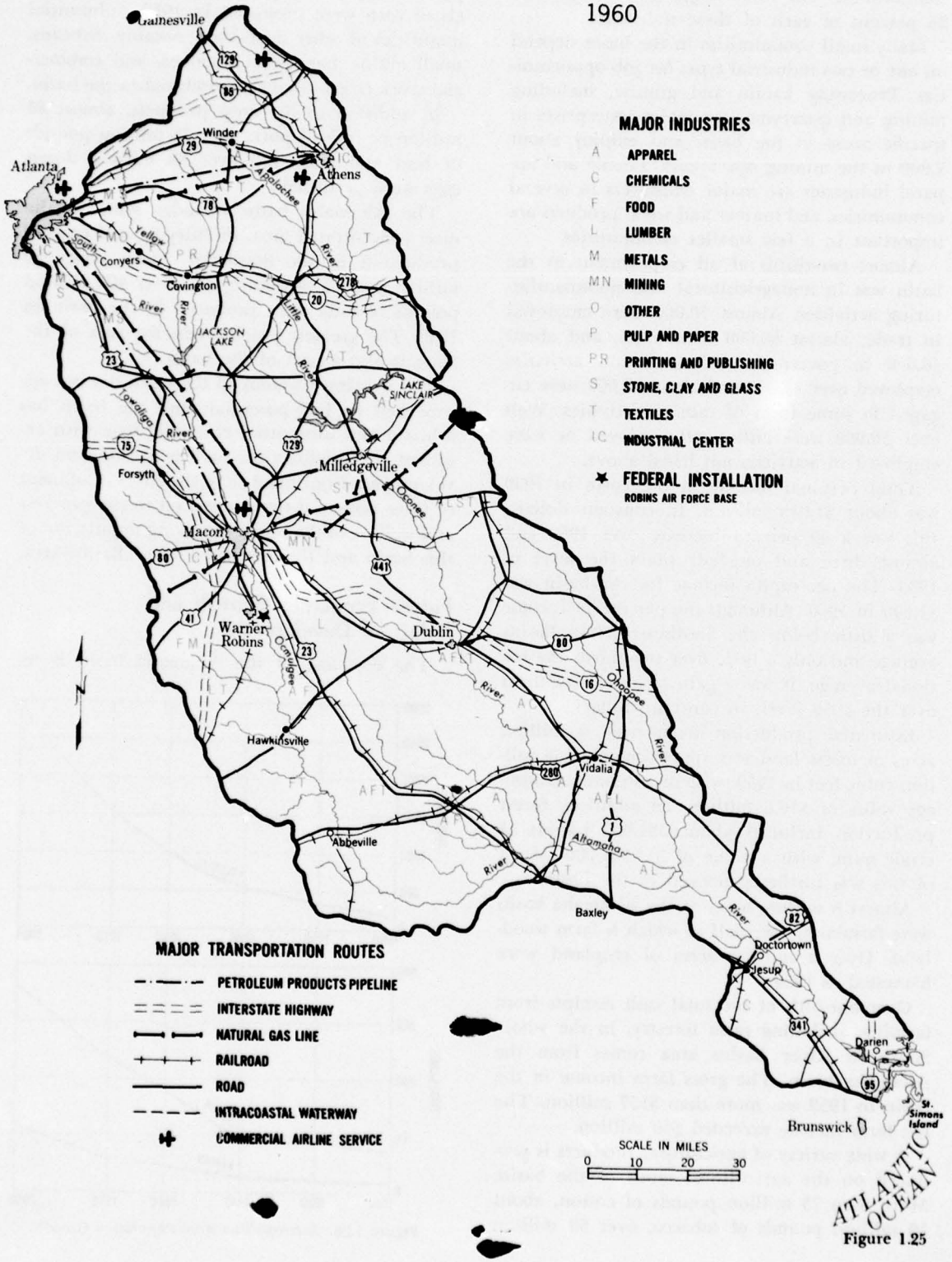


Figure 1.25

communities. The three larger cities have about 25 percent of each of these industries.

Many small communities in the basin depend on one or two industrial types for job opportunities. Processing kaolin and granite, including mining and quarrying, are major enterprises in specific areas in the basin and employ about 2,800 in the mining operations. Textile and apparel industries are major employers in several communities, and lumber and wood products are important in a few smaller communities.

Almost two-thirds of all employment in the basin was in nonagricultural and nonmanufacturing activities. Almost 70,000 were employed in trade; almost 50,000 in services; and about 46,000 in government. Construction activities employed over 15,000 and almost 3,000 were engaged in some form of mining activities. Well over 50,000 were either self-employed or were employed in activities not listed above.

Total personal income in the basin in 1960 was about $1,613 million. In constant dollars, this was a 50 percent increase over 1950 and almost three and one-half times the level of 1939. The per capita income for the basin was $1,550 in 1960. Although the per capita income was a little below the Southeast River Basins average and only a little over two-thirds the national average, it was a gain of about one-third over the 1950 level, in constant dollars.

Estimated production from over 6 million acres of forest land was approximately 166 million cubic feet in 1959, with an estimated stumpage value of $16.6 million. In addition, forest production included about 334,000 barrels of crude gum, with a value of $13,364,000. Much of this was further processed in the basin.

Almost 5 million acres of the Altamaha basin were farmland, over half of which is farm woodland. Over a million acres of cropland were harvested in 1959.

Over one-fifth of the total cash receipts from farming, including farm forestry, in the whole Southeast River Basins area comes from the Altamaha basin. The gross farm income in the basin in 1959 was more than $157 million. The net farm income exceeded $40 million.

A wide variety of agricultural products is produced on the agricultural lands of the basin. More than 73 million pounds of cotton, about 16 million pounds of tobacco, over 50 million pounds of peanuts, and about 8.8 million bushels of corn were produced in 1959. Substantial quantities of other field crops, notably soybeans, small grains, hay, sweet potatoes, and commercial truck crops, were also produced in the basin.

In addition to the crop products, almost 85 million pounds of pork, over 78 million pounds of beef and veal, and over 38 million dozen eggs were produced.

The Altamaha basin includes some of the most concentrated areas of dairying and poultry production in the Southeast. More than 250 million pounds of poultry and over 400 million pounds of milk were produced in the basin in 1959. The greatest peach-producing area of the State is also a part of the basin.

The existing economy of the basin has not approached its full potential; and the basin has a broad and substantial economic base with excellent potentialities for further growth and development. Continued accelerated development of these potentialities is essential to the progress and welfare of the rapidly growing population of this basin and the Southeast River Basins area.

Future Economic Growth and Industrial Development

The economy of the Altamaha basin is re-

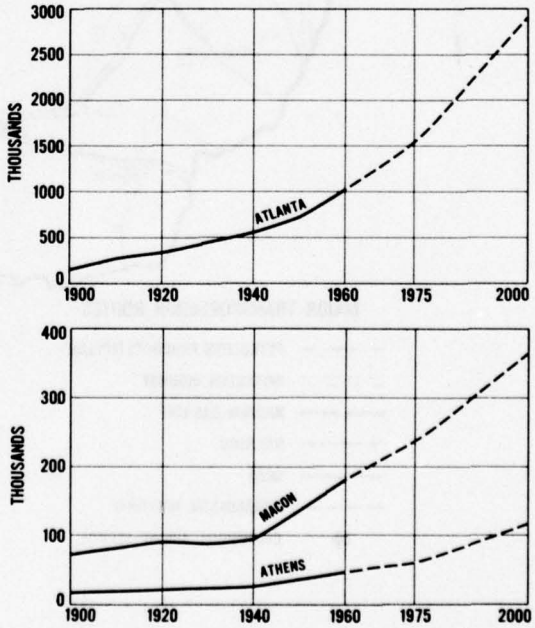


Figure 1.26 *Metropolitan Area Population Growth.*

lated not only to that of the Southeast but is also dependent upon the economy of the Nation. National trends in population, per capita income, and employment will affect related trends in the basin.

The basic information used in establishing the goals for the basin is contained in the Economic Framework established for the Southeast River Basins contained in Appendix 9, Economics. This framework includes projections of the important elements which are expected to shape the economy of both the Nation and the area for which the comprehensive plan is designed. These social and economic elements include population, gross national product, labor force and employment, income, and food and fiber requirements. The resource utilization and development needs are delineated to fit this social and economic environment and become the planning goals. The projections are not presented as precise predictions of future conditions, but are considered to be adequate as planning guides. To the extent that the projections may be too optimistic or conservative, the projected level of economic growth may be reached earlier or later, but the goals would not be greatly altered.

After the national projections had been made and production requirements established, similar projections were made for the Southeast River Basins area and each of the river basins. Needs were determined in relation to these national, area, and basin projections, physical resources, and the production requirements.

The population is projected to increase from 1,040,000 in 1960 to about 1,785,000 by the year 2000, and employment is expected to increase from 367,000 to about 680,000 during the same period.

Personal income is projected to increase from $1,613 million in 1960 to $6,490 million in 2000, and during the same period the per capita income of $1,550 will increase to over $3,600. Although the per capita income in the basin is now only about two-thirds of the national average, it is expected to be over three-fourths the national average by 2000.

Coinciding with economic development, employment is expected to almost double in the next 40 years. Manufacturing employment is expected to increase from about 84,000 in 1960



Figure 1.27 *Food Processing Bolsters the Basin Economy.*

to about 193,000 by 2000. In view of the potentials, manufacturing employment in the basin is expected to account for about 28 percent of total employment by 2000 as compared to about 23 percent in 1960. Rapid expansion of manufacturing employment in the basin is essential to attain the level of economic growth indicated by the needs of the projected population and is compatible with basin potentials, as reflected by all the economic projections.

Nonagricultural and nonmanufacturing employment is expected to increase rapidly with the rapid expansion in manufacturing activity and the continued shift of population to urban areas. Employment is projected to almost double in the major categories of trade, construction, and self employment, and to more than double in services, government, and mining.

Employment in agriculture is expected to continue to decline, although agricultural production will continue to increase. This will result largely from continued mechanization, farm consolidation, and improved production technology. Individual commercial farms will continue to increase in size and decrease in number. In 1960, about 44,000 people were employed in agriculture in the basin. This employment is projected to decrease to about 33,000 in 1975 and to less than 25,000 by 2000.

The continued decrease in agricultural employment along with population growth will rapidly increase the need for nonagricultural employment opportunities. Expansion in manufacturing activities is required to meet this important need. The Altamaha basin is fortunate in having the resources and potentials to meet this need if these resources and potentials are adequately developed.

The outlook for expanding manufacturing activities in the basin is favorable in the categories of metal; stone, clay, and glass; apparel; and other miscellaneous manufacturing activi-

EMPLOYMENT

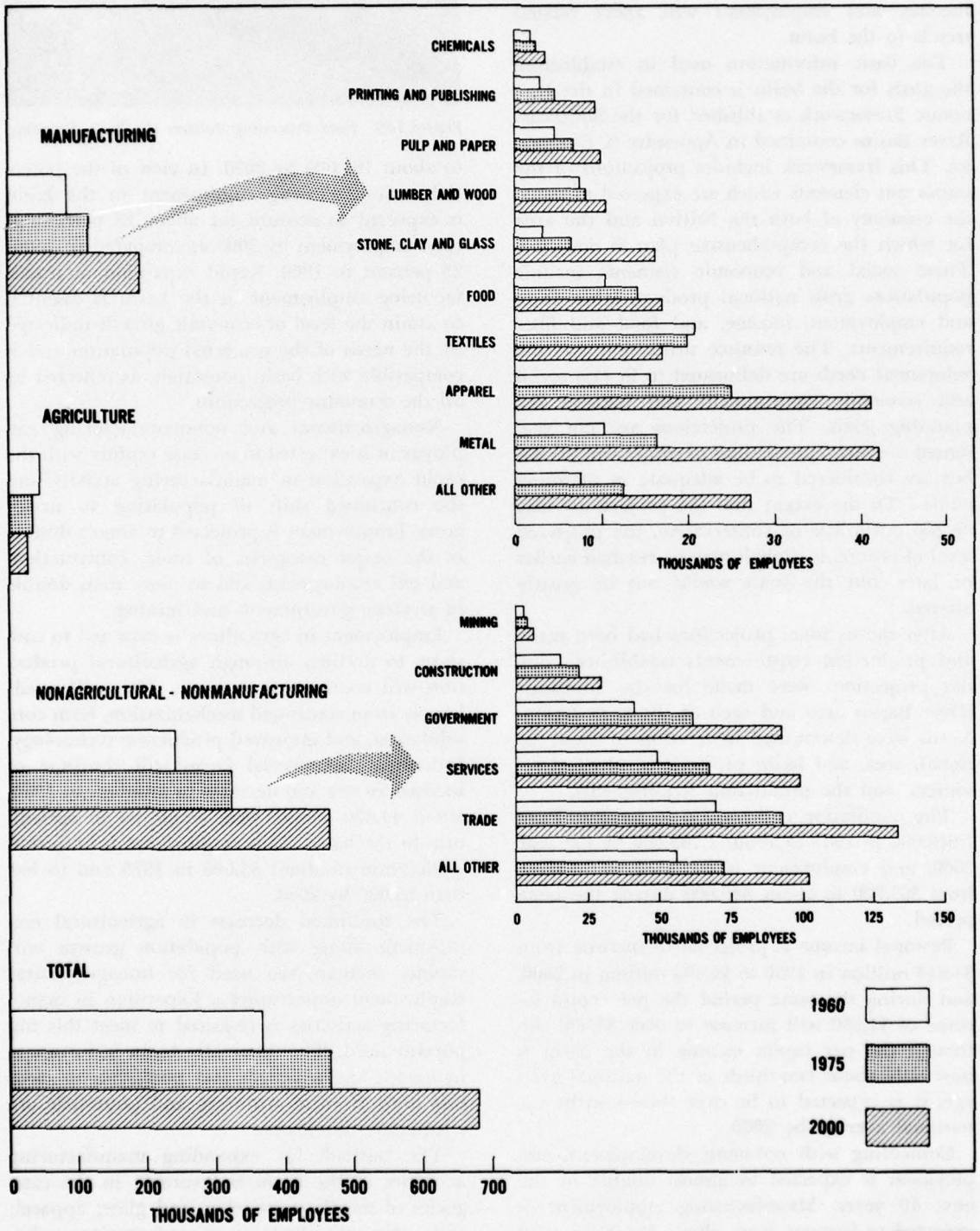


Figure 1.28

ties. Relatively rapid growth is also expected in printing and publishing, chemicals, and pulp and paper. Continued expansion in employment at a more moderate rate is expected in food and food processing and in the lumber and wood categories, although employment in textiles is expected to decline moderately.

The metal industries in 1960 employed about 10,000 people but this category is projected to increase to 42,000 by 2000. Potential market demand enhanced by rapid growth in urban areas accounts for the favorable outlook in this category. This will aid in broadening and diversifying the economic base, and increased employment in this relatively high wage category will tend to increase both total and per capita income levels.

The basin has excellent resources for rapid expansion in stone, clay, and glass manufacturing. Although activities in this category are now limited in volume and the potential is barely developed, employment in this category is projected to double by 1975, then double again by 2000, with over 16,000 then being employed.

The apparel industries, in 1960, employed over 15,000 people. With favorable market conditions and an abundant supply of adaptable labor, employment in this category is projected to continue to increase to about 25,000 in 1975 and to about 41,000 by 2000. Although the wage scale is relatively low for this category, rapid expansion of these activities will help provide employment in rural areas where the transition from agricultural to nonagricultural employment creates an urgent need for employment opportunities.

The abundant supply of water and forest products of the basin provides potentials for increased manufacturing activities in the pulp and paper industries and in the lumber and wood products industries. Although production is expected to increase, continuing mechanization and improved technology are expected to make the employment gains moderate.

Employment in the chemical industries and in printing and publishing activities is projected to increase with the growing population and continued urbanization. Although the volume of employment in these categories is not great, their ratio to total employment is expected to remain fairly stable.

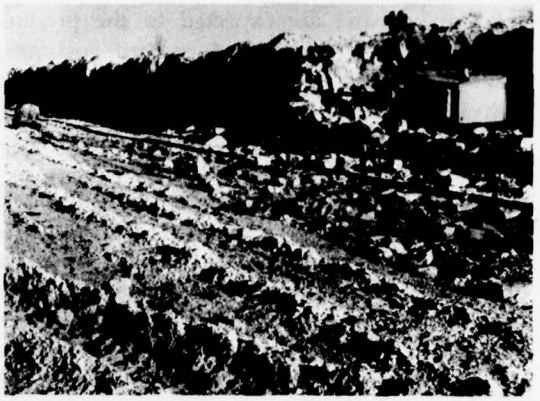


Figure 1.29 *Kaolin Pit near Macon. Employment in Stone, Clay, and Glass Manufacturing Is Expected to Quadruple by the Year 2000.*

Textile manufacturing activities are expected to continue to be an important component of the basin economy, but this category of employment is not expected to maintain its present relative position. Employment in this category is projected to remain about stable until 1975; after this, it will decline about one-fourth by 2000. Inasmuch as employment in this category has a relatively low wage scale, a decline in the proportion of employment in this category to total employment accounts for some increase in projected per capita income in the basin.

Agriculture is an important component of the Altamaha basin economy, and it is expected to continue so in the future. However, production must be increased if the requirements of an expanding population are to be met and the excellent agricultural resource potentials of the basin are to be utilized at an optimum for the welfare of the area and Nation.

Total farm production now amounts to about $157 million gross value. This is projected to increase to about $276 million in 1975 and about $408 million by 2000. This will involve a significant increase in the physical volume of both crop and livestock production.

The 1959 cotton production of about 74 million pounds will need to be increased to about 122 million pounds in 1975 and to 165 million pounds by 2000. Tobacco production, which in 1959 was 16 million pounds, is projected to be about 2½ times the present production by 2000. The peanut production of 54 million pounds in 1959 is expected to more than triple by the year 2000.

Large increases are expected in the production of other field crops such as corn, soybeans, small grains, and hay. The production of sweet potatoes in the basin is projected to almost triple by 2000, and commercial truck crop production will more than triple by 2000.

The production of livestock and livestock products, in general, is expected to increase even more rapidly than the production of other farm products. The production of beef and pork is projected to about double by 1975 and triple by 2000 over the 1959 amount. This will mean an annual increase of almost 150 million pounds of these two meat products by 1975 and an annual increase of well over 300 million pounds in the next 40 years.

The production of poultry and eggs is projected to increase to more than double the 1959 production. The production of poultry, mostly broilers in 1959, was over 250 million pounds. By 2000, this production is expected to be well over a half-billion pounds.

The production of milk in 1959 was over 400 million pounds. With continued urbanization and a growing market demand, milk production is expected to increase to almost 700 million pounds by 1975 and to over a billion pounds by 2000.

Although total woodland acreage is expected gradually to decrease over the next 40 years as a result of increasing demands for land for other uses, total forest production is expected to continue to increase. Farm woodland is expected to decrease by about three-quarters of a million acres and total woodland is expected to decrease by about 600,000 acres by 2000 from the 1959 acreage. Despite this moderate acreage decline, improved management, advancing technology, and accelerated resource development are expected to result in increased forest production. Total forest production is projected to increase by about 50 percent from 1959 to 1975 and to more than double by 2000. A large proportion of this increased production will be pulpwood.

Although both forestry and agricultural activities are dispersed throughout the basin, there is considerable difference between the basic characteristics of various areas of this large basin.

Farming activities, particularly row crop production, are heavily concentrated in the Upper Coastal Plain section between Macon and Vidalia. This is particularly true for the major crops such as tobacco and peanuts. The Piedmont area of the basin has considerable acreages of cotton and corn, although both are declining and are expected to continue to do so.

Almost three-fourths of the basin acreage devoted to the production of hay is in the Piedmont area where dairying and livestock production are major farm enterprises. The production of livestock and livestock products is heavily concentrated in the Piedmont area. This is particularly true of milk, poultry, and eggs.

The Lower Coastal Plain in the basin is rela-

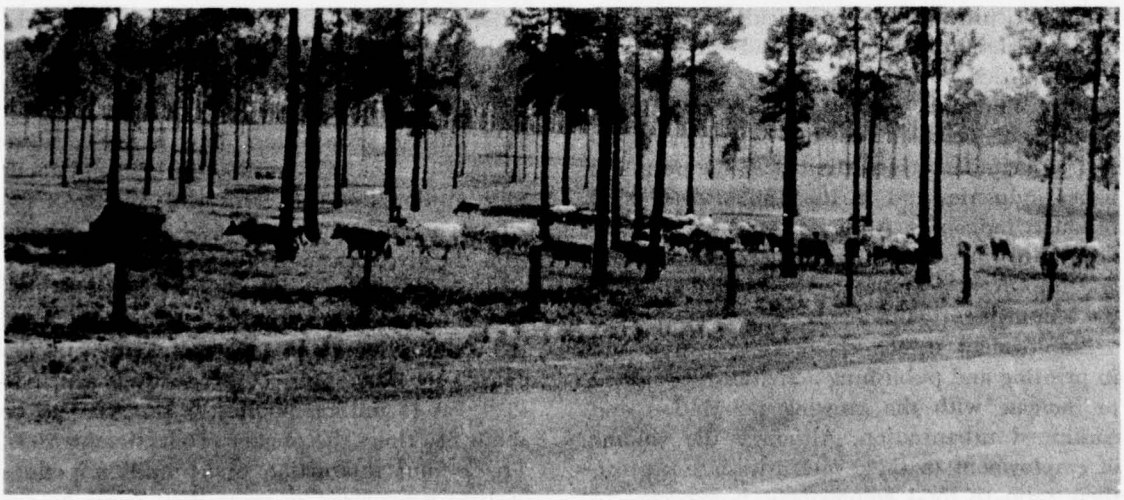


Figure 1.30 *The Need for Beef and Dairy Products Is Projected to About Triple by the Year 2000.*

tively small, with less than 1 million acres, and is heavily forested. Only about one-fourth of the Lower Coastal Plain is in farms and over three-fourths of this is farm woodland. There exists a good potential for converting sizable areas of the Lower Coastal Plain to agricultural production when and if needed.

As population grows and demand for agricultural products including forestry increases, the land resources of the basin will need to be further developed and more fully utilized.

There are many industrial development corporations in the basin whose purpose is to help establish new industries in their specific area. Chambers of commerce, industrial committees and commissions, either as city or city-county groups, are active in industrial development. These groups and agencies, when properly organized and directed, can be instrumental in improving the economic growth of an area.

Among the smaller communities and predominantly rural areas, there is considerable competition for new or expanded industrial development. Many county or city-county committees, commissions, or development agencies have been organized to sell an area to industry. There are several State and Federal agencies whose primary function is to assist communities and areas in formulating development plans and programs.

Under present law, the Small Business Administration can lend 80 percent of the cost of establishing new industries up to a maximum of $250,000 for each individual project. Under the Small Business Investment Act of July 30, 1953, loans can be made to local development companies to finance the construction, conversion, or expansion of industrial plants and shipping centers to be purchased or rented by small business concerns. These loans are made for 10 years and are repaid through receipts from lease of the buildings. The local agency is required to put up $0.20 of every dollar spent on the project.

The Area Redevelopment Act of 1961 is directed toward creating needed new employment opportunities through the development of facilities and resources. The program offers five broad types of assistance: Loans for industrial and commercial projects; loans and grants for public facilities; technical assistance; occupational training; and retraining subsistence payments. Many Federal and State agencies cooperate under the provisions of the Act.

A forerunner of the Area Redevelopment Act was the Rural Development Program established in 1955. Now renamed the Rural Areas Development Program, this program is an interagency effort to solve some of the economic problems of rural underdeveloped areas. The U. S. Department of Agriculture and the land-grant colleges are very active in this work. In addition, assistance is available in Georgia from Georgia Department of Commerce, Georgia Institute of Technology Engineering Experiment Station, and the University of Georgia Institute of Community and Area Development.

Also, there is increased opportunity under the Federal Housing Act to rehabilitate blighted residential, industrial, and commercial areas and to obtain technical assistance and planning aid in cities, small towns, and counties.

Under the provisions of the Job Training Act of 1962, trainable unemployed workers, members of farm families with a total income of less than $1,200 a year, and youths between 16 and 22 may be trained in those skills found to be in short supply.

The focal point in obtaining and utilizing assistance under these programs rests with local groups organized to effectively delineate the community interests and initiate action toward obtaining these objectives.

For short-range immediate results, the local development groups need to canvass the industries in their area and determine how to expand production under the present conditions. Long-range results can be achieved through the development of plans which utilize the resources of the area. The area around Macon has mineral resources, kaolin, limestone, fuller's earth, and bauxite, which can be developed. Besides exporting the raw materials, industries utilizing these materials could locate near both the raw material and water or other transportation.

As these economic projections and the factors associated with them indicate, the outlook for the future economy of the Altamaha basin is favorable and the potentials excellent. These projections are predicated upon the assumption that the land and water resources of the basin will be developed and utilized to the extent of

the economic potentials of the basin. Only with continued and accelerated development of all the resources of the basin can the projection levels be met.

Social and Institutional Factors

The people of any area are the most important factor in resource use and development and, in the final analysis, the nature of the economic and social environment is largely dependent upon the desires and actions of the people themselves. The future economy of the Altamaha basin will depend primarily upon the desires and actions of the basin interests in developing and utilizing the resources of the basin.

Public and private action in fully developing and utilizing the resources of the basin may be significantly affected by social and institutional factors, particularly educational levels, social customs, governmental structure, and resource ownership and use patterns. Although these factors may, at times, present problems, they should be recognized as a challenge to desired economic growth and social stability.

Along with the many advantages of the basin are some obstacles which, if not adequately met, will impede economic development and progress.

Inasmuch as the level of economic development in the basin is below that for most of the rest of the Nation, this leaves the area with large quantities of underdeveloped and undeveloped natural resources and provides a somewhat restricted economic base upon which to build. In the competitive race of economic development, the basin population must work hard to sustain its position and must exert increasing pressure to obtain the desired goals. The people must face the competitive economic battle with some social and institutional handicaps. Probably the most important of these is inadequate education and training.

Increased and improved educational facilities are needed to provide the leadership, talent, and skills necessary for increased industrialization and economic growth. Economic activities, which presently account for most economic growth, require not only a sufficient labor supply but also one adequately educated and adaptable to modern technological skills.

Many small businesses and manufacturing plants have been started by skilled workmen such as electronics workers, machinists, tool and die makers, and others.

The economic history of the United States demonstrates that economic growth and development proceed most rapidly, if other things are equal, in areas where all segments of the population are adequately equipped to contribute to and participate in the total economy.

The nature and stability of the local governmental structures and the nature and equality of the tax structures are important factors in economic development. The basin is characterized by many small local government units. Many of these are in rural areas where the shift to urban areas is causing a decline in population and economic activity. This severely limits the revenue sources from which public services are provided and makes it more difficult to maintain economic stability and growth.

On the other hand, many of the urban areas are growing so rapidly that the need for public services presses hard upon available revenue sources. Governmental units and structure often do not have flexibility that is conducive to adapting to these transitory conditions. As a result, adequate financing of schools, medical facilities, and other social service facilities is often slow and difficult. Continued progress toward more efficient and coordinated local government appears to be essential to the future economic well-being of the people.

Some institutional factors often appear to be both a cause and a consequence of the economic environment. This is true in the basin. Rapid transitions within the agricultural industry have made the labor of many small farmers, tenants, and other farm workers marginal or surplus in agriculture. Nonagricultural employment opportunities have not been sufficient to absorb this surplus. Some out-migration from the basin has resulted. Landownership and tenancy patterns often tend to slow the rate of adjustment of more efficient and economic farming units or alternative uses. Although progress is being made in this field, continued improvement is essential.

These are only some of the economic and social problems which the people of the basin must face and deal with in their effort to obtain more desirable economic conditions. Further improvement in solving these problems is needed to achieve economic growth and development.

PART TWO – NEEDS AND OPPORTUNITIES

General

Existing facilities and programs, needs and opportunities, and means of meeting the needs of the Altamaha basin are discussed in this Part for each of the purposes listed in Public Law 85-850. The discussion for each purpose considers that purpose only and does not attempt to indicate or analyze its interrelationships with other purposes.

The discussion of the existing programs and facilities generally includes inventory data and briefly outlines programs in which Federal and State agencies participate. Private and other public interests participate and cooperate in many of the same activities and, in addition, carry out many programs and projects not listed.

The needs and opportunities discussions point out the needs, problems, and general opportunities for meeting the needs. Potential resource development is limited by (1) the needs for each purpose geared to the number of people and the economic level of activity that are expected to prevail in the Altamaha basin as well as the rest of the Nation, and (2) the physical, financial, and political abilities of the basin to produce the material goods that are needed. These limits are intended to insure that excess material goods will not be produced and developments beyond the capabilities of the basin will not be proposed.

Many reports on the Altamaha basin have been prepared by Federal and State agencies and by private organizations. A summary of the more important studies is included in Appendix 12, Planning.

SECTION 1 – FLOOD CONTROL AND PREVENTION

General

Most of the flood damages in the Altamaha basin are concentrated in the upstream tributaries of the Piedmont province. In this area, severe flood damages occur to croplands and pasturelands and to fixed improvements. In addition, flood hazards have caused many of these flood-plain lands to be taken out of production.

Although flooding is widespread, flood damages on the Altamaha River and on the Ocmulgee and Oconee Rivers are not large because the flood plains have had little structural development. Most of the main-stream flood plains are forested. One percent is in cropland, and 1 percent is in pastureland. The flood plain of the Altamaha River is about 1 to 4½ miles wide. During major floods, the Altamaha River overflows the Townsend area near the river mouth on the left bank and is diverted into South Sapelo and South Newport Rivers. The banks on the right bank range from about 25 to 75 feet in height, except for the Buffalo Swamp area where, in the cases of major floods, water is diverted into Turtle River. Below the Fall Line, the flood plains of the Ocmulgee and Oconee Rivers are between 3 and 4 miles in width. Both rivers have occasional bluffs and frequent rock outcropping and shoals in the low-flow channel. The Ocmulgee and Oconee Rivers above the Fall Line are characterized by rocky streambeds, shoals, and upland stream pools.

Streamflow records including flood stages and volumes are being collected at the river gage stations shown on Figure 2.1 and at a number of others in upstream watersheds. Some of the records extend over a period of a half century or more, but many are of lesser length. In addition to the river gage stations, a number of other stations are operated as partial-record stations to measure crest heights of floods.

The records at the river gage stations plus historical knowledge of some floods in the years before stream gages were in operation provide a valuable record of floods and streamflow in the Altamaha basin. From this, it is possible to evaluate flood problems of the watershed.

Annual precipitation averages 49 inches, and annual runoff averages 13 inches. High runoff

FLOOD CONTROL
1960

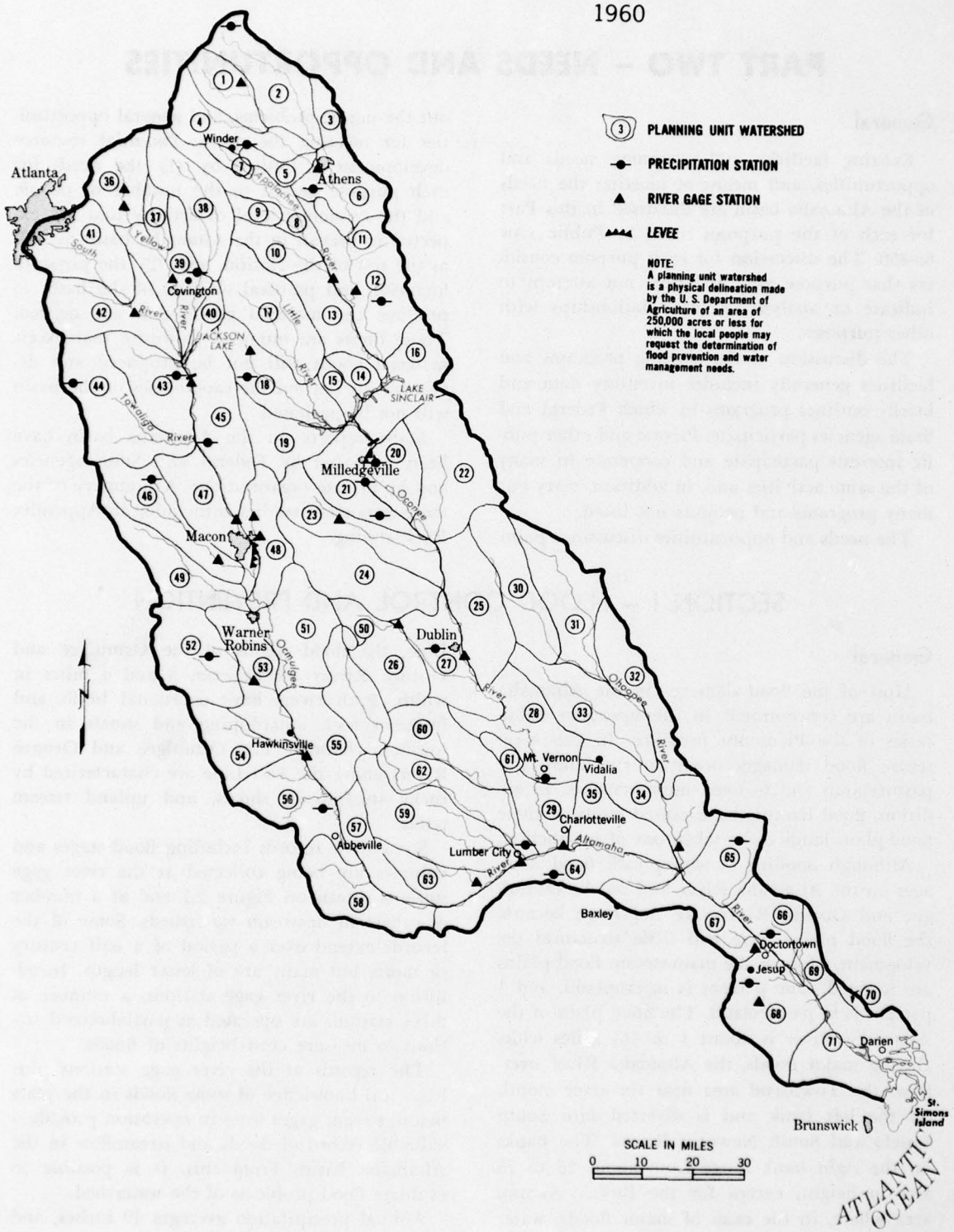


Figure 2.1

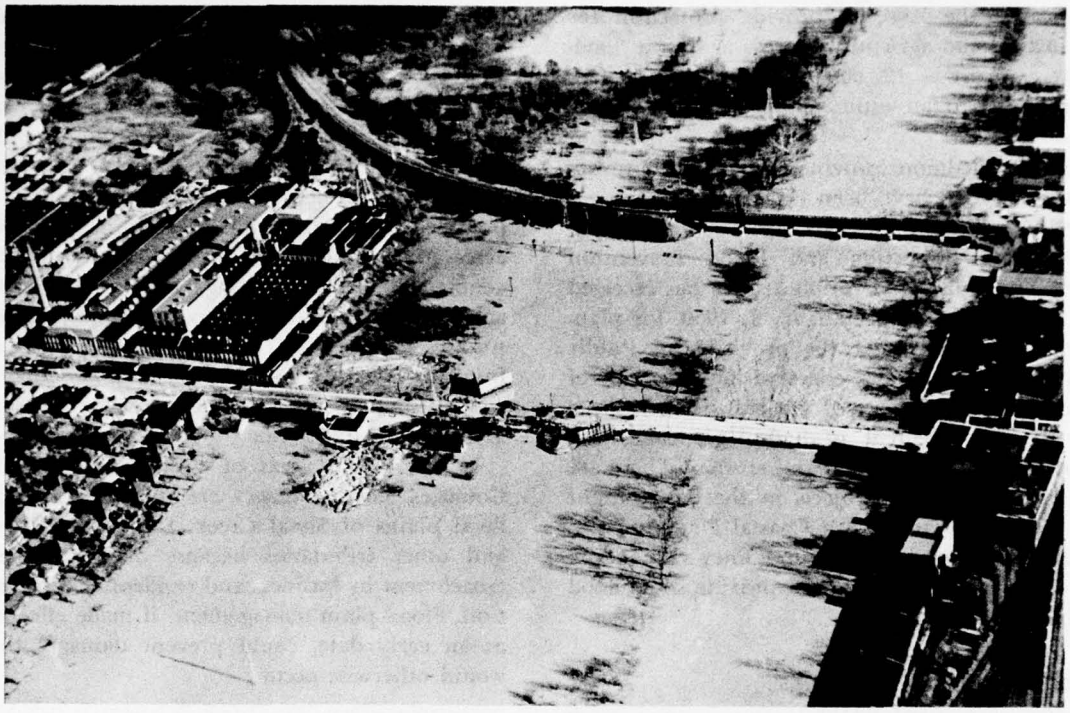


Figure 2.2 *Flooding of Ocmulgee River on November 28, 1948 in East Macon Prior to Levee Construction by Corps of Engineers.*

generally occurs from November to May. For the period of 1910 to 1958, approximately 80 percent of the flood peaks on the Ocmulgee River at Macon occurred from December through April. Thirty percent of these were in March. The remaining 20 percent were distributed through the other months. The highest flood occurred during November.

The time between a storm and the passage of the flood peak is measured in hours above the Fall Line and in days below the Fall Line. The timelag between the end of heavy rainfall and the flood peak at Doctortown on the Altamaha is 12 days.

Existing Facilities and Programs

The United States Weather Bureau currently makes flood forecasts on the Ocmulgee River at Macon, Hawkinsville, Abbeville, and Lumber City; on the Oconee River at Milledgeville, Dublin, and Mount Vernon; and on the Altamaha River at Charlotteville and Doctortown. The largest flood known on the Altamaha at the Doctortown gage was in January 1925 when the discharge was about 300,000 cubic feet per second.

When the flood of November 1948 overtopped the levee constructed by local interests at Macon, the Corps of Engineers raised, extended, and

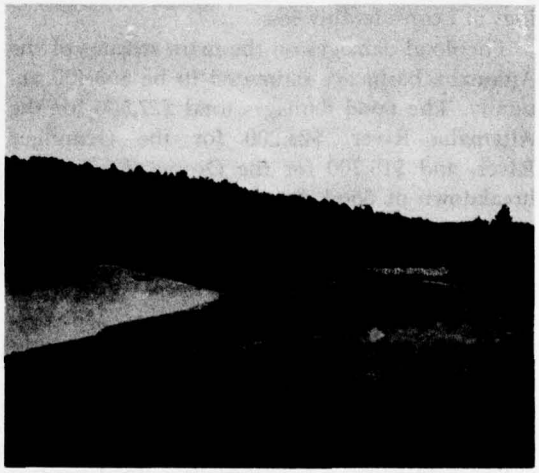


Figure 2.3 *Small Floodwater Retarding Structures Reduce Flood Losses and Sedimentation Damages.*

improved the levee to provide protection for industrial and agricultural areas against a flood-flow as great as 122,000 cubic feet per second, equivalent to an estimated 200-year frequency flood.

In the Piedmont province, eight flood prevention reservoirs have been constructed on watersheds under Public Law 566, 83d Congress, Watershed Protection and Flood Prevention Act. The Soil Conservation Service has received 21 applications as of January 1, 1960, for planning assistance under the provision of Public Law 566. The regular conservation programs of the U. S. Department of Agriculture contribute to the improvement of hydrologic conditions and the control of runoff and erosion. There are 10 group drainage projects in the basin. Eight of these are in the Lower Coastal Plain and two are in the Piedmont province. They vary in size from 500 to 9,260 acres and provide some flood relief for drained lands.

Needs and Opportunities

The history of floods and associated flood damages in this basin indicate that the most serious damages occur in the Piedmont province. The annual flood damages in this area have been estimated as $1,194,000. Of this, damages to crops and pasture total $394,000 and to fixed improvements, $800,000. In the Coastal Plain, flood damages and potential benefits from reduction of flood damages to existing crops and pasture, roads and bridges, and to farm buildings are considerably less.

The flood damages on the main streams of the Altamaha basin are estimated to be $68,400 annually. The flood damages total $27,500 for the Altamaha River, $24,200 for the Ocmulgee River, and $16,700 for the Oconee River. The breakdown of flood damages by types is $25,000 to improvements and livestock, $36,400 to crops and $7,000 to pasture. Improvements subject to flood damage are mostly on farms. Very little urban property is subject to damage. Milledgeville could sustain severe damage during a major flood, but average annual flood damages are low. Major highways and railroads in the basin are generally above record flood levels.

Possibilities exist for providing flood control and drainage by structures and channel improvements for most of the flood plains of tributary watersheds in the Coastal Plain. Benefits here would stem mostly from more intensive land use.

Over 700,000 acres of land lie in the main stem flood plains. Included in the total are the Townsend area, the Buffalo Swamp area, and the delta lands near the mouth of the river. If provided flood protection and drainage, 76,000 acres in the lower flood plains are especially adapted to truck farming, and over 172,000 acres to general farming and over 200,000 are suitable for pasture. This land is now largely in forests. A need for more agricultural production could stimulate more intensive use of the suitable land in this area.

In the urban areas of Fulton and DeKalb Counties, flood damages are increasing in the flood plains of Shoal Creek, Snapfinger Creek, and other tributaries because of gradual encroachment by business and residential construction. Flood plain management, if made effective at an early date, could prevent damages that would otherwise occur.

Means of Meeting the Needs

The present system of flood forecasting appears to be adequate.

Multiple-purpose flood prevention and drainage facilities could be installed on upstream watershed areas, which also would facilitate needed land use adjustments.

No reservoir-type projects appear warranted for flood control alone on the main stem of the Oconee, Ocmulgee, and Altamaha Rivers. However, flood control features might be incorporated in some multiple-purpose structures.

Local interests and State agencies and officials should cooperate in determining the nature and extent of their problems and needs, particularly in the Macon and Milledgeville areas. Recognition should be given to the possibilities of flood plain management. It is more practicable to zone flood plains, as to permissible structural developments, before developments are made. Thus, there are ideal conditions for flood plain zoning in much of the Altamaha basin.

Zoning the tributary flood plains in Fulton, DeKalb, and other urban counties for parks and recreation areas would do much to reduce future flood damages in these areas.

SECTION II – WATER SUPPLIES

General

Fresh surface and ground waters are abundant in the Altamaha basin. Further development and protection of these sources of water supplies are necessary for continued growth. Treatment, including chlorination, and continued surveillance of the public water supplies are required to safeguard the water quality for the protection of public health.

Ground water in the Piedmont province varies greatly as to quantity and quality. Just below the Fall Line, ground water is obtained from aquifers which are a part of the recharge elements of the principal aquifers of the lower basin. The chemical concentrations in the water obtained from these aquifers vary widely.

The ground waters of the lower portion of the basin are of uniformly good quality. The surface waters of the Coastal Plain province have a typical swamp-water coloring; however, the quality of the surface water throughout the basin is consistently suitable for municipal and industrial use with minimum standard treatment.

In general, ground waters are the principal source of supplies in the Coastal Plain and surface waters the principal source in the Piedmont province. Surface water supplies could be developed in the Coastal Plain to supplement the ground water supply if needed.

Existing Facilities and Programs

Domestic Water Supplies

Domestic water supplies are defined as private individual supplies designed to serve a single family. Estimates based on a limited survey made in 1960 indicate that 340,600 rural people obtained 17 million gallons of water a day from 76,000 domestic water supplies. Rural water use, excluding that used for stock water and irrigation purposes, averaged 50 gallons per capita per day. About 70 percent of the domestic water supplies were equipped with pressure systems. Approximately 60 percent of the wells did not meet accepted health standards and were deficient either in construction, water quality, or quantity.

Of the 76,000 rural homes depending on domestic water supplies, approximately 36,000 were served by dug wells, 27,000 by drilled wells, 4,000 by bored wells, and 5,000 by driven wells. The remainder obtained their water supply from springs.

Municipal Water Supplies

In 1960, some 103 municipal systems serving approximately 392,000 persons obtained their water supplies from sources within the basin. The water supplies of Athens, Barnesville, Clayton County, and Commerce serve approximately 12,000 persons who live outside the basin. The water systems of Atlanta, DeKalb County, East Point, Griffin, and Gwinnett County, which were obtained from sources outside the Altamaha basin, served an additional 308,000 persons living in the basin. The water systems of 117 communities and institutions supplied an average of 57.4 million gallons per day for use in the basin.

Ground water sources provide water for 73 municipal systems. Four systems used both surface and ground water sources. The remaining 26 municipal water systems used surface water

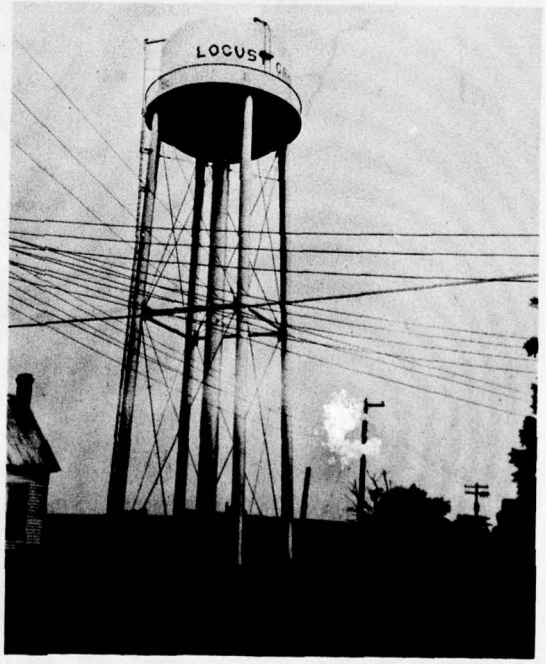


Figure 2.4 *Modern Water Supply Facilities Enhance the Basins Economic Potential.*

WATER SUPPLIES

1960

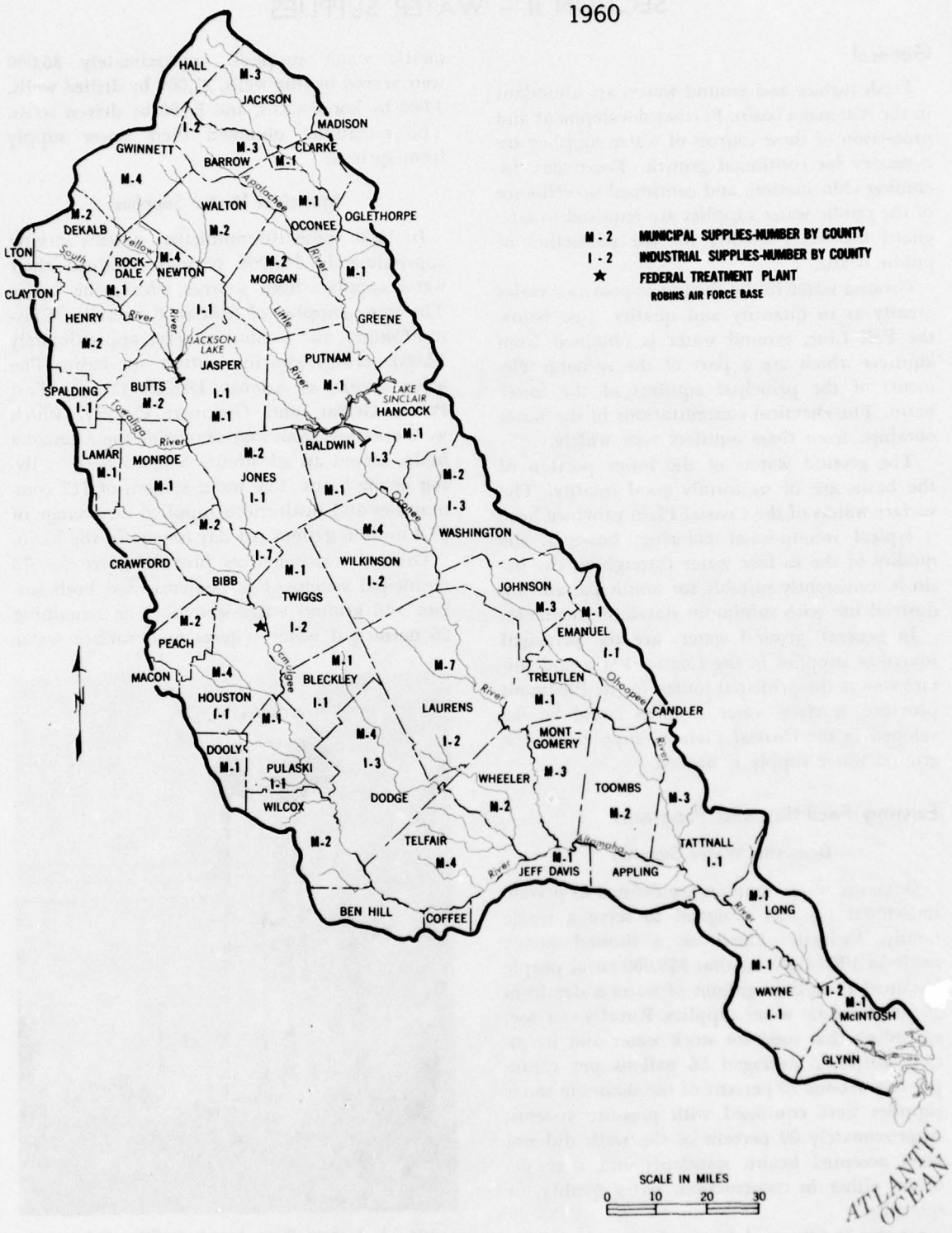


Figure 2.5

sources and supplied over 65 percent of the total water requirement of the basin. Approximately 27 percent of the average demand on the municipal systems was supplied to industry. Excluding this 15.5 million gallons a day, average water consumption by the population served totaled 107 gallons per capita per day.

Periodic bacteriological examinations are made of the water supplied to the public. The degree of the water treatment varies. Twenty-seven of the systems have conventional filtration plants with chlorination, 12 have softening or iron removal plants, 21 have only chlorination, 4 have chlorination and corrosion control, and the remaining 39 systems provide no treatment. The water supplies are flouridated by 13 of the municipal systems serving approximately 142,000 persons. Bacteriological quality of the municipal and semipublic supplies, such as for motels, State parks, work camps, and resorts, is under the surveillance of the State Department of Health.

TABLE 2.1

Basic Data on Municipal Water Supply Systems

Municipality	Population served	Source[1]	Treatment[1]	Design capacity (m.g.d.)[1]	Average demand (m.g.d.)[1]
Georgia					
Abbeville	860	W	None	0.860	0.040
Adrian	560	W	None	0.430	0.028
Ailey	470	W	None	0.144	0.040
Alamo	835	W	None	0.360	0.055
Athens[2]	41,355	S	DP	10.000	5.200
Auburn	375	W	D	0.115	0.020
Barnesville[3]	6,600	S	P	1.000	1.000
Boys Estate (Darien)	52	W	None	0.050	0.005
Braselton	50	W	None	0.072	0.003
Byron	425	W	K	0.600	0.019
Cadwell	360	W	None	0.144	0.030
Centerville	525	W	ADF	0.094	0.035
Chauncey	125	W	None	0.086	0.008
Chester	275	W	None	0.050	0.015
Clayton County[4]	13,995	S	DP	3.000	1.650
Cochran	4,870	W	DP	0.720	0.250
Collins	640	W	None	0.570	0.025
Commerce	3,820	S	DP	1.000	0.750
Conyers[5]	3,580	S	DP	0.500	0.350
Covington[6]	9,130	S	DPV	1.500	0.650
Trappist Monastery	105	SW	D	0.100	0.028
Dacula[7]	540	W	D	0.036	0.030
Darien	1,695	W	None	1.370	0.150
Dexter	350	W	None	0.080	0.035
Dry Branch					
Industrial Village	75	W	None	Undetermined	0.006
Twisco Heights Subdivision	85	W	None	Undetermined	0.009
Dublin[8]	15,185	W	ADPV	2.400	1.020
Dudley	350	W	DK	0.700	0.070
East Dublin	1,250	W	ADF	0.440	0.065
East Juliette[9]	260	S	DP	0.150	0.048
Eastman	5,250	W	DV	2.000	0.600
Industrial Village	375	W	D	0.800	0.038
Eatonton	3,640	S	DPV	0.500	0.400
Forsyth	4,695	S	DPV	1.000	0.400
Fort Valley	9,810	W	ADPV	3.000	0.285
Glennville	3,875	W	None	1.800	0.285
Glenwood	680	W	None	0.150	0.038

(continued)

TABLE 2.1 — Continued

Municipality	Population served	Source[1]	Treatment[1]	Design capacity (m.g.d.)[1]	Average demand (m.g.d.)[1]
Gordon #1	1,550	W	None	0.940	0.100
#2	375	W	None	0.130	0.070
Gray	1,510	W	ADP	0.300	0.065
Grayson	320	W		0.043	0.020
Greensboro	2,885	SW	DP	1.000	0.187
Hawkinsville	3,970	W	D	Undetermined	0.450
Hazlehurst	4,040	W	D	Undetermined	0.200
Helena	1,330	W	None	0.580	0.011
Irwinton	840	W	DK	0.280	0.055
Jackson	2,625	S	DP	0.500	0.357
Jefferson	2,195	S	DP	0.864	0.500
Jeffersonville	1,515	W	None	0.420	0.100
Jesup	7,350	W	D	3.200	0.570
Kite	400	W	None	Undetermined	0.020
Lawrenceville[7]	4,000	W	D	0.750	0.283
Lithonia	2,065	S	DP	0.250	0.150
Norris Lake Subdivision	150	W	D	0.072	0.015
Locust Grove	420	S	None	1.100	0.030
Ludowici	1,580	W	None	0.570	0.140
Lumber City	1,350	W	None	Undetermined	0.125
Lyons	3,320	W	None	Undetermined	0.200
McDonough	3,425	SW		0.380	0.360
McIntyre	560	W	DP	0.360	0.040
McRae	2,740	W	D	1.220	0.351
Macon	72,765	S	DP	45.000	20.000
Cochran Field	370	W	D	1.150	0.300
Madison	3,080	S	DP	0.500	0.200
Mansfield	400	W		0.144	0.015
Metropolitan Mobile Homes (Norcross)	250	W	None	0.039	0.014
Milan	865	W	None	0.067	0.065
Milledgeville	11,265	S	DP	2.000	1.330
State Hospital[10]	16,160	S	DP	3.000	2.347
Colony Farm	350	S	None	Undetermined	0.020
Monroe	6,900	S	DPV	2.000	1.300
Monticello	2,130	S	DPV	0.500	0.210
Montrose	245	W	D	0.100	0.017
Mount Vernon	1,150	W	None	Undetermined	0.070
Pepperton	525	W	AD	0.290	0.120
Perry	6,010	W	ADPV	2.000	0.850
Pineview	350	W	D	Undetermined	0.022
Porterdale	2,365	S	DP	1.650	0.900
Reidsville	1,305	W	None	Undetermined	0.075
Reidsville Prison	3,400	W	D	1.680	0.600
Rentz	300	W	D	0.086	0.015
Rhine	500	W	None	Undetermined	0.035
Robins Air Force Base	10,000	W	DKV	12.400	4.360
Rutledge	480	W	None	0.068	0.040
Sandersville	5,400	W	D	1.800	0.500
Scotland	200	W	None	0.220	0.020
Snellville	475	W	D	Undetermined	0.050
Social Circle #1	1,925	S	DP	0.300	0.193
#2	250	S	D	Undetermined	0.013
Soperton	2,260	W	None	1.000	0.100
Sparta	1,960	W	DP	0.268	0.106
Statham	725	S	None	0.145	0.055
Stone Mountain	1,800	S	DP	0.215	0.120

(continued)

TABLE 2.1 — Continued

Municipality	Population served	Source[1]	Treatment[1]	Design capacity (m.g.d.)[1]	Average demand (m.g.d.)[1]
Swainsboro	6,800	W	D	2.300	0.800
Tennille	1,300	W	None	Undetermined	0.098
Toomsboro	690	W	None	0.145	0.050
Unadilla	1,345	W	None	0.500	0.175
Uvalda	550	W	D	0.290	0.045
Vidalia	7,795	W	D	3.600	1.500
Warner Robins	21,600	W	ADKV	2.500	1.050
Watkinsville	759	S	DP	0.144	0.100
Winder	5,755	S	DP	1.000	0.700
Wrightsville	2,000	W	None	1.100	0.200

NOTES: [1] A = Aeration; D = Disinfection; F = Filters; P = Purification; V = Fluoride adjustment; K = Chemical adjustment; W = Wells; S = Surface; m.d.g. = million gallons per day.
[2] Serves adjacent areas including Winterville, Whitehall, and Bogart.
[3] Serves Aldora.
[4] Serves Jonesboro, Stockbridge, Morrow, Mountain View, and Lake City.
[5] Serves Milstead.
[6] Serves Oxford.
[7] Also served by Gwinnett County Water System.
[8] Serves Veterans Administration Hospital.
[9] Serves Juliette.
[10] Serves 3,500 in Midway-Hardwick (Baldwin County).

Industrial Water Supplies

Some of the industrial establishments in or near municipal areas obtain their water supplies from municipal systems. Others have developed private sources of supply. In 1960, industrial water consumption, based on a survey of major industries, totaled 78.3 million gallons of water a day from private sources and an additional 15.5 million gallons a day from municipal water systems.

Of the industries surveyed, 6 obtained their water from surface sources, 22 used well water exclusively, and 8 obtained water from both wells and surface sources. Excluding water obtained from municipal systems, water use totaled 52.6 million gallons a day from ground water and 25.7 million gallons a day from surface sources. Existing sources of water were reported as adequate to meet the 1960 demands.

The industrial water use is primarily nonconsumptive and nearly all of the withdrawal is discharged into streams.

TABLE 2.2

Sources of Industrial Water Supplies — Water Use in 1960

Industry	Number of plants	Number of employees	Drinking, process, and boiler				Cooling				Total plant demand (m.g.d.)[3]
			Source[1]		Treatment[2]	Average demand (m.g.d.)[3]	Source[1]		Treatment[2]	Average demand (m.g.d.)[3]	
			Number	Type			Number	Type			
Chemical	2	91	1	M	U	--	1	S	U	0.140	0.210
			1	M	None	--	1	S	U	0.070	
Food	10	864	4	W	None	[4]	4	W	None	[4]	
			1	MS	None	[4]	1	W	U	[4]	
			1	W	D	[4]	1	W	D	[4]	
			1	M	--	[4]	1	WM	D	[4]	2.102
			1	WS	P	[4]	1	S	U	[4]	
			1	W	None	[4]	1	S	P	[4]	
			1	W	None	[4]	1	S	None	[4]	

(continued)

TABLE 2.2 — Continued

Industry	Number of plants	Number of employees	Drinking, process, and boiler				Cooling				Total plant demand (m.g.d.)[3]
			Source[1]		Treatment[2]	Average demand (m.g.d.)[3]	Source[1]		Treatment[2]	Average demand (m.g.d.)[3]	
			Number	Type			Number	Type			
Mining	10	2,344	1	M	--	--	1	W	U	0.072	0.072
			1	WS	None	1.153	--	--	--	--	1.153
			1	WS	None	0.168	1	S	None	0.500	0.668
			1	W	U	[4]	1	W	U	[4]	U
			2	W	None	[4]	2	W	None	[4]	7.475
			3	W	None	0.513	--	--	--	--	0.513
			1	MS	None	[4]	1	S	None	[4]	1.250
Metal	2	810	1	W	U	[4]	1	W	U	[4]	0.040
			1	MW	U	0.200	--	--	--	--	0.200
Pulp and paper	3	2,265	1	MW	U	--	1	W	U	[4]	1.680
			1	WS	CD	0.050	1	S	CD	[4]	15.350
			1	W	H	[4]	1	W	U	[4]	41.000
Textile	8	4,067	1	MW	--	--	1	MW	--	--	U
			1	S	PC	1.600	1	S	P	0.100	1.700
			1	W	CD	[4]	1	W	U	[4]	0.002
			2	WS	CD	4.270	2	S	P	0.080	4.350
			1	W	None	[4]	1	S	None	[4]	0.007
			1	MW	None	[4]	--	--	--	--	0.360
			1	MW	H	[4]	1	W	H	[4]	0.100
Miscellaneous	1	50	1	W	U	[4]	1	S	U	[4]	0.022

NOTES: [1] Source: M = Municipal; S = Surface; W = Wells.
[2] Treatment: C = Settling; D = Disinfection; H = Softening; P = Purification; U = Undetermined.
[3] Million gallons per day.
[4] Breakdown of water use not available.

Needs and Opportunities

Domestic Water Supplies

In 1960, many of the wells were improperly sealed, uncovered, without pumps, or had pumps which were not self-priming. Improper construction and the lack of proper equipment make wells subject to bacteriological contamination and turbidity. The drilled wells, for the most part, met sanitary standards of construction and were equipped with pressure systems. For the protection of public health, all wells need to be properly covered, sealed, and equipped with satisfactory pumps and pressure systems. Many benefits are derived from an adequate pressurized water supply.

Some of the ground water supplies have objectionable amounts of sulfur, iron, and hardness. It is possible to remove most of these undesirable characteristics, but the expense involved may be more than the individual owner desires to pay. Unless the quality of the water is seriously impaired, one quickly adapts to the available supply.

By 1975, the average per capita use of the rural population is expected to increase to 70 gallons per day. Domestic water supplies are expected to serve 283,000 persons with an average water demand of 19.8 million gallons per day. The rural population served by domestic supplies is expected to decrease to 138,500 persons by the year 2000 as municipal systems expand their geographical coverage. Their water use is estimated at 13.9 million gallons per day on the basis of 100 gallons per person per day.

Municipal Water Supplies

Future municipal water requirements are based on population projections and an estimated per capita water demand of 150 gallons per day by 1975 and 200 gallons per day by 2000. Ground water resources will continue to be used where they are adequate in quantity and where supplies can be economically developed for the expected future water needs. Adequate quantities of surface water are available throughout the entire area from sources within or near the basin.

TABLE 2.3

Municipal Water Supply Needs*

Period	Population served	Number of places	Number of places requiring new or enlarged		
			Source or treatment	Elevated storage	Distribution systems
1960 to 1975	488,900	90	72	47	77
1975 to 2000	720,600	91	23	20	79

*Includes population served by Federal and State installation. Does not include population served by systems with water source outside of basin. These are terminal values and are not cumulative.

Surface water should be used where ground water is limited in quantity and where the additional development of ground water may increase the possibility of salt-water intrusion.

Most of the subdivisions with separate water systems in 1960 are expected to incorporate or combine their systems with adjacent cities by 1975. Additional countywide water systems are expected to be developed to serve nonurban population in concentrated areas. Where ground water sources are limited and in densely populated areas, community surface water supply can be developed as economical alternatives to the individual wells.

Needed water system improvements were reported in 1960 by 50 municipalities. In addition, other enlargements may be required to assure adequate facilities and supplies for the estimated growth and development of the communities.



Figure 2.6 *Improvement of Some Wells Is Required to Meet Acceptable Health Standards.*

By 1975, an estimated 488,900 persons are expected to be served by 90 municipal supplies, and the water demand for that year is estimated at 73 million gallons per day. By the year 2000, it is estimated that 720,600 people will use 144 million gallons per day supplied by 91 municipal systems in the basin. It is estimated that 1,006,000 persons living in the basin will be served by municipal systems located both within and outside the basin in 1975 and a total of 1,646,000 in the year 2000.

Industrial Water Supplies

Proper development of surface and ground water sources would provide adequate water supplies for industrial growth. The estimated water requirements for the year 1975 are 112.3 million gallons per day. Industrial water demand is expected to increase to approximately 162.4 million gallons a day by the year 2000. These figures do not include water for industrial use supplied by municipal water systems.

Means of Meeting the Needs

Domestic Water Supplies

Supplies that are subject to possible bacteriological contamination from improper well construction or handling of water are hazards to public health. Drilled wells properly sealed and equipped with pressure systems are preferred to other types of construction.

In areas where ground water is limited, community systems may be needed to replace the domestic wells. The Farmers Home Administration program for group development of rural water supplies can assist in the development of small water systems to provide adequate safe supplies for a number of rural homes.

Provision should be made for an adequate number of properly constructed pressurized water systems by 1975 by the construction of over 5,000 new drilled wells, equipping an additional 18,000 existing wells with pressure systems, and providing well covers or seals for an estimated 30,000 wells, as well as the replacement of some unsatisfactory domestic systems by extensions of municipal systems. If these needs are met prior to 1975, a continued maintenance and rehabilitation program will assure adequate water for the estimated 31,000 domestic water supplies needed by the year 2000.

Public health departments can assist in the solution of domestic water supply problems by additional emphasis on the rural water supply programs. Selection of good sources, the installation of good pumps, and proper construction practices should be encouraged through information programs and consultation with owners. The water should be checked for bacteriological quality.

Municipal Water Supplies

Each municipality needs continued studies and educational programs to assure that the future water supply needs will be met. This will be difficult for the smaller towns unless they employ technically trained personnel or avail themselves of consultant services.

Ground waters of the basin usually can be developed more economically than other sources, particularly in the Coastal Plain areas. Potability of some supplies can and should be improved by treatment. Where ground water is limited, treated surface water can supplement the supplies. Surface water is expected to be the major source of supply for the Piedmont province. All supplies should be chlorinated.

Municipalities must plan and provide for their own needs. Technical assistance can be obtained from Federal, State, and private sources. Consulting engineers can design facilities to meet future municipal needs using readily available equipment and following the standard water works practices. There are no apparent unusual supply, development, or treatment problems.

Industrial Water Supplies

The expansion of facilities to provide adequate water supplies for normal growth of existing industries and for development of supplies for new industries is expected to be required prior to 1975. An additional expansion will be needed prior to the year 2000. Needed facilities include new wells, surface water intakes, and treatment facilities for conditioning process water. No significant industrial water supply problems from either quantity or quality are expected. The available water sources in the Altamaha basin, if properly developed, can meet all water demands of the foreseeable future.

SECTION III – NAVIGATION

General

Navigation on the Altamaha River and its tributaries upstream to the Fall Line was an important factor in the early development of the basin. Powered commercial craft plied the rivers from 1819 to 1934 and moved much of the freight between the coastal areas, the Fall Line cities, and intermediate points. For many years, Darien was an important export center for cotton and other products.

Existing Facilities and Programs

Navigation projects in the basin include a harbor at Darien with a 12-foot depth authorized in 1890. The present project for the rivers adopted in 1912 authorizes a 3-foot channel from the ocean to Milledgeville and Macon to be secured by dredging and snagging and for gradual increases in depth as practicable. At present, however, much of the channel in the Ocmulgee River cannot be used by pleasure craft during low-flow periods, and the channel in the Oconee River upstream to Dublin is usable only during high-water stages. Both streams, in their present condition, are hazardous and undependable for pleasure-boat use a great part of the time. Commercial barge traffic on the Altamaha River is not practical at present because of shallow depth and other channel conditions. The boat canal that once connected Brunswick to the Altamaha near Darien has fallen into disuse, but it could

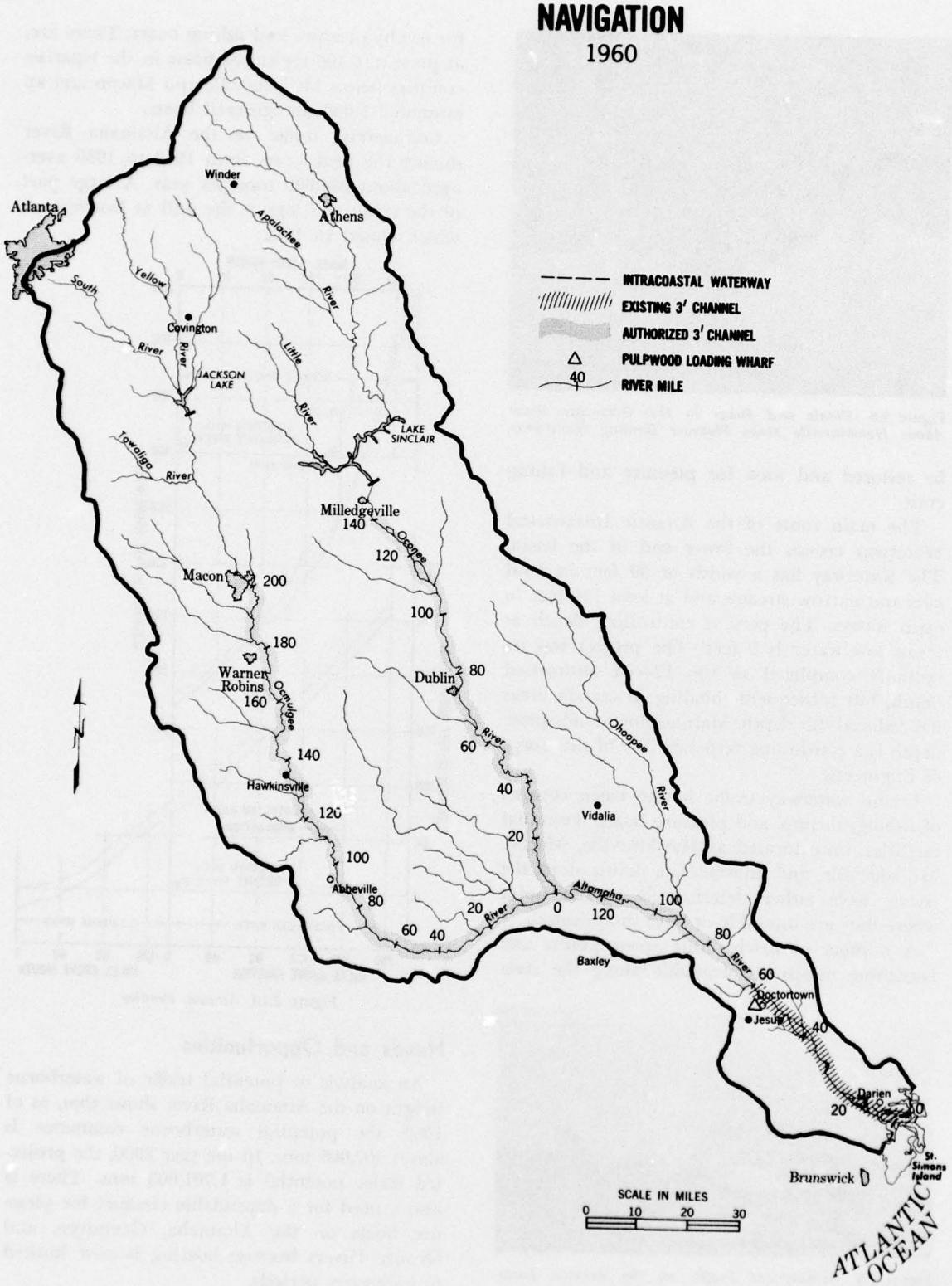

NAVIGATION
1960
INTRACOASTAL WATERWAY
EXISTING 3' CHANNEL
AUTHORIZED 3' CHANNEL
PULPWOOD LOADING WHARF
40 RIVER MILE
Atlanta
Winder
Athens
Apalachee River
South Yellow River
Covington
Little River
JACKSON LAKE
LAKE SINCLAIR
Towaliga River
Milledgeville
Oconee River
Macon
Warner Robins
Ocmulgee River
Dublin
Ohoopee River
Hawkinsville
Vidalia
Abbeville
Altamaha River
Baxley
Doctortown
Jesup
Darien
Brunswick
St. Simons Island
SCALE IN MILES
0 10 20 30
ATLANTIC OCEAN

Figure 2.7



Figure 2.8 *Shoals and Snags in the Ocmulgee River Above Hawkinsville Make Pleasure Boating Hazardous.*

be restored and used for pleasure and fishing craft.

The main route of the Atlantic Intracoastal Waterway crosses the lower end of the basin. The waterway has a width of 90 feet in land cuts and narrow streams and at least 150 feet in open waters. The present controlling depth at mean low water is 9 feet. The project was essentially completed to the 12-foot authorized depth, but subsequent shoaling in certain areas has reduced this depth. Maintaining an adequate depth is a continuing responsibility of the Corps of Engineers.

Inland waterway traffic in the basin consists of fishing, shrimp, and pleasure boats. Terminal facilities, once located at Hawkinsville, Macon, Milledgeville, and intermediate points along the rivers, have either deteriorated to the point where they are unusable or have disappeared.

A number of newly built access points and launching ramps are available along the river for use by pleasure and fishing boats. There are, at present, 6,400 registered boats in the riparian counties below Milledgeville and Macon and an estimated 5,000 unregistered boats.

Commercial traffic on the Altamaha River during the peak years from 1918 to 1930 averaged about 284,000 tons per year. A large part of the traffic was logs to the mill at Doctortown which closed in 1952.



Figure 2.9 *Commercial Traffic on the Atlantic Intracoastal Waterway Is Increasing.*

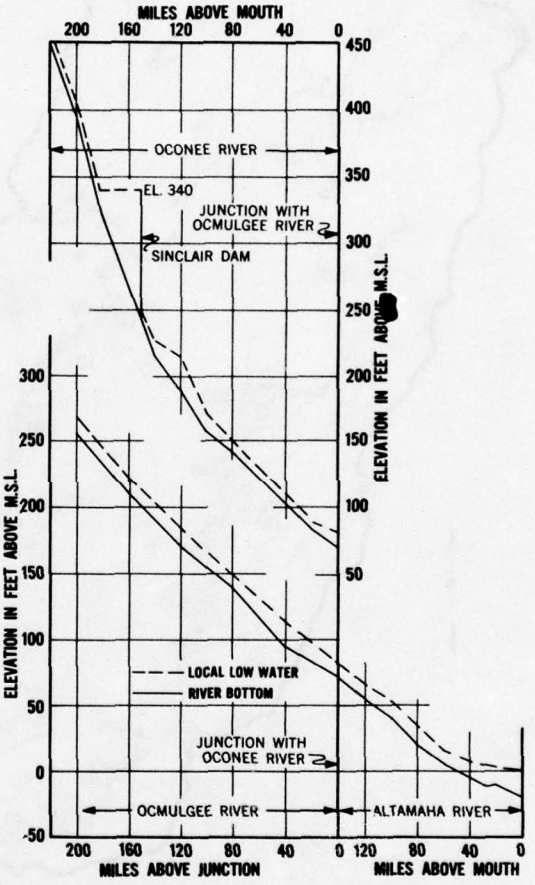


Figure 2.10 *Stream Profiles.*

Needs and Opportunities

An analysis of potential traffic of waterborne freight on the Altamaha River shows that, as of 1960, the potential waterborne commerce is about 407,000 tons. In the year 2000, the projected traffic potential is 1,701,000 tons. There is also a need for a dependable channel for pleasure boats on the Altamaha, Ocmulgee, and Oconee Rivers because boating is now limited to highwater periods.

A number of new industries have expressed an interest in locating along the river should it be made navigable. Reservoirs would provide extensive recreation sites and fishing areas. Little recreation or fishing use is made of this river at the present time because access is difficult.

Commercial traffic on the Atlantic Intracoastal Waterway consists mostly of barge tows. Working craft, such as dredges, derrick boats, and pile drivers, also make frequent trips. In 1960, commodities moved on the Intracoastal Waterway totaled about 974,000 short tons. This is more than five times the tonnage moved in 1947. In 1960, the principal traffic items were 361,000 tons of pulpwood, pulp, and paper, and 340,000 tons of petroleum and petroleum products. Other commodities transported were principally sand and gravel, iron and steel, and fertilizer. The Waterway is also used extensively by pleasure boats and yachts traveling between Florida and northern cities.

Means of Meeting the Needs

Improvement for navigation of the Altamaha and Ocmulgee Rivers to Macon does not appear warranted at this time. Consideration should be given, however, to the inclusion of navigation locks in any dams constructed below Macon and Dublin in the future.

A navigation project below Doctortown would open the area to additional industrial development in the future and would also provide the first step in more complete development of the river for navigation when such development is warranted.

SECTION IV – RECLAMATION, IRRIGATION, AND DRAINAGE

General

Drainage is the principal method of reclaiming land for agriculture, forestry, and other uses in the Southeast. As considered herein, drainage is the means of correction of wetness in agricultural soils within limits of physical and economic feasibility. Reclamation and drainage are considered synonymous in this Report. In the humid Southeast, irrigation is a relatively new practice but is rapidly gaining in popularity.

Existing Facilities and Programs

Irrigation

Approximately 17,800 acres in the basin were irrigated in 1960, principally by sprinkler systems. Some acres were irrigated by the furrow or open-ditch method. Subsurface irrigation has not been used in the Altamaha basin. Twenty-two percent of the land that was irrigated is in the Piedmont province, and 78 percent is in the Coastal Plain. Tobacco, corn, and vegetables were the principal irrigated crops.

Although supplemental irrigation in the Southeast is a relatively new practice, in 1960 there were 549 farms in the basin that had irrigation systems. In one county alone there are 150 systems used to irrigate 485 farms. All irrigation was on Land Capability Classes I, II, and III land.

Drainage

Onfarm or individual-type drainage predominates in the Altamaha basin. Forty thousand acres of land subject to water problems are adequately drained. This has been done by install-

TABLE 2.4

Source of Water Used for Irrigation—1960

Land resource area	Acres irrigated from			Estimated annual gross amount of water used (acre-feet)
	Ponds	Streams	Wells	
Piedmont	2,834	1,031	27	5,000
Upper Coastal Plain	8,706	2,732	914	10,000
Lower Coastal Plain	1,275	209	160	1,100
Total	12,815	3,972	1,101	16,100

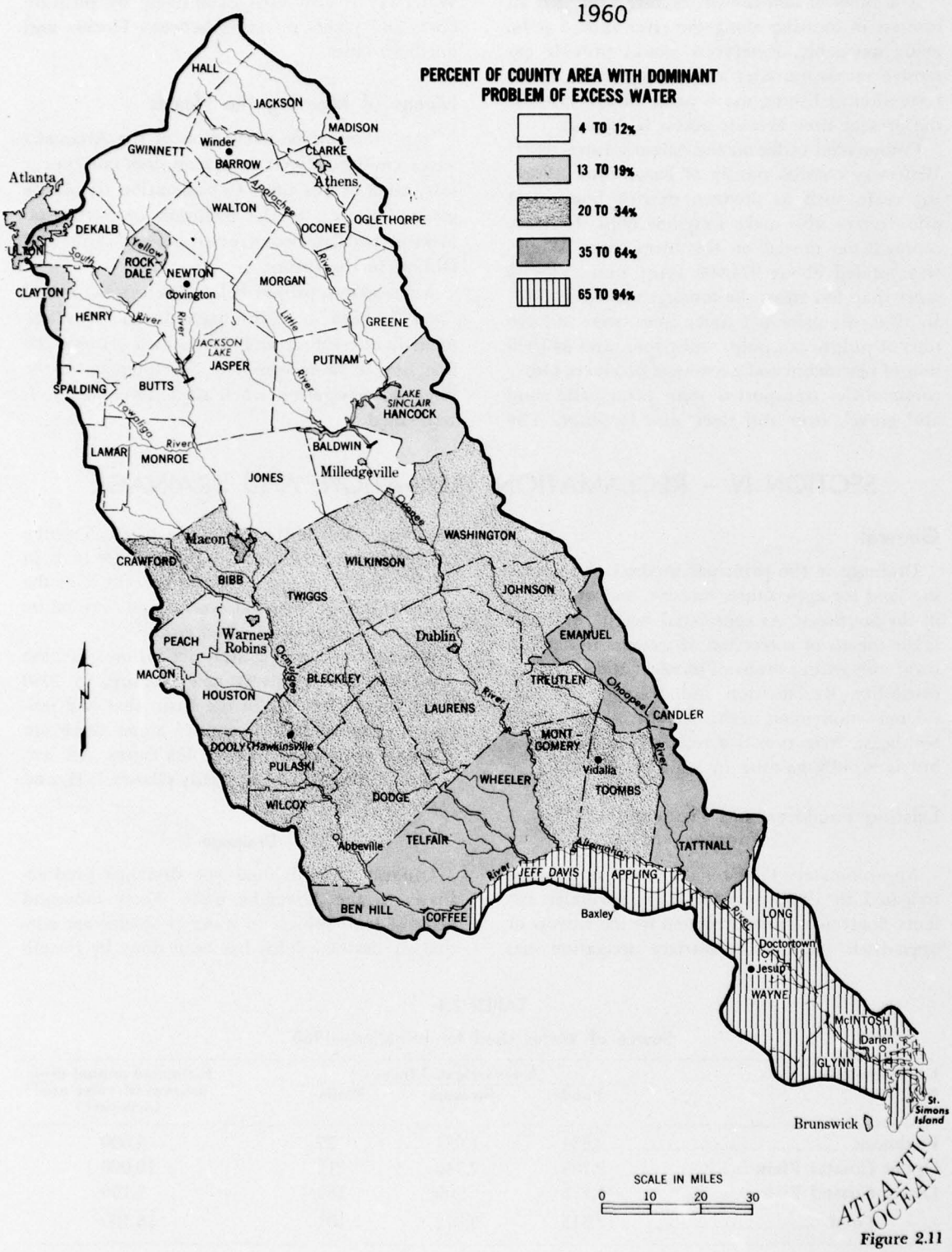

DRAINAGE
1960
PERCENT OF COUNTY AREA WITH DOMINANT PROBLEM OF EXCESS WATER
4 TO 12%
13 TO 19%
20 TO 34%
35 TO 64%
65 TO 94%
HALL
JACKSON
MADISON
GWINNETT
Winder
BARROW
CLARKE
Athens
Atlanta
WALTON
OCONEE
OGLETHORPE
DEKALB
FULTON
ROCKDALE
NEWTON
Covington
MORGAN
CLAYTON
HENRY
GREENE
JACKSON LAKE
JASPER
PUTNAM
SPALDING
BUTTS
LAKE SINCLAIR
HANCOCK
LAMAR
MONROE
BALDWIN
Milledgeville
JONES
WASHINGTON
Macon
CRAWFORD
BIBB
WILKINSON
TWIGGS
JOHNSON
PEACH
Warner Robins
Dublin
EMANUEL
MACON
HOUSTON
BLECKLEY
TREUTLEN
LAURENS
CANDLER
DOOLY
Hawkinsville
PULASKI
MONTGOMERY
Vidalia
WHEELER
TOOMBS
WILCOX
DODGE
Abbeville
TELFAIR
TATTNALL
JEFF DAVIS
APPLING
BEN HILL
COFFEE
Baxley
LONG
Doctortown
Jesup
WAYNE
McINTOSH
Darien
GLYNN
St. Simons Island
Brunswick
ATLANTIC OCEAN
SCALE IN MILES
0 10 20 30

Figure 2.11



Figure 2.12 *Dense Pine Stand After Land Was Drained in Lower Coastal Plain.*



Figure 2.13 *Pine Production Following Drainage, Altama Plantation near Brunswick, Ga.*

ing open main and lateral ditches, surface field ditches, and tile drains.

Eight drainage facilities affecting 500 or more acres have been developed. These eight facilities benefit some 20,000 acres. Two of the facilities were installed on single farms by individuals, four were installed by small groups of landowners, and two were installed by more formally organized groups. All of the installed facilities are in the Lower Coastal Plain in Glynn, McIntosh, and Wayne Counties and in the Piedmont province in Greene and Oconee Counties.

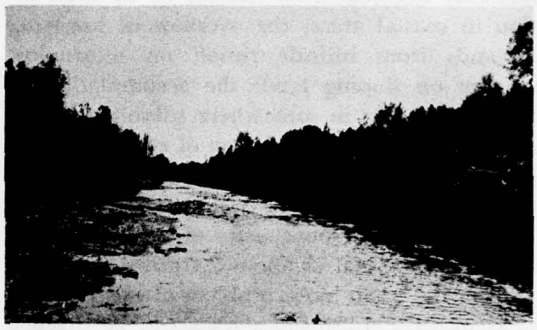


Figure 2.14 *Improved Channels Facilitate Drainage.*

Needs and Opportunities

Irrigation

There are about 5.4 million acres of potentially irrigable land, disregarding the availability of water, including 2.1 million acres of cropland and pastureland, in the basin.

Based on the 1954-60 trends in irrigated land use and the potential water supply, it appears that if these trends should continue 62,000 acres might be irrigated by 1975 and more than 137,000 acres by 2000. Economic relationships, however, do not appear to warrant this much irrigation development.

Irrigation included in the plan was established on the basis that incremental returns to the farmer, based on long-term projected prices would at least equal the incremental operation, maintenance, and replacements costs without consideration of secondary effects or intangibles. This general guide was considered acceptable for reconnaissance studies although it was realized that followup individual irrigation development would be subject to standard and more detailed evaluations.

Generally, ample water is available for irrigation purposes. Water requirements could be provided by streams, wells, and from farm ponds.

Studies of the upstream watershed areas indicate that some of them have potential for development of irrigation water supplies by collective action. However, no storage projects for irrigation water supply alone appear justifiable in the foreseeable future. Further study and investigations will be necessary to determine conclusively if the projects are feasible under future conditions. Most of the potential projects involving irrigation could be developed by small groups or by individuals, privately financed.

Farm potentials for irrigation should be individually analyzed. Factors determining the feasibility of using supplemental irrigation in the basin as a regular farming practice include the soil, the kinds of crops grown, drought frequency and seasonal water shortages, and the location and quality of available water.

Improvements needed in some of the existing

irrigation systems include more efficient irrigation practices and better equipment. Where structural or operational improvements are made, erosion is reduced and definite improvements occur in irrigation efficiency. Additional studies and better dissemination of information is needed.

Drainage

Excess water in cropland interferes with crop growth and seasonable tillage, seeding, cultivation, and harvesting.

Drainage problems in the Altamaha basin are varied. They include the periodic floodings of lands by overflow from streams or by tidal action in coastal areas; the overflow of low-lying flatlands from hillside runoff on return-flow seepage on sloping land; the accumulation of too much water in soils where subsoil drainage is restricted; the accumulation of excess water in depressions or low-lying areas such as ponds; and the development of a high-water table resulting from the movements of artesian water. Altogether, a total of about 2.4 million acres of land in the basin has a problem of excess water.

As of 1959, 1,236,500 acres could be drained by individual onfarm systems and about 1,146,-300 acres of the wet soils could be drained by group action. Based on trends, farmer interest, anticipated land use, and the present rate of establishment of open drains, about 8,500 acres of cropland and pastureland, some 135,000 acres of woodland, and about 5,400 acres of other land could be drained by 2000.

Tile drainage has not been practiced to an appreciable extent in the basin, although much of the wetland is adaptable to this practice. Pump drainage has a potential where gravity outlets are not available in the Lower Coastal Plain.

In the Piedmont and Upper Coastal Plain, extensive opportunities exist for landowners to transfer agricultural production to drained land to reduce production pressures on eroding hill lands so that conservation measures may be applied on eroding areas.

Means of Meeting the Needs

Irrigation

Development of farm irrigation systems and the farm-by-farm application of water-management principles and techniques to use these water supplies are necessary to realize the full benefits of irrigation.



Figure 2.15 *Irrigating Millet for Dairy Herd Pasture.*

Development of the full irrigation potential will depend on future national, regional, and local needs; changing economic conditions; and the determination or desirability of potential beneficiaries.

Continuing the technical, loan, and cost sharing assistance available through U. S. Department of Agriculture programs could facilitate the realization of full benefits of irrigation developments and water management principles and techniques.

Accelerated education services could be provided as technological advances in equipment and irrigation practices and research findings become known.

The future use of irrigation is expected to meet individual farm needs and desires rather than become an extensive production practice. Irrigated acreage will be expanded as justified by agricultural production demands to the extent that such demands can be more economically met by irrigation than by other means. This irrigation should result from private initiative and expenditures.

Most of the irrigated acreages will consist of scattered or isolated tracts throughout the basin. Sprinkler irrigation systems will probably be the major type of system used. Large scale irrigation projects are not expected to be needed for the purpose of meeting production requirements.



Figure 2.16 *Filling of Natural Drainage Ways Results in Swamp Conditions.*

Drainage

Over 104,800 acres of cropland, about 71,400 acres of pastureland, 2.2 million acres of woodland, and more than 89,200 acres of other land are susceptible to treatment for drainage, if maximum food and fiber resource development were needed by year 2000. However, maximum production from all potential pastureland and cropland will not be needed during the next 40 years to meet the projected needs.

Most of the projects expected to be installed in the Lower Coastal Plain would allow more intensive use of the land or would benefit woodland. In other areas, projects would benefit pastureland and cropland.

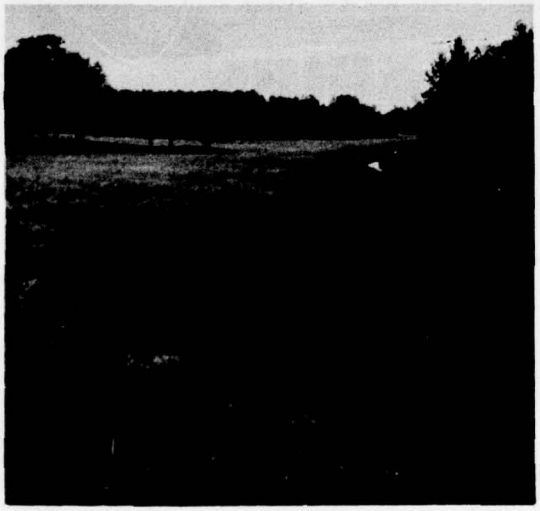


Figure 2.17 *Flood Prevention and Drainage Channel Restores Pasture.*

There are alternatives to drainage by the year 2000. Variations could occur as to: (1) The number of acres drained; (2) type of drainage —individual or project; (3) location of drainage in the basin; and (4) land use and crops. Alternative plans for drainage would involve essentially a change in areas drained or adoption of other technological improvements or other management practices. Alternative uses for wetlands include use for production of hardwoods and use as wildlife habitat. It is not intended to imply, in this Section, that drainage development of wetlands for agricultural purposes is necessarily more desirable than other uses or improvements. Full consideration should be given by landowners and governmental interests involved to all alternative uses before detailed plans are decided upon.

Development of farm drainage systems and farm-by-farm application of water management principles and techniques should be considered to realize the full benefits of drainage. These programs would result from private initiative and expenditures. Onfarm outlet channels, mains, laterals, and surface field ditches would continue as the major types of systems used. Drainage works required on individual farms, together with minor lateral ditches and other works required to serve a group of farms, are generally considered a non-Federal responsibility within the financial capabilities of local interests. Additional tile mains and laterals and pumping would also be considered in applicable areas.

Development of the potential projects depends upon future national, regional, and local needs, changing economic conditions, and the desires and determination of the potential beneficiaries.

The existing technical and financial assistance program of the U. S. Department of Agriculture could be utilized in the installation of drainage facilities on additional areas.

Accelerated educational services could facilitate drainage developments by making known the results of research and field trials on drainage practices, methods, equipment, operations, and management.

Research findings on drainage problems and solutions could facilitate drainage developments.

SECTION V – HYDROELECTRIC POWER AND INDUSTRIAL DEVELOPMENT

General

The basin is entirely within the State of Georgia and is all in a single power-supply area as defined by the Federal Power Commission. The Georgia Power Company wholesales energy to several municipalities and electric membership cooperatives and serves the ultimate customer in the remaining areas. In general, the municipalities with their own electric distribution systems restrict their service areas to city limits or to the areas immediately adjacent thereto. The electric membership cooperatives serve rural areas and some suburban areas around urban centers.

Industrial development in the basin has been aided by a network of highways and railroads, an available labor force, an abundant supply of water, an adequate source of power, and ample raw materials. The metropolitan Atlanta area industrial complex, partly within the basin, dominates the upper basin area and is the distribution center for the southeast region. Athens and Macon have industrial complexes and are distribution centers. Other industrial centers are dominated by one or two industries or by industry types. There are about 84,000 people employed in about 950 manufacturing establishments. Industrial development is discussed in Section IV of Part One.

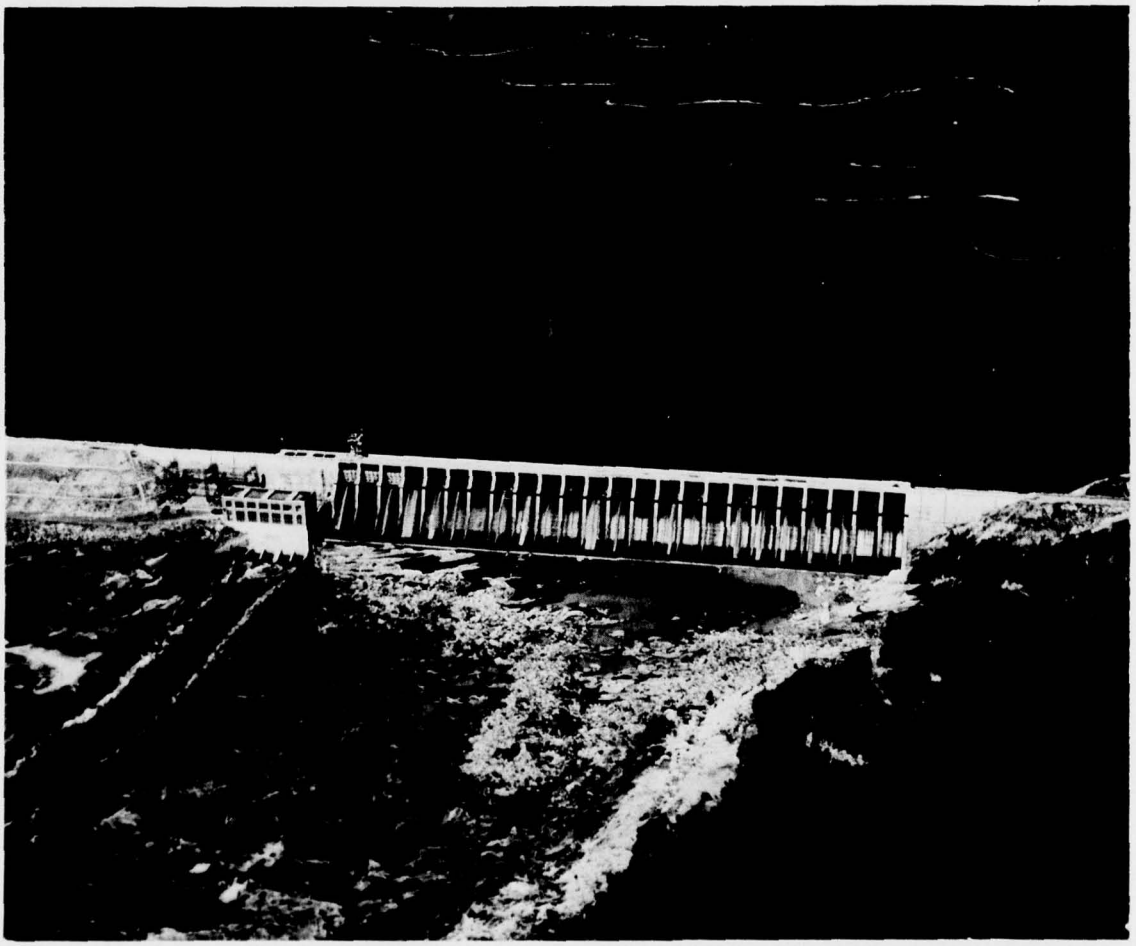


Figure 2.18 *The Georgia Power Company's Lake Sinclair Project Develops Part of the Hydroelectric Power Used in the Basin.*

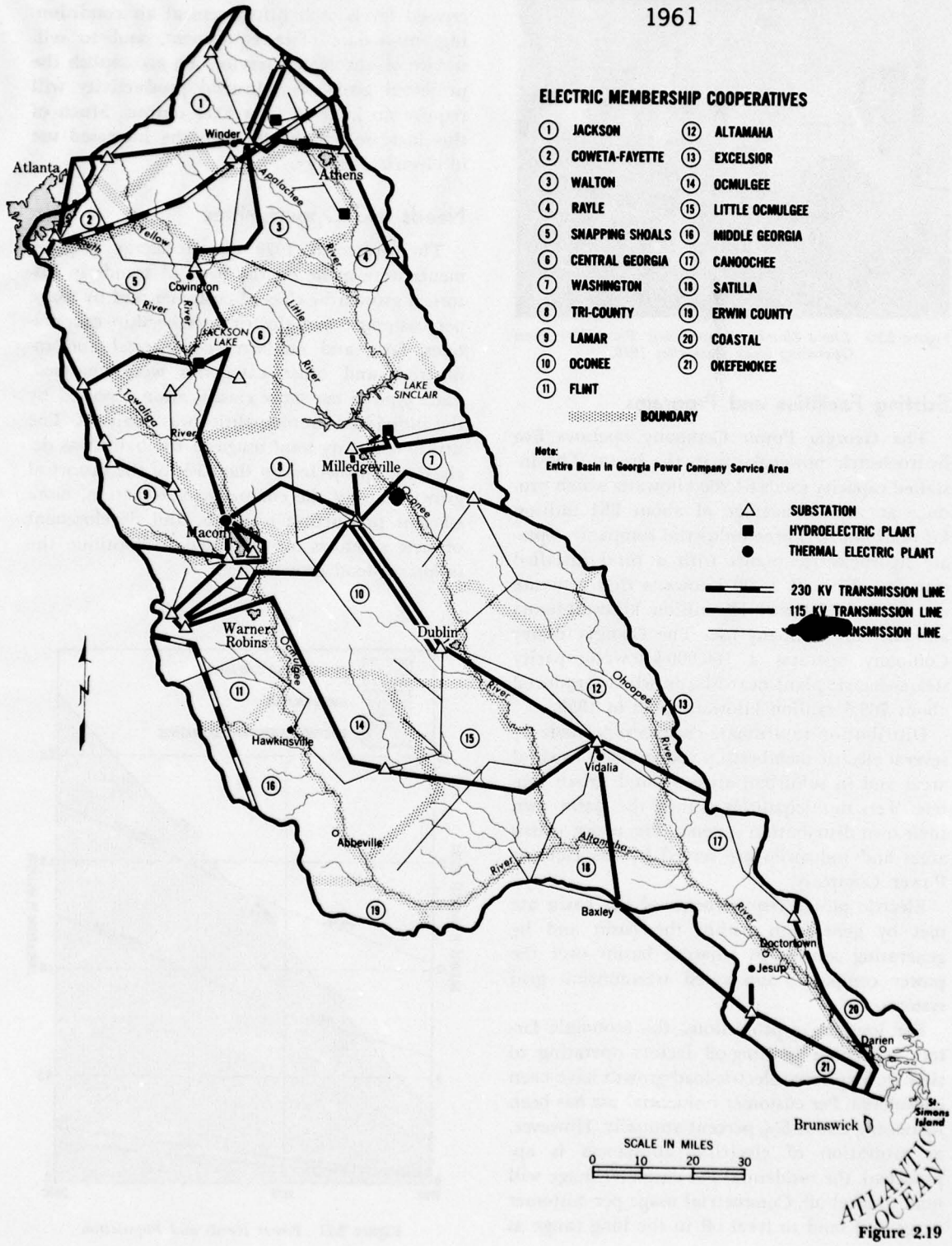

ELECTRIC POWER FACILITIES
1961
ELECTRIC MEMBERSHIP COOPERATIVES
1 JACKSON
2 COWETA-FAYETTE
3 WALTON
4 RAYLE
5 SNAPPING SHOALS
6 CENTRAL GEORGIA
7 WASHINGTON
8 TRI-COUNTY
9 LAMAR
10 OCONEE
11 FLINT
12 ALTAMAHA
13 EXCELSIOR
14 OCMULGEE
15 LITTLE OCMULGEE
16 MIDDLE GEORGIA
17 CANOOCHEE
18 SATILLA
19 ERWIN COUNTY
20 COASTAL
21 OKEFENOKEE
BOUNDARY
Note:
Entire Basin in Georgia Power Company Service Area
SUBSTATION
HYDROELECTRIC PLANT
THERMAL ELECTRIC PLANT
230 KV TRANSMISSION LINE
115 KV TRANSMISSION LINE
TRANSMISSION LINE
Atlanta
Winder
Athens
Covington
Milledgeville
Macon
Warner Robins
Dublin
Hawkinsville
Vidalia
Abbeville
Baxley
Doctortown
Jesup
Darien
Brunswick
St. Simons Island
ATLANTIC OCEAN
Apalachee River
Yellow River
South River
Little River
JACKSON LAKE
LAKE SINCLAIR
Towaliga River
Ocmulgee River
Oconee River
Ohoopee River
Altamaha River
SCALE IN MILES
0 10 20 30

Figure 2.19

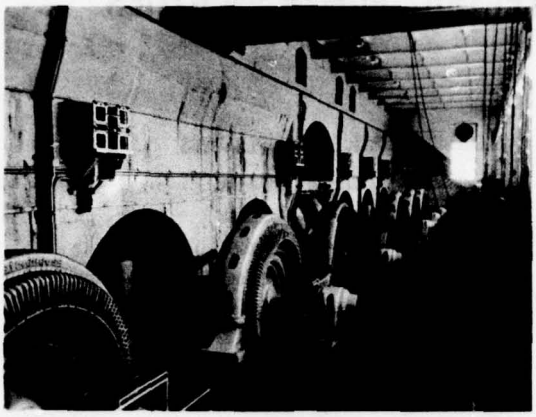


Figure 2.20 *Lloyd Shoals Hydroelectric Plant Has Been Operating Since December 1910.*

Existing Facilities and Programs

The Georgia Power Company operates five hydroelectric powerplants in the basin. The installed capacity totals 64,200 kilowatts which produce an annual average of about 254 million kilowatt-hours. Three industrial companies operate hydroelectric plants with a total installed capacity of about 3,000 kilowatts that generate an average of about 13 million kilowatt-hours annually for company use. The Georgia Power Company operates a 160,000-kilowatt-capacity steam-electric plant near Macon which produced about 768.5 million kilowatt-hours in 1959.

Distribution to ultimate customers is made by several electric membership cooperatives in rural areas and in suburban areas around urban centers. Ten municipalities within the basin own their own distribution systems. The major urban areas and industries are served by the Georgia Power Company.

Electric power requirements of the basin are met by generation within the basin and by generating sources in adjacent basins over the power company's integrated transmission grid systems.

For long-range projections, the economic factors and other leveling-off factors operating to slow the explosive electric-load growth have been considered. Per customer residential use has been increasing about 5½ percent annually. However, as saturation of electrical appliances is approached, the residential per customer usage will tend to level off. Commercial usage per customer usage will tend to level off in the long range as new and modernized establishments shift to increased levels of lighting, central air conditioning, up-to-date office equipment, and to self-service or automated service. To accomplish the projected goals of industrial productivity will require an increase in worker output. Much of this increase will be through the increased use of electrical energy.

Needs and Opportunities

The projected 1975 electric-energy requirements were made on the basis of trends in historical growth by class of customer and by usage per customer. For electric membership cooperatives, farm and nonfarm, commercial and industrial, and other categories were analyzed. Each type of customer classification reported by the individual municipalities was analyzed. The utility company total usage in the basin was derived and projected on the basis of the historical growth rate of the company. Automation, more efficient production methods, and development of new products are expected to continue the industrial-load growth.

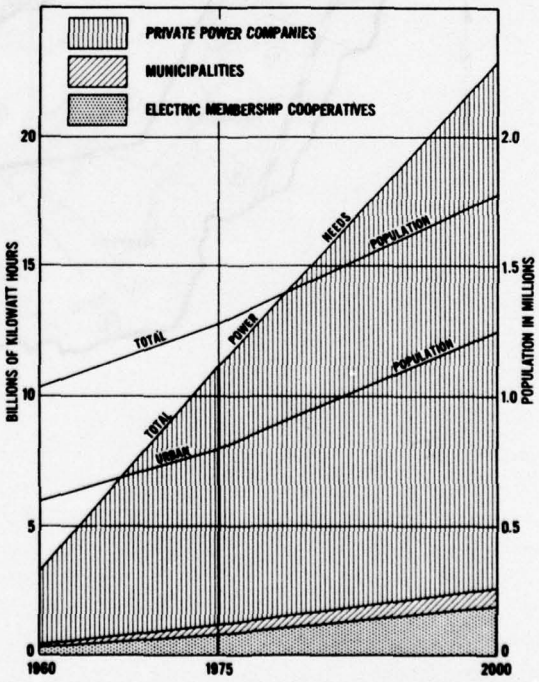


Figure 2.21 *Power Needs and Population.*

The projected energy requirements for the basin are expected to increase from about 3.2 billion kilowatt-hours, with a demand of 636,000 kilowatts in 1960, to about 11.3 billion kilowatt-hours, with a demand of 2,106,000 kilowatts by 1975, and to 23.5 billion kilowatt-hours, with a demand of 4,322,000 kilowatts by 2000.

Means of Meeting the Needs

Several potential hydroelectric sites and several plans for diverting water from one watershed to another have been investigated. Many of these sites have been eliminated from further study because of excessive land and relocation costs. Of the sites and schemes investigated, five sites with power in conjunction with other potentials, warranted further study.

These sites are at Laurens Shoals on the Oconee River, Peachstone Shoals on the South River, Abbeville and Coopers Ferry on the Ocmulgee River, and a project on the Altamaha River at the junction of the Ohoopee River. These sites would have a potential for an installed capacity of 388,000 kilowatts and for generating about 670 million kilowatt-hours of energy needed for peak loads.

The Georgia Power Company has started construction on the first unit of a planned steam-electric plant on Lake Sinclair, which will have an ultimate capacity in excess of 1.5 million kilowatts.

To meet the increased electric loads projected for the basin will require construction of new transmission lines from sources of energy to load centers, new and expanded substations and additional distribution lines. The new and expanded facilities will be located to meet the shifting load pattern set by changes in commercial, industrial, and domestic demands. No special problems are expected to be encountered in transmitting electrical energy from source to consumer.

SECTION VI – SOIL CONSERVATION AND UTILIZATION

General

Soil conservation and utilization consists of both enduring and recurring or short-term practices to protect the basic land resource and to provide a stable base for permanent agriculture. Enduring conservation practices include critical area planting, land smoothing, terracing, pond construction, grassed waterways, and various types of more or less permanent plantings. Recurring conservation practices include conservation cropping systems, contour farming, and cover cropping. This Section is largely confined to a discussion of soil conservation and utilization of cropland and pastureland.

Until the 1930's, the basin agriculture consisted largely of row crop farming. By the mid-1930's, erosion had damaged much of the basin cropland. Since then, interest in soil conservation measures has grown steadily. As a result, considerable progress has been made in conservation of cropland and pastureland. Combined Federal, State, and local agricultural efforts have aided this progress. Conversion of erodible cropland to grassland and woodland has been most rapid in the last two decades. This conversion has been aided by incentive payments to farm operators, by comparatively high livestock and wood-products values, and by technological improvements in agricultural practices and measures. However, the use of land-treatment practices has not been rapid enough to overcome or minimize past damages and, at the same time, protect the present basic land resource. Protection of the land resource is needed in the interest of present-day agriculture and as a step in developing the land to meet the expected growing demands for agricultural products.

Although agricultural land has many classifications, the Land Capability Classifications of the U. S. Department of Agriculture are used to illustrate the types and degrees of land problems. Capability classification is an interpretive grouping of soils for agricultural purposes. The groupings are based on a physical inventory of soil characteristics, the slope, and the degree of erosion. Soils in each class have limitations and management problems of about the same degree.

Soils in Classes I, II, III, and IV are suitable for cultivated crops, pastureland, rangeland, woodland, and wildlife. Class I soils have few limitations that restrict use. Class II soils have

SOIL CONSERVATION
1960



Figure 2.22

some limitations that reduce the choice of plants or require moderate conservation practices. Class III soils have severe limitations that reduce the choice of plants or require special conservation practices, or both. Class IV soils, if cultivated, require very careful management and are not suitable for row crops year after year.

Classes V, VI, and VII soils normally should be used for pastureland or rangeland, for woodland, or for wildlife. Class V soils have little erosion hazard, but they have other limitations that restrict the kind of plants that can be grown and prevent normal tillage of cultivated crops. Class VI soils have severe limitations that make them unsuited for cultivation of crops. Class VII soils have severe limitations that make them unsuited for cultivation of crops and restrict their use largely to grazing, woodland, or wildlife.

Class VIII soils have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, water supply, or esthetic purposes.

Classification for the land area of the basin devoted to agricultural uses in 1958 follows:

TABLE 2.5

Distribution of Land Use by Land Capability Classification (percent)

	I	II	III	IV	V	VI	VII	VIII
Cropland	66.9	45.9	18.8	9.8	0.6	2.1	0.6	----
Pastureland	11.6	11.4	9.8	7.6	0.6	5.2	1.2	----
Forest	17.0	37.4	65.6	78.7	98.4	90.0	90.5	38.7
Other	4.5	5.3	5.8	3.9	0.4	2.7	7.7	61.3

Existing Facilities and Programs

As of January 1958, some 91,600 acres of cropland, about 16,000 acres of pastureland, and about 10,400 acres of other land had no problems that limited use. At the same time, some 1,241,000 acres of cropland, about 533,700 acres of pastureland, and 257,500 acres of other land had dominant erosion problems. Some 313,000 acres of cropland, 64,500 acres of pastureland, and 65,600 acres of other land had dominant unfavorable soil condition problems.

As of 1960, some 8,100 farm ponds had been constructed in the basin for single or combination usages, such as livestock water, irrigation water storage, fire protection, and fishing. They ranged in size from about 3 surface acres to a little over 6 surface acres. About 63 percent of these ponds was used for livestock water, about 7 percent for irrigation water storage, and almost all of the ponds provided some fishing.

Erosion was, and is, a problem in the basin. Much of the land is hilly, and many of the soils are easily eroded. Studies reveal that about 4,925,000 acres out of all of the land that has been placed into a Land Capability Class had either a primary or secondary erosion problem. The soil erosion problems were classified by degrees into five groupings. These groupings and the acreage in each are as follows:

TABLE 2.6

Distribution of Land Having Erosion

Erosion group	Acres	Percent of total
1	700,100	14.2
2	2,229,800	45.3
3	1,662,300	33.7
4	268,500	5.5
5	64,600	1.3
Total	4,925,300	100.0

Group 1 is the least eroded land and has more than 75 percent of the original topsoil remaining. Group 2 land is moderately eroded and has from 25 to 75 percent of the original topsoil remaining. Group 3 land is severely eroded and has less than 25 percent of the original topsoil but 75 percent or more of the subsoil remaining. Group 4 land is very severely eroded and has lost all of its topsoil but has from 25 to 75 percent of the subsoil remaining. Group 5 land is severely gullied. Erosion groups 1, 2, and 3 soils could deteriorate to erosion groups 4 and 5

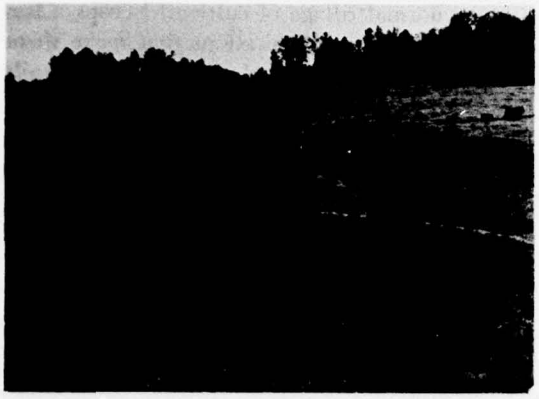


Figure 2.23 *Good Pastures Are Needed for Raising Cattle.*

soils rather rapidly unless sound soil and water conservation practices are continued. Where slopes are steep and topsoil depths are shallow, more extensive plant cover is needed. Generally, forest land and pastureland have adequate cover. Adequate cover implies that plant food and soil characteristics are being maintained. An estimated one-fourth of the cropland in the basin has adequate cover.

In 1959, 16.7 percent of all land in the basin was used as cropland, 8.1 percent was in pasture, 69 percent was in woodland, and 6.2 percent was in all other uses, including cities, roads, and other nonagricultural uses. Nearly 99 percent of all cropland was in Land Capability Classes I through IV. The remaining cropland was in Land Capability Classes V and VI. About 2 percent of all land in the basin is in Land Capability Class I. The remaining 98 percent of the land has some restrictions in use and normally has some erosion, unfavorable soil or water problems.

Several major State and Federal soil and water conservation and utilization programs are in operation in the basin. These programs provide cost sharing, credit, technical assistance, and education and information services.

The 15 Soil and Water Conservation Districts in the basin are under State charter and coordinate various kinds of State and Federal aid that are available to farmers. Many private organizations and groups make their services available to the farm operators in these districts.

Organized watershed programs in the basin are substantial. Twenty-one applications, covering more than 669,000 acres, for Federal assistance for developing watershed projects under Public Law 566 had been submitted as of January 1, 1960. Other installations and developments which might affect, or be affected by, soil conservation and utilization programs include defense and other governmental installations, roads, and urban and industrial areas. Acreages in strip-mining and related activities are not a problem in the basin at present.

Needs and Opportunities

To meet the estimated food and fiber production needs projected for the basin to the year 2000, overall agricultural production must double. In 1959, the land area of the basin totaled 9,265,000 acres. Of this, some 8,648,000 acres were used in the production of agricultural products, including forest products. By the year 2000, an estimated 8,287,000 acres are expected to be available for agricultural production. The 361,000 acres in the basin that will be lost to agriculture will be used for urban and industrial growth, new highways, airports, water development, and to supply other needs of a growing population. The total area for these purposes by the year 2000 is estimated to be 978,000 acres. To meet the increased goals for agricultural production, there will be a need for some resource development and for more efficient land use. Essential elements of resource development include improved levels of management, conservation practices, and the adoption of technological improvements.

The basin agriculture has long been a vital part of its economy. Row crop acreages in the future may decrease slightly, but livestock numbers and pasture acreages may increase. Some 2,301,000 acres were in cropland and pastureland in 1959. By 2000, 2,577,000 acres are expected to be used as cropland and pastureland. This will increase the needs for conservation treatment of open land. By the year 2000, some 1,569,000 acres of cropland and pastureland or 60 percent of the 2,577,000 acres in use are expected to be in such condition that they would be benefitted by conservation treatment.

By 2000, it is expected that 675,300 acres of cropland will benefit from treatment because of dominant erosion problems. In addition, 158,000 acres of cropland would benefit from treatment because of an unfavorable soil condition.

Some 736,200 acres of pastureland and rangeland would benefit from conservation treatment. Some of the treatment for pastureland by the year 2000 are as follows:

TABLE 2.7

Pastureland and Rangeland with Erosion or Other Problem (thousands of acres)

Established or reestablished vegetation	434
Improve vegetative cover	288
Reduce overgrazing	191
Protect overgrazing	52
Erosion problems	52
Rodent control	6
Noxious plant control	131

Some of the above treatment or control meaures may be expected to be applied on the same acreage. Solutions include management of soil, water, livestock, and vegetation.

By the year 2000, about 40 percent of the basin conservation treatment on both cropland and pastureland will be located in the Piedmont province.

Additional farm ponds will be needed in the basin to provide a share of the small impoundment fishing demands and provide water for livestock, irrigation, recreation, and as a part of the conservation needs of many farms. By 2000, the number of farm ponds should increase to almost 20,300. This would add some 71,200 acres of additional surface water on farms.

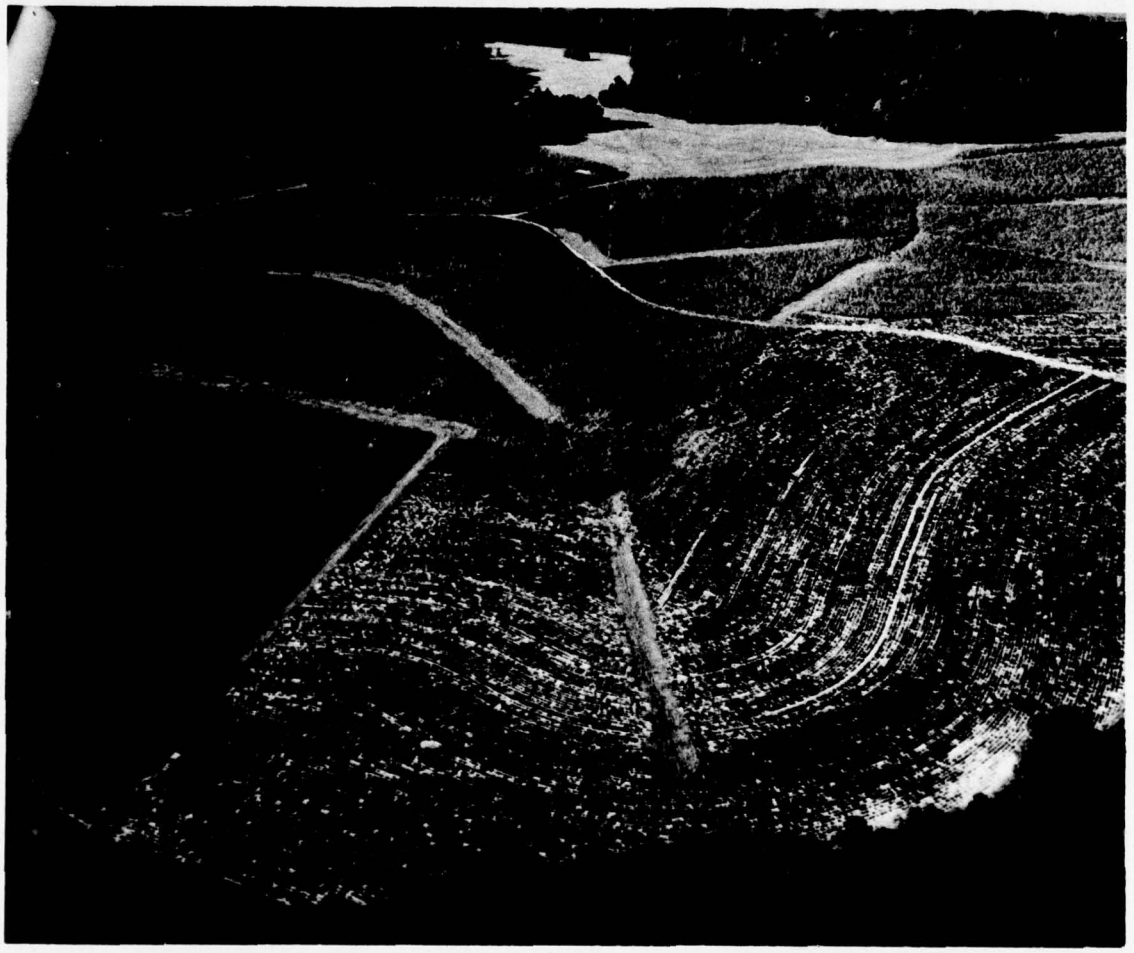


Figure 2.24 *Conservation Measures Protect the Land and Increase Farming Efficiency.*

Land conversion, or the shift in type of land use, will be a continuous process in the basin. About 24,200 acres in Land Capability Classes V through VII were planted to crops in 1959. Most of this acreage will likely shift to land more suitable to cropping. Other shifts will be needed to fit a particular crop to a specific soil type. Still other shifts will be needed to replace land lost to urban growth and development. By 2000, some 202,000 acres of land now in pastureland, woods, and other uses will need to be converted to cropland. Also, 272,000 acres of cropland, woodland, and other land will need to shift to pastureland and rangeland.

Data on woodland needing conservation treatment are included in Section VII, Forest Conservation and Utilization.

Means of Meeting the Needs

The degree and rapidity that conservation measures will be installed will be affected by such factors as changing needs for agricultural products, general economic conditions, and future policies of Federal, State, and local agencies. Land treatment measures are normally applied farm by farm under going agricultural and conservation programs. Accelerated rates of providing land treatment and stabilization of critical areas may be undertaken under the provisions of Public Law 566, 83d Congress, the Watershed Protection and Flood Prevention Act, where such action could help solve the problem in designated watersheds.

To accomplish the land-use changes and meet the conservation treatment needs indicated above, sound soil and water conservation practices and high-level management will be necessary. The land-use changes and conservation treatments are planned to restore and improve the soil resource base to the minimum point where it would be protected and soil losses reduced.

The following measures, excluding woodland conservation measures, are essential to attain a satisfactory level of protection for cropland, pastureland, and rangeland. Most of these are not satisfactory land treatment measures when applied singly, in improper combination, in insufficient intensity, or to wrong land use.

To meet cropland conservation treatment and utilization needs, high-level management should include: (1) Proper choice and rotation of crops; (2) control of excess water with drainage, vegetated waterways, contour operations, and structures; (3) use of correct amounts of commercial fertilizer, lime, and manure; (4) maintenance of organic matter at high levels; (5) improvement and maintenance of soil plant nutrients, and soil moisture; (6) selection of proper planting and seeding times; (7) improved tillage methods; (8) control of weeds, insects, and plant diseases; (9) proper combinations of soil and water conservation practices and measures; and (10) use of farm ponds.

High-level management for pasture and range includes management of soil, water, livestock, and vegetation. Soil management includes the application of lime, nitrogen, phosphate, potash, and other nutrients in the amounts determined by soil tests. Nutrients should be applied in sufficient quantities to grow cover that will protect the soil and provide for livestock forage. The number of livestock and the grazing period should be regulated so that pasture plants can grow vigorously during the grazing season. Vegetation management should include proper mowing, the use of chemicals for weed and brush control, and fire protection. Water management should include an adequate number of properly distributed farm ponds.

To aid in meeting the conservation needs, additional studies are required. Data on costs and returns of conservation farming practices and systems are needed. Studies should be instituted on the conversion of land to alternative purposes. Intensive studies should be made on how to reduce and avoid possible detrimental effects of land use shifts. Studies are needed of the institutional, educational, and social factors that influence farmers to apply, or not to apply, soil conservation practices and plans. Studies are needed to enable technicians to make improved estimates of the need for cost sharing for various practices in watershed programs.

Studies on erosion control and soil management are needed to develop: (1) Erosion equations with factors to predict erosion losses under specific soil, slope, and other conditions; (2) additional data to determine proper strip-cropping widths, grade, and direction; (3) design factors for maximum allowable terrace and row grades;

(4) more precise data to determine the length of time grass-legume sods should occupy the land for maximum benefit to soils and crop yields; (5) reasons for increases or decreases in yield following lime applications; and (6) the best times and methods for planting cool-season cover crops on cropland and in pecan orchards.

Selected plant management studies are needed to insure that livestock production continues as an important enterprise.

Technical assistance available under current programs will be sufficient to carry out the soil and water conservation practices involved in the expected land use changes until the year 2000.

Increased emphasis should be given annually to designing financial assistance programs to encourage those conservation practices which provide the most enduring conservation benefits practicably attainable on lands where they are to be applied.

SECTION VII – FOREST CONSERVATION AND UTILIZATION

General

Wood production and processing are important in the Altamaha basin economy, and forests occupy 6,347,000 acres of the total 9,265,000 acres of land in the basin. About 6,000 acres are classed as noncommercial forest.

Approximately 136,000 acres of the total forest land are in Federal ownership, including 101,000 acres under national forest administration. Public non-Federal forest ownerships account for another 40,000 acres. The remaining 6,171,000 acres are in private forest ownership, including some 1,124,000 acres owned or under long-term lease by pulp and paper companies. The remaining 5,047,000 acres are about equally divided between farm woodland and private nonfarm nonindustrial holdings.

Pine forests make up 60 percent of the commercial forest area. Longleaf and slash pine are the principal species in the Coastal Plain, and loblolly and shortleaf pine predominate in the Piedmont.

TABLE 2.8

Altamaha Commercial Forest Acreage, 1959 (thousands of acres)

Pine	3,780
Oak-pine	587
Upland hardwoods	719
Bottom land hardwoods	1,255
Total	6,341

Bottom land hardwoods, the next most prevalent group, accounts for 20 percent of the woodland area and is composed mainly of black and tupelo gum, cypress, ash, maple, and bottom land oaks. This group normally borders major rivers and tributaries. The oak-pine and upland hardwood stands are scattered throughout the basin and make up the remaining 20 percent of the woodland acreage. Species normally found in the oak-pine and upland hardwood types include upland oaks, hickory, yellow poplar, soft maple, slash pine, longleaf pine, loblolly pine, and shortleaf pine.

In terms of growing stock, there are 2,253 million cubic feet of softwoods and 1,472 million cubic feet of hardwoods. Some 166 million cubic feet of growing stock was cut in 1959 for all products. Sawlogs were the major product harvested, followed by pulpwood. The remainder of the growing stock that was cut went into miscellaneous bolts, fuelwood, piling, posts, and ties. The stumpage value of the wood harvested in 1959 was $16.6 million.

There are approximately 8,891,000 faces on slash and longleaf pine trees being worked for gum-naval stores. The wood-naval stores resource is becoming scarce as the supply of virgin longleaf pine stumps is gradually consumed. Sulphate pulpmill naval stores production has increased considerably in recent years; existing mills have nearly reached maximum production from this byproduct.

Existing Facilities and Programs

There are a number of active programs for improving forestry practices and yields in the basin. The State of Georgia is accelerating its programs for management assistance, and more woodland owners are being interested in improving their woodland. In addition, both industry and consulting foresters are helping in-

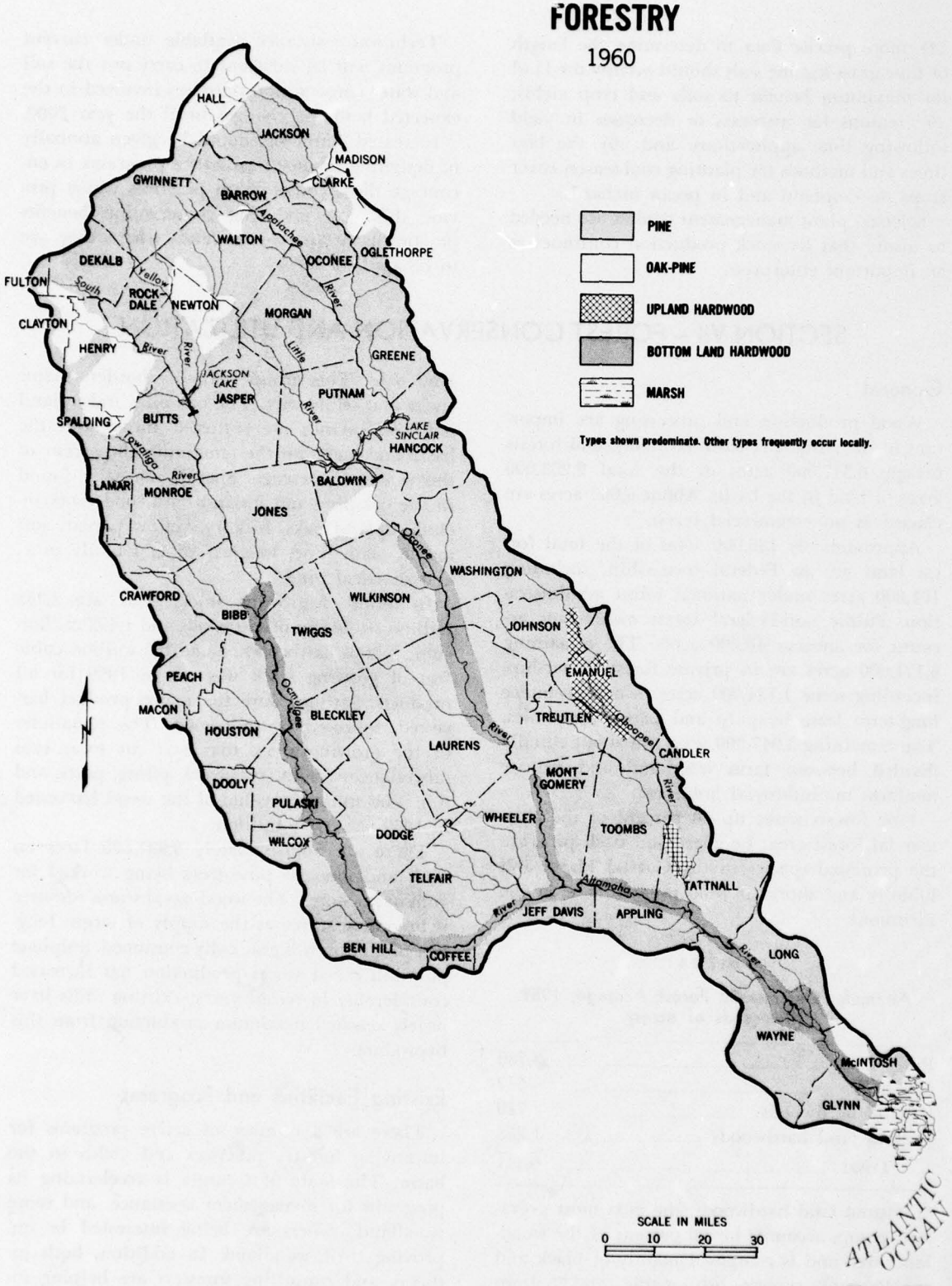

FORESTRY
1960
PINE
OAK-PINE
UPLAND HARDWOOD
BOTTOM LAND HARDWOOD
MARSH
Types shown predominate. Other types frequently occur locally.
HALL
JACKSON
MADISON
GWINNETT
CLARKE
BARROW
Appalachee
WALTON
OCONEE
OGLETHORPE
DEKALB
FULTON
Yellow
South
ROCK-DALE
NEWTON
River
MORGAN
CLAYTON
HENRY
River
Little
GREENE
JACKSON LAKE
JASPER
PUTNAM
River
SPALDING
BUTTS
LAKE SINCLAIR
HANCOCK
Towaliga
River
LAMAR
MONROE
BALDWIN
JONES
Ocmulgee
WASHINGTON
CRAWFORD
WILKINSON
BIBB
TWIGGS
JOHNSON
EMANUEL
PEACH
MACON
Ocmulgee
BLECKLEY
TREUTLEN
Ohoopee
HOUSTON
River
LAURENS
CANDLER
MONT-GOMERY
River
DOOLY
PULASKI
WHEELER
TOOMBS
WILCOX
DODGE
TELFAIR
Altamaha
TATTNALL
River
JEFF DAVIS
APPLING
BEN HILL
COFFEE
River
LONG
WAYNE
McINTOSH
GLYNN
ATLANTIC OCEAN
SCALE IN MILES
0 10 20 30

Figure 2.25

terested landowners manage and improve their forest lands.

Public and private organizations support research that relates to forest problems and needs of the basin. Included among the organizations are the Agricultural Experiment Stations, the U. S. Forest Service, various State colleges and universities, the Georgia Research Council, the Georgia Forestry Commission, the wood-using industries, and several foundations. Protection, management, utilization, and genetic studies receive major attention.

Major emphasis on informational and educational activities is provided by the State forestry organization through field personnel and by trained district and central office specialists.

In 1960, all of the woodland was under organized fire protection, except for 206,000 acres in Jeff Davis, Johnson, and Peach Counties. Most of the counties in the basin have been protected for at least 10 years. The Georgia Forestry Commission has done an effective job in reducing wildfire losses but is not fully staffed or equipped to cope with critical fire periods.

Nearly 325 million tree seedlings were distributed by the Georgia Forestry Commission in the basin during the last 10 years. About 73 million of these were distributed during the 1959-60 planting season. Other nurseries, mainly those owned by pulp and paper companies, also distributed seedlings in the basin. On the average, 800 trees are planted per acre, although planting prescriptions range from about 600 to 1,200 seedlings per acre. About 68 percent of the seedlings planted during the 1959-60 planting season were slash pine. Loblolly pine accounted for most of the remaining seedlings distributed. Other species planted were white and longleaf pine, red cedar, and yellow poplar.

The Naval Stores Conservation Program is administered by the U. S. Forest Service for the Agricultural Stabilization and Conservation Service. The Service provides conservation payments for carrying out certain approved forestry practices on the land. Of the 1,360 producers in the basin, some 985 are enlisted in the Naval Stores Conservation Program and work 7,270,000 of the 8,891,000 faces treated for naval stores production.

There have been no recent major epidemics of insects or diseases in the woodlands of the basin, although local outbreaks have occurred periodically. Field technicians help detect outbreaks and report them for appropriate action.



Figure 2.26 *Poor Stands of Timber May Result from Insects, Diseases, and Forest Fires.*

Needs and Opportunities

In view of the projected increases in population, income, and gross national product, it is estimated that, by the year 2000, approximately 386 million cubic feet of growing stock will need to be cut annually in the basin for processing.

The wood-naval stores industry will eventually consume all the economically suitable stumpwood, and production from this source will have to be replaced. Gum-naval stores will be the principal replacement, and production will have to be doubled to maintain total present output of naval stores products. Enough slash pine and longleaf pine trees of a suitable size will be available for production.



Figure 2.27 *Good Stands of Slash Pine Result from Proper Forestry Practices.*

Means of Meeting the Needs

Improved practices and coordinated individual and community efforts will be increasingly essential to the production program as pressures for wood products mount.

On Federal lands, forest management and protection programs must be accelerated. Work is needed for installation of facilities, road building, planting, and carrying out stand improvement measures.

The program for non-Federal lands for the next 40 years could include: Intensified forest-fire protection; strengthening of forest insect and disease detection and control programs; building of fence to control woodland grazing; planting and erosion control work; site preparation for natural regenerating; commercial and non-commercial timber-stand improvement work, either in conjunction with reforestation or as a separate measure; establishment of shelterbelts, woodland drainage, and water control management; improved naval stores practices; more adequate programs for forest credit and insurance; and intensified educational research and management assistance programs.

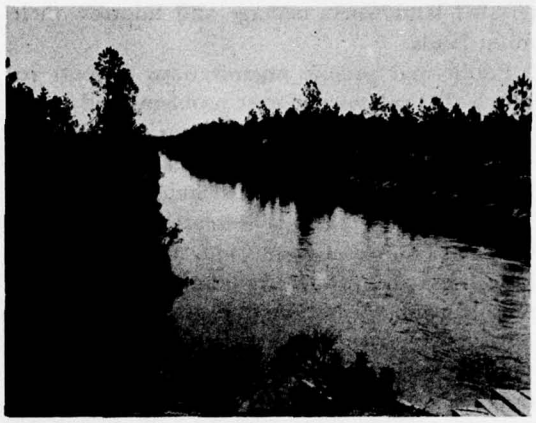


Figure 2.28 *Drainage Improves Timber-Stand Potential.*

TABLE 2.9

Basin Forest Production and Value
(thousands)

Item	Unit	1959	1975	2000
Growing stock, annual cut	cu. ft.	166,000	248,000	386,000
Stumpage value	dollar	16,600	24,800	38,600
Gum-naval stores	face	8,891	12,220	17,780
Net annual leasing value of naval stores	dollar	1,778	2,445	3,556

SECTION VIII – FISH AND WILDLIFE

General

Fish and wildlife resources have contributed much toward meeting the needs for food, furs, and outdoor recreation of people residing within and outside the Altamaha basin. The relative importance of these uses has changed much since early colonial days when the fur trade was one of the leading industries. Commercial fishing along the coast still provides a livelihood to many people, however, primary use throughout the basin is fishing and hunting for sport.

Existing Facilities and Programs

Wildlife and Sport Fisheries

There are 5.3 million acres in the basin suitable for big game. The quality of this habitat ranges from poor to excellent. This includes all of the predominantly forested land and about one-half of the woodlands interspersed by cleared land. Of this, white-tailed deer and/or wild turkeys occupy about 2.5 million acres, or about 47 percent of the total habitat. The average density of big game within the basin is about one animal per 268 acres of suitable habitat.

Small game habitat totals approximately 9.2 million acres and includes forested, interspersed, cleared, and marsh lands. Mourning doves concentrate in grain fields during the autumn months while their numbers are augmented by migrants from the north. Bobwhite quail and rabbits, which occur throughout the basin, are most abundant on cultivated lands and on regularly burned sections of the piney woods. Squir-

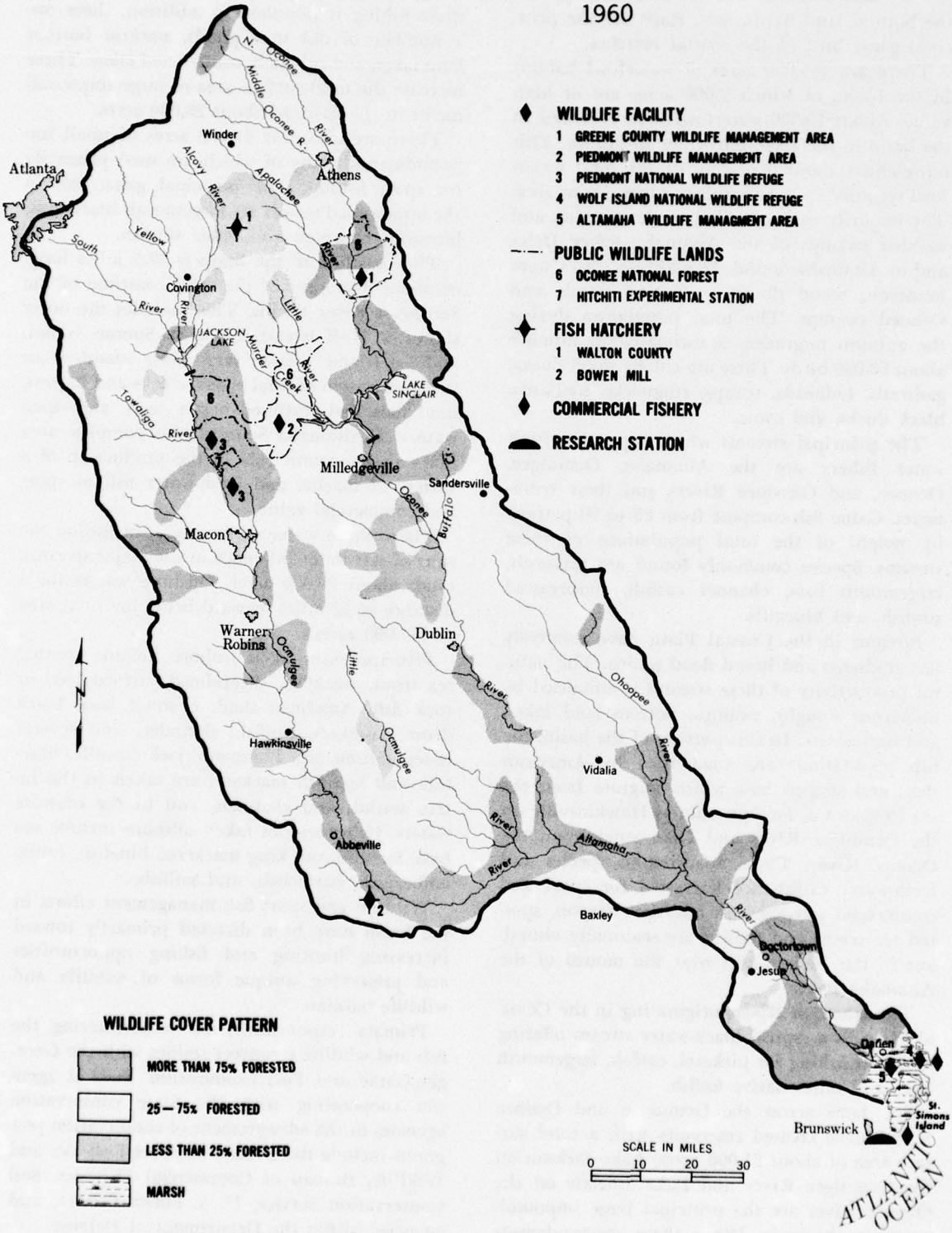

FISH AND WILDLIFE
1960
WILDLIFE FACILITY
1 GREENE COUNTY WILDLIFE MANAGEMENT AREA
2 PIEDMONT WILDLIFE MANAGEMENT AREA
3 PIEDMONT NATIONAL WILDLIFE REFUGE
4 WOLF ISLAND NATIONAL WILDLIFE REFUGE
5 ALTAMAHA WILDLIFE MANAGMENT AREA
PUBLIC WILDLIFE LANDS
6 OCONEE NATIONAL FOREST
7 HITCHITI EXPERIMENTAL STATION
FISH HATCHERY
1 WALTON COUNTY
2 BOWEN MILL
COMMERCIAL FISHERY
RESEARCH STATION
WILDLIFE COVER PATTERN
MORE THAN 75% FORESTED
25—75% FORESTED
LESS THAN 25% FORESTED
MARSH
SCALE IN MILES
0 10 20 30
Atlanta
Winder
Athens
Covington
Milledgeville
Sandersville
Macon
Warner Robins
Dublin
Hawkinsville
Vidalia
Abbeville
Baxley
Doctortown
Jesup
Darien
St. Simons Island
Brunswick
ATLANTIC OCEAN
N. Oconee River
Middle Oconee R.
Oconee River
Alcovy River
Apalachee
South River
Yellow River
Little River
JACKSON LAKE
Murder Creek
Ryer
LAKE SINCLAIR
Towaliga River
Ocmulgee
Little Ocmulgee
Ohoopee River
Altamaha River
Buffalo

Figure 2.29

rels are most abundant in the oak, hickory, and the bottom land hardwoods. Rails are the principal game bird of the coastal marshes.

There are 465,000 acres of waterfowl habitat in the basin, of which 2,000 acres are of high value. About 10,500 waterfowl were recorded in the basin in the 1960 midwinter inventory. This represented about 6 percent of the total waterfowl recorded in the Southeast River Basins area. The majority were observed in the marshes and wooded swamps of the Altamaha River Delta and in Altamaha Sound. In addition, there were numerous wood ducks on inland ponds and wooded swamps. The total population during the autumn migration is estimated to number about 50,000 birds. These are chiefly wood ducks, gadwalls, redheads, scaups, ringnecks, mallards, black ducks, and coots.

The principal streams which support a fresh water fishery are the Altamaha, Ocmulgee, Oconee, and Ohoopee Rivers and their tributaries. Game fish compose from 25 to 90 percent by weight of the total populations of these streams. Species commonly found are pickerels, largemouth bass, channel catfish, redbreasted sunfish, and bluegills.

Streams in the Coastal Plain have relatively flat gradients and broad flood plains. The natural productivity of these streams is enhanced by numerous sloughs, swamps, bottom land lakes, and backwaters. In this portion of the basin, the fish populations are augmented by American shad and striped bass which migrate from the sea to spawn as far upstream as Hawkinsville on the Ocmulgee River and Lake Sinclair on the Oconee River. These anadromous species and fresh-water catfish are harvested for sport and commercial purposes. In addition, tarpon, spotted sea trout, and redfish are seasonally abundant in the fresh waters near the mouth of the Altamaha River.

The Ohoopee River, originating in the Coastal Plain, is a typical black-water stream offering excellent fishing for pickerel, catfish, largemouth bass, and other native finfish.

Six dams across the Ocmulgee and Oconee Rivers have created reservoirs with a total surface area of about 21,000 acres. Lake Jackson on the Ocmulgee River and Lake Sinclair on the Oconee River are the principal large impoundments in the basin. While these impoundments are primarily for hydroelectric power purposes, sport fishing is popular. In addition, there are a number of old mill ponds, natural bottom land lakes, and privately constructed lakes. These increase the total surface area of large impoundments in the basin to about 28,000 acres.

There are also over 31,000 acres of small impoundments, many of which are used primarily for sport fishing. The principal game fish in the impounded waters are largemouth black bass, bluegills, crappies, and other sunfish.

The coastline of the basin is 17.5 miles long, or about 3 percent of the total coastline of the Southeast River Basins. This includes the outer shores of Wolf Island, Little St. Simons Island, and Sea Island. Inshore from these islands is an intricate system of tidal rivers, creeks and bayous, mud flats and scattered oyster reefs, and open waters of Altamaha Sound. This complex area plays an important role in the production of a variety of marine and fresh-water fish of sport and commercial value.

The inshore water surface area, including the zone of salt water influence in the major streams, totals about 20,000 acres. Offshore waters for a distance of 12 miles seaward bring the total area to 111,000 acres.

Principal fish taken inshore include spotted sea trout, weakfish, sheepshead, striped bass or rock fish, American shad, channel bass, black drum, croakers, pinfish, flounder, and several lesser bottom fish. Pompano, jack crevalle, bluefish, and Spanish mackerel are taken in the inlets, sounds and channels, and in the offshore waters. Other species taken offshore include sea bass, Spanish and king mackerel, bluefish, cobia, amberjack, barracuda, and sailfish.

Wildlife and sport fish management efforts in the basin have been directed primarily toward increasing hunting and fishing opportunities and preserving unique forms of wildlife and wildlife habitat.

Primary responsibility for administering the fish and wildlife resources resides with the Georgia Game and Fish Commission. Federal agencies cooperating with the State conservation agencies in the advancement of conservation programs include the Bureau of Sport Fisheries and Wildlife, Bureau of Commercial Fisheries, Soil Conservation Service, U. S. Forest Service, and agencies within the Department of Defense.

TABLE 2.10

Fresh-Water Fish and Wildlife Installations and Areas
(thousands of acres)

Area	1960 ownership		
	Public		Private
	Federal	Non-Federal	
Federally administered			
Piedmont National Wildlife Refuge	32,000	---	---
Wolf Island National Wildlife Refuge	500	---	---
Fort Stewart	10,000	---	---
Oconee National Forest	100,500	---	---
State administered			
Piedmont Wildlife Management Area	(Included in Oconee National Forest)		
Altamaha Wildlife Management Area	---	20,000	---
Greene County Wildlife Management Area	(Included in Oconee National Forest)		
Walton County Fish Hatchery	---	---	---
Bowen Mill Fish Hatchery	---	---	---
Privately administered			
Price Mountain Refuge	---	---	12,000
Total	143,000	20,000	12,000

There are over 163,000 acres of publicly managed wildlife habitat in the basin. The Oconee National Forest and the Piedmont National Wildlife Refuge are the largest tracts of land within the basin in which wildlife resources are managed for public use. Of special significance are the large privately owned timberlands in the lower portion of the basin which have been developed and leased for public hunting.

The restoration of white-tailed deer in the Piedmont province with the establishment of the Piedmont National Wildlife Refuge in 1939 has been one of the most successful wildlife projects in the basin. The Altamaha Wildlife Management Area, under the direction of the Georgia Game and Fish Commission, has demonstrated that while costs are high, reclamation of old rice fields for wildlife purposes can be accomplished. The State also has a farm-game program which encourages and aids farmers in managing wildlife resources on their lands.

Fishery management has been largely concerned with technical advice, renovation and restocking of natural lakes and farm ponds, law enforcement, and information-education programs. Game fish for stocking basin waters are produced in two State and four Federal hatcheries. The two State hatcheries are located within the basin.

Commercial Fisheries

Commercial fishing is one of the oldest enterprises in the basin. Darien, the basins principal port, and nearby Brunswick, in the Satilla-St. Marys basins are recognized as two of the seafood centers of Georgia.

The average annual commercial catch from 1955 to 1959 was 3.1 million pounds, worth about $390,000 to the fishermen. Fish caught directly for food contributed more than 98 percent by weight and value of the total landings.

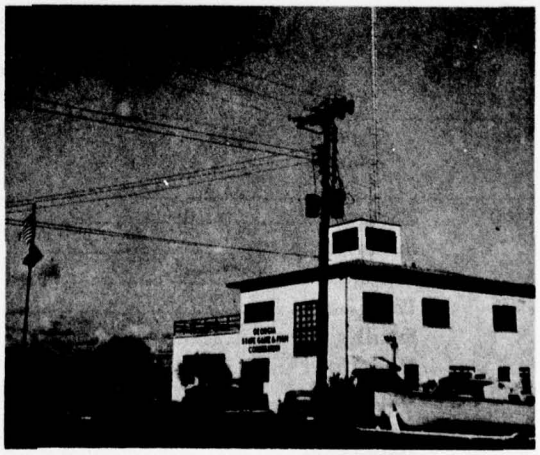


Figure 2.30 *Field Headquarters, Division of Coastal Fisheries, Georgia Game and Fish Commission, Brunswick, Ga.*

Crabs, shrimp, and oysters were the principal shellfish in the catch. American shad, king whiting, flounders, and fresh-water catfish were the principal finfish. While a portion of the total catch is consumed locally, the bulk is processed and marketed throughout the eastern United States.

There were four shore establishments in Darien in 1959 that handled or processed part of the commercial catch. Some 17 plants in Brunswick processed about 30 percent of the catch in the Altamaha basin.

There are numerous salt-water fisheries programs for research, development, and service in the region, although few are headquartered in the basin. The Georgia Marine Institute of the University of Georgia, with laboratories located on Sapelo Island near Darien, conducts investigations relative to the organic productivity of the marshes and estuaries.

The Bureau of Commercial Fisheries conducts biological and hydrographic studies of the South Atlantic through their Brunswick laboratory and offers technological services directed toward development of new markets for fishery products. The Bureau also provides market news service and assists the industry with loans to qualified fishermen.

Needs and Opportunities

Wildlife and Sport Fisheries

In 1960, hunting and fishing afforded approximately 2 million user-days of outdoor activity. About 800,000 user-days of demand remained unsatisfied. The projected demand for hunting and sport fishing is expected to increase to about 4.8 million user-days by the year 2000.

The total population increase and trend toward urbanization were considered to be the decisive factors influencing total hunting and fishing demand. The per capita demand will decrease slightly but the net effect of urbanization and population increase will be a significant increase in hunting and fishing demand.

Use of publicly owned and managed areas will continue to increase at a rate greater than the general increase in population and overall hunting and fishing effort. This, too, reflects the impact of urbanization. Closure of more private lands to public use will make it increasingly difficult for the urbanite to find a place to hunt, despite increases in travel, leisure time, and personal income.

White-tailed deer have increased at a remarkable rate, particularly in the lower Piedmont province. Small game resources may be expected to continue to support the majority of the hunting pressure. However, the supply and the availability of small game will become critical. Further, it will not be economically feasible to increase substantially the total numbers of small game animals over the basin as a whole. Practices have been developed and are being effectively employed in local areas to increase natural quail production, but costs of such management have prohibited extensive application.

TABLE 2.11

Wildlife Needs and Supplies (thousands)

Year	Type of resource	Needs	Supplies		Deficits
		User-days	Acres of habitat	User-days* capacity	User-days capacity
1960	Big game	132	5,360	100	32
	Small game	660	9,179	765	0
	Waterfowl	15	465	4	11
1975	Big game	380	5,784	200	180
	Small game	750	9,169	764	0
	Waterfowl	15	465	4	11
2000	Big game	450	5,784	240	210
	Small game	900	8,732	728	172
	Waterfowl	15	465	4	11

*Based on existing and prospective numbers of game animals, and with normal expansion of going programs.

TABLE 2.12

Sport Fishing Needs and Supplies
(thousands)

Year	Type of resource	Needs	Supplies		Deficits
		User-days	Acres of habitat	User-days* capacity	User-days capacity
1960	Streams	230	22	352	0
	Large impoundments	573	28	280	293
	Small impoundments	1,148	31	730	418
	Salt water	53	111	444	0
1975	Streams	317	22	352	0
	Large impoundments	791	28	280	511
	Small impoundments	1,451	48	1,155	296
	Salt water	68	111	444	0
2000	Streams	352	22	352	0
	Large impoundments	1,041	28	280	761
	Small impoundments	1,916	74	1,805	111
	Salt water	155	111	444	0

*Based on existing and prospective standing crop of game fish, and with normal expansion of going programs.

Waterfowl hunting is confined largely to the marshes and lowlands of the Altamaha River and to the wetlands of the Ocmulgee and Oconee Rivers and Lake Jackson. Little increase in this kind of hunting is expected without an overall increase in the wintering waterfowl population.

Fresh-water fishing needs will be met by utilizing small and large impoundments and the streams. Sport fishing on salt water, which expanded at an unprecedented rate during the last 25 years largely as a result of the development of outboard motors and boats and introduction of boat trailers, will continue to increase.

The Altamaha is severely polluted in many of its reaches. South River, one of the principal headwater tributaries, receives wastes from Atlanta. The Ocmulgee River is degraded as a fishing stream by wastes from the cities of Macon and Warner Robins. The Oconee is polluted near its source by municipal sewage and poultry and fertilizer wastes in the Athens and Jefferson area and by sewage and wastes from the city, the prison, textile mills, and other sources in the Milledgeville area. Wastes from kaolin mines near the Fall Line have converted many miles of fishing streams into sediment ponds. Fish kills have been reported in the Altamaha below Jesup. These conditions must be remedied before the fishing potentials of the affected streams may be realized.

The flood plains of the Ocmulgee, Oconee, and Altamaha Rivers consist of extensive swamps and bottom land hardwood forests, natural lakes, creeks, and extensive backwaters forming some of the best big game range in the basin. Sport fishing, afforded by accessible natural lakes, is productive. There is need for the preservation and development of portions of the basin for fish and wildlife purposes.

Commercial Fisheries

The demand for food fish landed at ports in the basin is expected to increase to about 4 million pounds by 1975 and to about 6.6 million pounds by 2000. The demand for trash fish, used chiefly for bait, is expected to increase to about 110,000 pounds by 2000.

The 1960 catch was considered to be the basins current share of the United States market. The projected catch requirements reflect the pounds of fish which must be caught to meet the basins future share of the United States market.

In making these projections, the Commission recognized that production of food fish in the United States has declined since 1950 while food fish imports have steadily increased. Factors responsible for this decline are fluctuations in

TABLE 2.13

Commercial Catch Requirements
(thousands of pounds)

Species	1960*	1975	2000
For food			
Selected finfish	278	330	430
Shrimp	860	900	1,030
Crabs	1,882	2,400	4,000
Oysters	40	60	100
Other fishes	0	300	900
Subtotal	3,060	3,990	6,460
For other than food			
Industrial fishes	60	70	110
Total	3,120	4,060	6,570

*Based on average annual catch, 1955-1959.

supply, increased costs, competition from other animal protein foods and fishery imports, and lack of information about the sea. The per capita consumption of food fish has remained constant for a number of years.

In the basin, the total catch of selected food fish landed at docks has been relatively stable since 1930, despite an increase in the number of fishermen and fishing craft. The shrimp fishery was expanded in the early 1940's in response to increased demand coupled with improved techniques for processing and marketing. However, further expansion of this industry has been curtailed. Oyster production, which reached its zenith in the early 1900's, declined to an extreme low in 1960.

The demand for quality seafood, however, is high and is expected to continue increasing in the future. Thus, it was assumed that in the future domestic production would meet foreign competition; and, while total pounds of imports would continue to increase, the ratio of imports to domestic production would remain constant.

These and other considerations led to the establishment of production goals by type of fishery which totals the overall projected requirements by 2000.

Means of Meeting the Needs

Wildlife and Sport Fisheries

Big game development affords one of the most promising ways to meet the future demand for hunting. With more extensive management, the habitat can readily supply the expected big game demand, plus a considerable amount of unsatisfied demand for small game and waterfowl hunting. The general trend of land use favors big game enhancement. Some loss of habitat is expected through urban and industrial development, but this will be generally offset by conversion of other lands to forests. Some forestry practices involving destruction of hardwoods, planting of solid pine stands, and draining and clearing of mixed forest land tend to reduce the carrying capacity of habitat. However, greater emphasis on cooperation among forest interests, conservation agencies, and sportsmen, along with increased hardwood production, may be expected to improve overall conditions.

To meet the demand for big game hunting, an inventory of 90,000 animals will be needed by 2000, or 70,000 more animals than the estimated population. Programs, therefore, will have to be accelerated and additional wildlife areas established to insure sufficient production and availability of big game.

The existing and proposed wildlife management areas should be improved by the State game and fish departments in cooperation with the landowners generally in accordance with the type of programs now in effect. The coordinated approach to timber-wildlife management, as practiced on the national forests, should be applied on a much larger scale. Continued im-

provement of wildlife habitat and public use of military areas also should be encouraged.

The development of small game resources to meet future demands lies primarily with landowners. Bobwhite quail and mourning doves, the most popular game species occur largely as a result of the type and pattern of land use. Agricultural practices which provide food and cover for wildlife should be encouraged. Prescribed burning, roadside planting, and establishment of food and cover strips should be employed more extensively by owners of commercial forests in the coastal flatwoods. Emphasis should be given to this type of program on all lands within the existing and proposed management areas and to keeping these areas open to public hunting. Extensive development should be carried out on all suitable habitat in the basin. Fields need to be developed for dove hunting purposes by State and local interests employing conservation practices that will encourage removal of the annual surplus without endangering basic stocks.

Meeting the demand for waterfowl hunting is not a problem which can be effectively attacked within the basin solely by more intensive management, although this will be of some value. The waterfowl value of the basin wetlands can be enhanced by single-purpose wildlife developments and habitat improvement in conjunction with water development projects, including large reservoirs, farm pond and small watershed programs.

The bottom lands of the rivers have considerable waterfowl potentials which could be realized by a program designed to increase the supply and availability of waterfowl food. Development of green tree reservoirs, flooding and dewatering projects, in the flood plains of streams in the Upper Coastal Plain and the middle Piedmont areas hold considerable promise. Areas of particular importance are the Oconee River and Buffalo Creek bottom lands near Sandersville and the Ocmulgee River swamps near Macon.

The establishment of regulated shooting preserves by local interests for small game and waterfowl hunting should be encouraged since this type of sport affords reasonably satisfactory hunting without being dependent upon resident game supplies.

A balanced program of stream and lake improvement and development is needed to meet present and future fishing requirements.

If the present trend in farm pond construction continues and management is intensified, ample numbers and acreages of small impoundments to meet the demand for this type fishing can be expected, if public access is provided. However, greater percentages of the ponds need to be constructed near population centers. Expansion of the current fisheries program also will be needed to service these and other impoundments and, thereby, increase the average production of fish per acre and the quality of fishing afforded.

Greater demand and more intensive fishing pressure on large impoundments are expected with increased human populations and accelerated fishery management programs. An additional 76,000 acres of large impoundments, with management at a low to medium level, would be required to produce the weight of fish necessary to satisfy the expected fishing pressure. As an alternative single-purpose program, a minimum of 10,000 additional acres of large impoundments with management at a high level would suffice.

Pollution abatement, increased fish production, and streamflow regulation will be required to enhance and preserve the value of the streams for fishing. To preserve and increase the public fishing opportunity, existing programs of access development will have to be greatly expanded. Minimum facilities at each site should include a boat-launching ramp and parking areas. Camping facilities would further increase their utility.

To meet the need for salt-water fishing in the basin will require further development of facilities, services, and accommodations. The marine waters of the basin are capable of producing more than enough fish to meet the projected requirements, but facilities for salt-water sport fishing are largely undeveloped. Stretches of the seacoast are without public access. Consequently, it is only lightly utilized by surf or boat fishermen. Bridges which cross bays and inlets, if equipped with catwalks, could provide convenient and readily available fishing opportunities to the public. Jetties and breakwater structures, which may be constructed, could serve a

sizable segment of the fishing public if equipped with walkways.

Artificial fishing reefs need to be developed to localize marine fish populations and to be appropriately marked so that they may be easily located by sport fishermen. This type of program offers one of the best and most economical means of improving the catch in the open sea.

Preservation and development of certain areas in the bottom lands of the Ocmulgee and Oconee Rivers for fish and wildlife purposes will require public action whereby greater recreational use of the natural resources may be encouraged without impairment of their natural characteristics. Public acquisition and administration of the lands and waters within designated areas are needed to insure proper development.

Commercial Fisheries

The present fishing fleet is adequate to harvest many more pounds of fish from the sea if new sources of the more heavily utilized fish can be found and the market increased for other fish which are locally abundant. Improved gear will be required and operations will have to be expanded, but capital investment in additional vessels should be relatively small.

Oyster production could be increased several times. Old surveys reveal that in the shallow inshore waters of the basin there are many acres of oyster reefs which were formerly productive. In addition, there are many acres of bottoms which could be put into oyster production by establishment of the cultch and by abatement of pollution practices based on the adoption of realistic pollution standards.

Known shrimp resources are fully utilized at present. The catch along the Atlantic coast has not increased in recent years despite a marked increase in fishing pressure. More extensive knowledge is needed concerning the biology of the shrimp and the effects of fishing on the shrimp population. New sources of supply need to be discovered.

The crab fishery affords one of the most favorable opportunities to help meet the requirements for shellfishes. There is an abundance of this type of fishery in the coastal waters of the basin for which there has been a steadily growing market.

The catch of finfish could be expanded to meet established goals. Methods of handling and processing fish such as mullet and speckled trout must first be improved to create quality products that will compete with seafoods from other areas.

The shallow inshore waters of the basin offer great potential for seafood culture. Despite the productivity of the seas, it will become increasingly difficult to harvest the wild crop at a cost that will enable the industry to compete with foreign competition and the mass production and marketing methods of the meat and poultry industries. Results thus far achieved through experimental pond culture for shrimp and pompano, however, provide sufficient basis for the initiation of experimental management programs. Extensive application of proven practices can be expected after practical demonstrations of this technology.

SECTION IX – RECREATION

General

The landscape of forest and farm areas is a major recreation resource in the Altamaha basin, but little has been done to attract people seeking outdoor recreation. Rivers, reservoirs, and recreation areas are distributed throughout the basin; but generally, the areas developed for outdoor recreation are scarce. However, several areas have undergone vigorous expansion during the past decade. Other areas have experienced population declines. Two cities, Macon and Atlanta, have increased rapidly in population, and existing recreation areas have shown increased use. The area has many land and water resources which can be adapted to meet recreation needs by supplying recreation facilities for large numbers of people. The recreation plan focuses upon utilizing natural resources where they are available. However, there is a great need to create conditions which are attractive to the outdoor recreationist. These conditions can be created only by developing land and water resources which lend themselves to providing recreation opportunities.

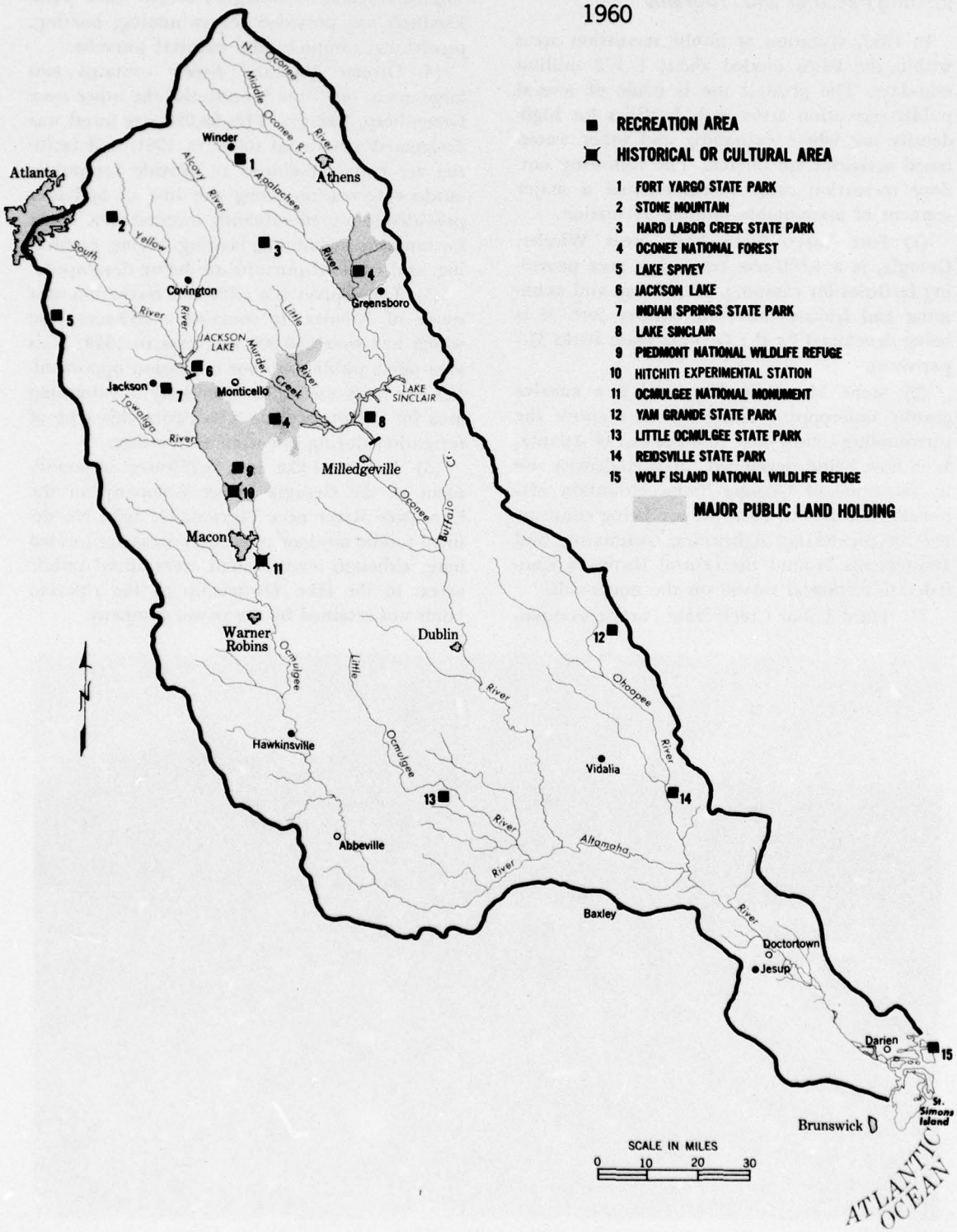

RECREATION
1960
RECREATION AREA
HISTORICAL OR CULTURAL AREA
1 FORT YARGO STATE PARK
2 STONE MOUNTAIN
3 HARD LABOR CREEK STATE PARK
4 OCONEE NATIONAL FOREST
5 LAKE SPIVEY
6 JACKSON LAKE
7 INDIAN SPRINGS STATE PARK
8 LAKE SINCLAIR
9 PIEDMONT NATIONAL WILDLIFE REFUGE
10 HITCHITI EXPERIMENTAL STATION
11 OCMULGEE NATIONAL MONUMENT
12 YAM GRANDE STATE PARK
13 LITTLE OCMULGEE STATE PARK
14 REIDSVILLE STATE PARK
15 WOLF ISLAND NATIONAL WILDLIFE REFUGE
MAJOR PUBLIC LAND HOLDING
Atlanta
Winder
Athens
Covington
Greensboro
Jackson
Monticello
Milledgeville
Macon
Warner Robins
Dublin
Hawkinsville
Vidalia
Abbeville
Baxley
Doctortown
Jesup
Darien
Brunswick
St. Simons Island
JACKSON LAKE
LAKE SINCLAIR
N. Oconee River
Middle Oconee R.
Alcovy River
Appalachee River
South Yellow River
Little River
Murder Creek
Towaliga River
Oconee River
Buffalo Cr.
Little Ocmulgee River
Ocmulgee River
Ohoopee River
Altamaha River
SCALE IN MILES
0 10 20 30
ATLANTIC OCEAN

Figure 2.31

Existing Facilities and Programs

In 1959, visitation at public recreation areas within the basin totaled about 1 1/3 million user-days. The greatest use is made of several public recreation areas with facilities for high-density use where swimming and other water-based activities are offered. The following outdoor recreation areas accommodated a major segment of accountable outdoor recreation.

(1) Fort Yargo State Park, near Winder, Georgia, is a 1,500-acre recreation area providing facilities for camping, picnicking, and swimming and features an 18th century fort. It is being developed by the Georgia State Parks Department.

(2) Stone Mountain Memorial is a massive granite outcropping rising 600 feet above the surrounding countryside 16 miles east of Atlanta. It is now being developed for high-density use by the State of Georgia Stone Mountain Memorial Association. Facilities are being constructed for picnicking, sightseeing, swimming, and amusements around the central theme, a Confederate memorial carved on the north side.

(3) Hard Labor Creek State Park, encompassing 5,850 acres, is Georgia's largest State park. Facilities are provided for swimming, boating, picnicking, camping, and cultural pursuits.

(4) Oconee National Forest contains two large areas, one near Monticello, the other near Greensboro, Georgia. This 96,096-acre forest was designated a national forest in 1961, and facilities are being developed to provide for public outdoor recreation along the line of activities provided in a predominantly forested area. Areas for camping, swimming, boating, hiking, picnicking, and cultural pursuits are being developed.

(5) Lake Spivey is a 1,800-acre recreation area south of Atlanta. It contains a 650-acre lake which had over 350,000 user-days in 1959. This area offers public outdoor recreation opportunities for mass use. It is essentially a swimming area for urban dwellers who desire this type of recreation during hot summer weather.

(6) Jackson Lake is a 4,750-acre impoundment of the Georgia Power Company on the Ocmulgee River near Jackson, Georgia. No defined public outdoor recreation areas are located here, although several small areas afford public access to the lake. Ownership of the riparian lands was retained by the power company.



Figure 2.32 *Recreation at Lake Sinclair Is Increasing.*

(7) Indian Springs State Park, a 612-acre park, is reputedly the oldest State park in the United States. It was obtained by the State of Georgia in 1825. An 80-acre lake permits boating and swimming. Almost 200,000 user-days were accounted for in 1959.

(8) Lake Sinclair is a 15,330-acre lake on the Oconee River north of Milledgeville, Georgia. The Georgia Power Company operates the power project. Facilities are available for boating, swimming, and picnicking; and it is estimated that 175,000 user-days were accounted for on this lake in 1959.

(9) Piedmont National Wildlife Refuge is a 32,209-acre wildlife refuge northwest of Macon, Georgia, with some facilities for limited recreation activities.

(10) Hitchiti Experimental Station is a 4,594-acre area north of Macon where forest research is conducted. This forest is part of the Oconee National Forest.

(11) Ocmulgee National Monument is a 683-acre area near Macon, Georgia, administered by the National Park Service. The monument offers an unusual concentration of archeological remains of Indian villages and temple mounds. A visitor center and guided tours provide information.

(12) Yam Grande State Park is a small, 6-acre recreation area west of Swainsboro, Georgia. It has a swimming pool and picnicking and camping facilities.

(13) Little Ocmulgee State Park is a 1,400-acre recreation area near McRae, Georgia. In addition to the archeological excavations, it contains a lake which provides boating, swimming, picnicking, and camping facilities.

(14) Reidsville State Park is a 120-acre area within the city limits of Reidsville, Georgia. Recreation activities are confined to picnicking and pool swimming.

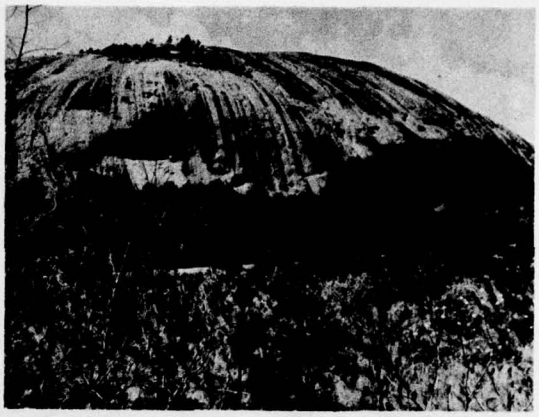


Figure 2.33 *Stone Mountain, the Largest Granite Mass of Its Kind, Is an Important Tourist Attraction.*

(15) Wolf Island National Wildlife Refuge is a small 538-acre area near the mouth of the Altamaha River. Inaccessible at present, it has not been developed for outdoor recreation use.

Needs and Opportunities

In estimating the future demand for recreation, it was assumed that the residents of the Southeast River Basins who leave the area primarily for recreation purposes are about equal in number to the nonresidents who visit the area for recreation. It was assumed that approximately one-fifth of the leisure days available to the people of the basin would be accounted for in some way or another at public outdoor recreation areas. However, many travelers pass through the basin, and about 60 percent of these seek some type of outdoor recreation enroute. Many of the projected new residents of future years are expected to move into the basin because of climate and recreational facilities.

Urbanization trends in the Southeast River Basins closely follow national trends. Residents and tourists are expected to need about 41 mil-

TABLE 2.14

Recreation User-Days—1960, 1975, and 2000
(millions)

Area	1960	Projected need	
		1975	2000
Altamaha basin	3.7	15.3	36.0
Southeast River Basins	35.0	95.0	230.0

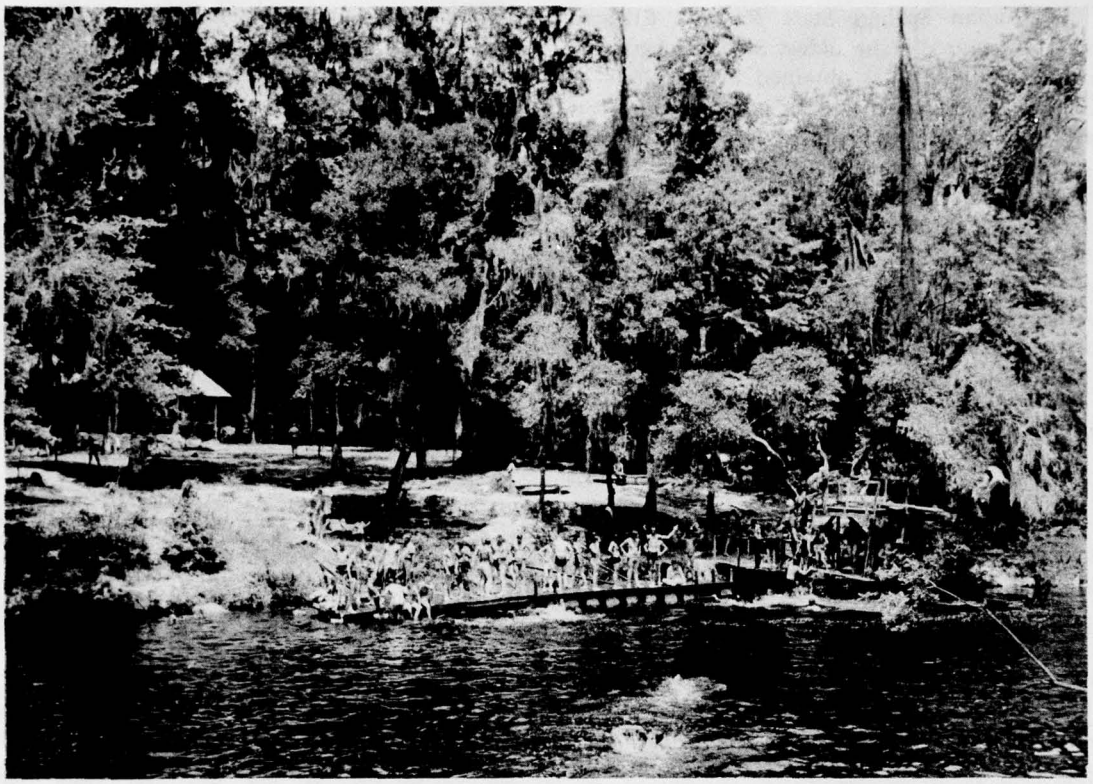


Figure 2.34 *Clean Water Is a Major Recreation Resource.*

lion user-days of outdoor recreation by 2000. There will be a need for facilities for 36 million user-days. The balance of over 5 million user-days will be found in the other major river basins in the Southeast River Basins. Demand will occur mainly in the summer months, and much of the demand will be for water-oriented recreation facilities. Although spring and fall are comfortable for outdoor recreation, the winter weather is not conducive to most recreation activities.

Means of Meeting the Needs

To satisfy resident needs within the limitations of resource availability and to provide for nonresident requirements, the recreation plan calls for an intensified effort to increase public outdoor recreation facilities to accommodate 10 times the current use. In many cases, demands can be satisfied by expanding existing facilities and by emphasizing the development of those resources not now utilized for recreation.

Of the existing recreation areas, those at Stone Mountain and Lakes Sinclair and Jackson could best absorb the largest number of visitors. However, to obtain a varied recreation plan, full development of existing facilities of all the other areas should be vigorously pursued. State parks, private developments available for public use, and national forests recreation sites could be expanded in most cases by increasing facilities to meet the need for greater public outdoor recreation opportunity.

It is expected that over 10 million user-days would be accommodated at existing areas by 1975 and 18 million user-days by the year 2000. In order to reach the goal of 36 million user-days annually by 2000, new areas could best be developed to meet the additional needs.

Areas for high-density use could be provided relatively close to major population centers. Facilities could be constructed to meet mass-use demands for outdoor recreation.

Atlanta residents are expected to have great need for outdoor recreation areas within easy

TABLE 2.15

Projected Increase of Outdoor Recreation Use
(thousands of user-days)

Item	1960	Increase to 1975	Increase 1975-2000	Total 2000
Enlarging existing areas	3,694	5,771	8,345	17,810
New areas	----	5,825	12,365	18,190
Total	3,694	11,596	20,710	36,000

driving distance of the metropolitan area. The upper reaches of the tributaries of the Ocmulgee River east and southeast of Atlanta are desirable locations for mass recreation with extensive water-based recreation opportunity. Small impoundments in the Atlanta area could also be used to meet these urgent needs for increased opportunities. Not all small impoundments would be adaptable; but where they are compatible with other uses, every effort should be made to combine their use. Several large water areas would be desirable where facilities could be developed to meet both high-density use and those uses which require greater land and water acreages.

The smaller population centers are expected to require centers for recreation use. Construction of recreation areas close to these cities would help to meet their needs.

The Curry Creek site above Athens on the North Oconee River, the Big Flat Creek site on the Alcovy River, the New Bethel site on the Yellow River, and the Peachstone site on South River, and sites near Macon are all areas where recreation needs could be met if water-oriented facilities were available.

General outdoor recreation areas, such as State and local parks, river and lake recreation areas, could be located throughout the basin so as to provide outdoor recreation opportunities for both urban and nonurban residents and tourists. These areas should include sites subject to substantial development for a wide variety of uses which would sustain a considerable amount of activity in camping, picnicking, boating, swimming, and cultural pursuits. Small reservoirs, in many instances, could be adapted for outdoor recreation. Access areas ranging from 10 to 75 acres and county and State park areas ranging from 100 to 500 acres would serve as local and State recreation areas. They could be sized to meet local or regional conditions, depending upon demands and physical adaptability of the area.

Natural environment areas would permit recreation in the out-of-doors, along with other resource uses. These areas would have areas within them adapted to high-density use and general recreation use where conditions would warrant. Users would be able to enjoy the resource in its existing state. The extensive water-surface and woodland area would provide opportunities for recreationists who seek dispersed activities such as boating, hiking, and camping.

Historic and cultural areas would also provide limited opportunity for recreation. Four sites have been identified as having unusual significance in historic and archeological background. The identified sites are: (1) Fort King George, 1 mile east of Darien; (2) Shinholser on Indian Island, 10 miles south of Milledgeville on the Oconee River; (3) Shoulderbone, 9 miles from Sparta; and (4) Browns Mountain, 10 miles southeast of Macon. Responsible State and local agencies could develop these areas. In some



Figure 2.35 *Undeveloped Indian Mound in Shoulderbone Area near Sparta, Georgia.*

cases, development may involve only a small interpretive center; in others, it may require some restoration. The additional facilities would depend upon the use. It would be desirable to include these sites as part of a larger recreation area where sufficient land and water would attract recreationists seeking a wider range of recreation experiences.

SECTION X – SALINITY AND SEDIMENT CONTROL

General

Problems of salinity and sedimentation are localized and are not significant in the Altamaha basin at the present time.

A salinity problem occurs when enough salt accumulates in the soil to impair crop productivity or when salt water intrudes into freshwater areas so as to interfere with water use, needs, or availability.

There are 53,700 acres of saline soils, principally salt-water marsh, in the basin. This represents 0.6 percent of the total basin area. Because of the high costs associated with reclamation, little of this land has been reclaimed for cropland or improved pastureland. Its current use for wildlife habitat and for limited grazing by livestock constitute the major projected uses of this land.

Salt-water marshes are moving slowly inland because of the rising sea level, and as a result, the plant life is changing from fresh-water to salt-water types. Salt-water intrusion of ground water supplies could develop into a problem in the Altamaha basin if extensive future demands are made on the ground water aquifer near the ocean.

A sediment problem results when water transports and deposits silt, sand, and other matter in reservoirs, ditches, channels, and other areas where they are not wanted or when these materials in water curtail its use.



Figure 2.36 *Salt Marsh in Coastal Areas Is Slowly Increasing.*

Sediment yield of the Altamaha River system does not present a major problem at this time. In general, sediment yields are greater in the upper portion of the basin than in the lower portion. Samples on the Ocmulgee River at Macon show suspended sediment concentrations only slightly over 100 parts per million. Although an average of 533 tons of sediment per square mile of drainage area was deposited in the Lloyd Shoals Reservoir during the period 1910 to 1935, the average annual yield from the drainage area above the reservoir now is in the order of 100 to 300 tons per square mile annually. Samples taken from the Altamaha River indicated concentrations of about 16 parts per million. Except for the creeks in the Fall Line area that carry heavy sediment concentration from clay processing operations, a concentration of 40 parts per million plus or minus 20 to 40 parts per million is a reasonable average for most of the basin.

TABLE 2.16

Estimated Annual Sediment and Erosion Damage-1959

General location and type of damage	Amount
Piedmont	
Damage from overbank deposition	$95,000
Swamping caused by channel fill	64,000
Flood plain scour	35,000
Erosion damage to roadbanks	36,000
Coastal Plain	
Cost for ditch maintenance	7,100
Basin	
Sediment damage to small reservoirs	18,000
Basin total	255,100

Because of land-use changes from crops to forest and the installation of conservation measures,

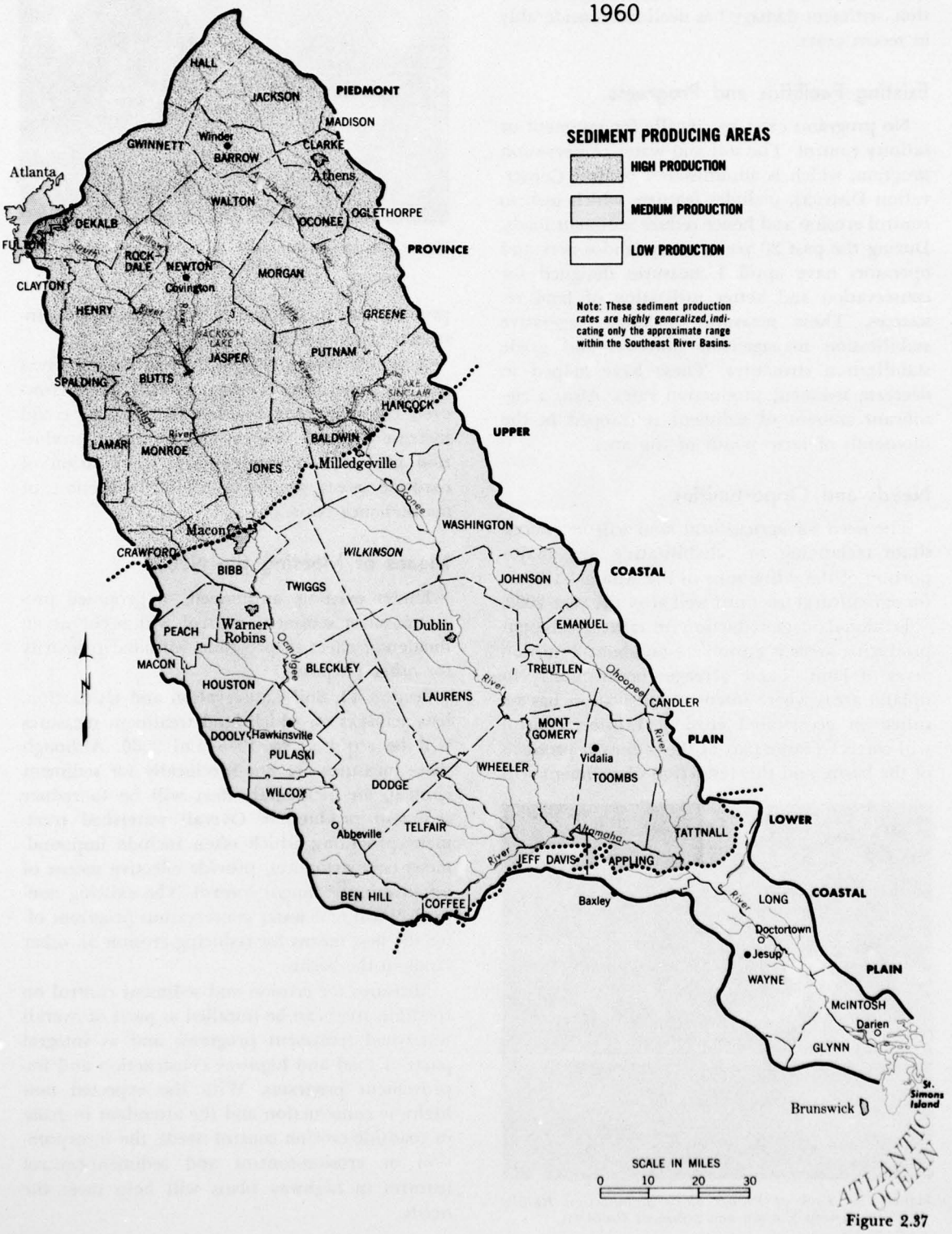

SEDIMENT
1960
SEDIMENT PRODUCING AREAS
HIGH PRODUCTION
MEDIUM PRODUCTION
LOW PRODUCTION
Note: These sediment production rates are highly generalized, indicating only the approximate range within the Southeast River Basins.
PIEDMONT
PROVINCE
UPPER
COASTAL
PLAIN
LOWER
COASTAL
PLAIN
HALL
JACKSON
MADISON
GWINNETT
Winder
BARROW
CLARKE
Athens
Atlanta
WALTON
OCONEE
OGLETHORPE
DEKALB
FULTON
ROCK DALE
NEWTON
Covington
MORGAN
CLAYTON
HENRY
GREENE
JACKSON LAKE
JASPER
PUTNAM
SPALDING
BUTTS
LAKE SINCLAIR
HANCOCK
LAMAR
MONROE
BALDWIN
Milledgeville
JONES
WASHINGTON
Macon
WILKINSON
CRAWFORD
BIBB
TWIGGS
JOHNSON
PEACH
Warner Robins
Dublin
EMANUEL
MACON
BLECKLEY
TREUTLEN
HOUSTON
LAURENS
CANDLER
DOOLY
Hawkinsville
MONT-GOMERY
PULASKI
Vidalia
WHEELER
TOOMBS
WILCOX
DODGE
Abbeville
TELFAIR
TATTNALL
JEFF DAVIS
APPLING
BEN HILL
COFFEE
Baxley
LONG
Doctortown
Jesup
WAYNE
McINTOSH
Darien
GLYNN
St. Simons Island
Brunswick
ATLANTIC OCEAN
SCALE IN MILES
0 10 20 30

Figure 2.37

including land treatment and reservoir construction, sediment damage has declined considerably in recent years.

Existing Facilities and Programs

No programs exist specifically for sediment or salinity control. The soil and water conservation program, which is administered by Soil Conservation Districts, includes features which seek to control erosion and hence reduce sediment loads. During the past 20 years, many landowners and operators have applied measures designed for conservation and better utilization of land resources. These measures included vegetative stabilization management practices and grade stabilization structures. These have helped to decrease sediment production rates. Also, a significant amount of sediment is trapped in the thousands of farm ponds of the area.

Needs and Opportunities

The need for agricultural land will not necessitate reclaiming or rehabilitating any major portion of the saline soils in the Altamaha basin for agricultural use until well after the year 2000.

Erosion-damage reduction for critical sediment producing areas is a problem on about 2 million acres of land. These acreages occur mostly in upland areas where intensive cultivation has resulted in accelerated erosion. Erosion control will correct a large part of the sediment problem of the basin, and this reduction of sediment will prolong the useful life of and enhance downstream water developments.



Figure 2.38 *Lack of Proper Slope Stabilization Results in Serious Erosion and Sediment Problems.*



Figure 2.39 *Roadside North of Soperton Stabilized with Bahia Grass.*

Roadside erosion is critical in localized areas but offsite sediment damages are not large. However, increasing construction of highways could increase highway erosion and sediment production problems. Treatment and stabilization of roadside areas would result in reduction of maintenance costs.

Means of Meeting the Needs

Under existing, authorized, or proposed programs, most sediment control will occur as an incidental effect to programs initiated primarily for other purposes.

Section VI, Soil Conservation and Utilization, lists acreages on which land treatment measures will be required by 1975 and 2000. Although these measures are not specifically for sediment control, an incidental effect will be to reduce sediment production. Overall watershed treatment programs, which often include impoundment type structures, provide effective means of establishing sediment control. The existing nonproject soil and water conservation programs offer the best means for reducing erosion on other lands in the basin.

Measures for erosion and sediment control on roadside areas can be installed as parts of overall watershed treatment programs and as integral parts of road and highway construction and improvement programs. With the expected new highway construction and the attendant increase in roadside erosion control needs, the incorporation or erosion-control and sediment-control features in highway plans will help meet the needs.

Due to the limited extent of saline soils, salinity does not present a major problem at this time. Foresight and planning can do much to prevent damages from occurring due to salt-water intrusion in the coastal areas.

SECTION XI – POLLUTION ABATEMENT AND PUBLIC HEALTH

General

Public health is an important factor in resource development. Economic growth is retarded when poor health causes a loss in production and necessitates high expenditures for personal medical attention. Programs in this field are concerned with improving the health, safety, and welfare of the entire population.

Although the scope of public health encompasses everything from mental health to mosquito control, only those phases directly related to land and water resources development are included in this study. Items discussed in this Section include: The abatement of air and water pollution; radiation monitoring; the collection and disposal of community and industrial waste; and vector control. The development and protection of potable water supplies as discussed in Section II are also an important part of the public health programs. Other public health related items are included in appropriate sections of the Report. The basic objective of all phases of public health programs is the protection of the health of the community through the control of man's environment.

Air pollution results from many of man's activities. The extent of air pollution and its effects on the population will depend upon population distribution; industrial, commercial, and agricultural activity, fuel usage; and waste disposal practices. Meteorology, topography, and other natural features influence dispersion of pollutants and, thus, are important factors in determining pollution levels which may occur. Concentration of certain toxic airborne materials may be fatal to man or may impair the growth of vegetation. Such impairment could produce blighted areas and restrict land use.

Pollution can destroy the usefulness of the water and limit its reuse. The liquid and water-carried waste of municipal, industrial, and agricultural activities eventually finds its way to the water courses. The objective of a water pollution control program is to prevent waste loading in excess of the assimilating capacity of the receiving streams and maintain stream water quality suitable for reuse.

Solid municipal and industrial waste requires land for disposal. The proper sanitary landfill disposal affords land reclamation, eliminates insect breeding areas, and prevents the leaching of materials which could affect water quality.

Continued radiological monitoring would indicate any increase from manmade radiation which, because of its long-life characteristics and lethal properties, could directly affect land and water resources use and development.

Vector control can have a beneficial effect on the development of the land and water resources. The mosquitoes of the area may carry disease and are always a nuisance. Land and water management practices are an essential part of an effective vector control program.

Existing Facilities and Programs

Pollution Abatement

The surface waters of the basin are used for final disposal of treated or untreated liquid waste from 60 municipalities, 8 institutions, and over 42 industries.

Waste discharges from the Atlanta metropolitan area have resulted in serious water quality degradation in the headwaters of South River.



Figure 2.40 *Detergents in Streams Reduce the Quality of the Water.*

POLLUTION ABATEMENT

1960

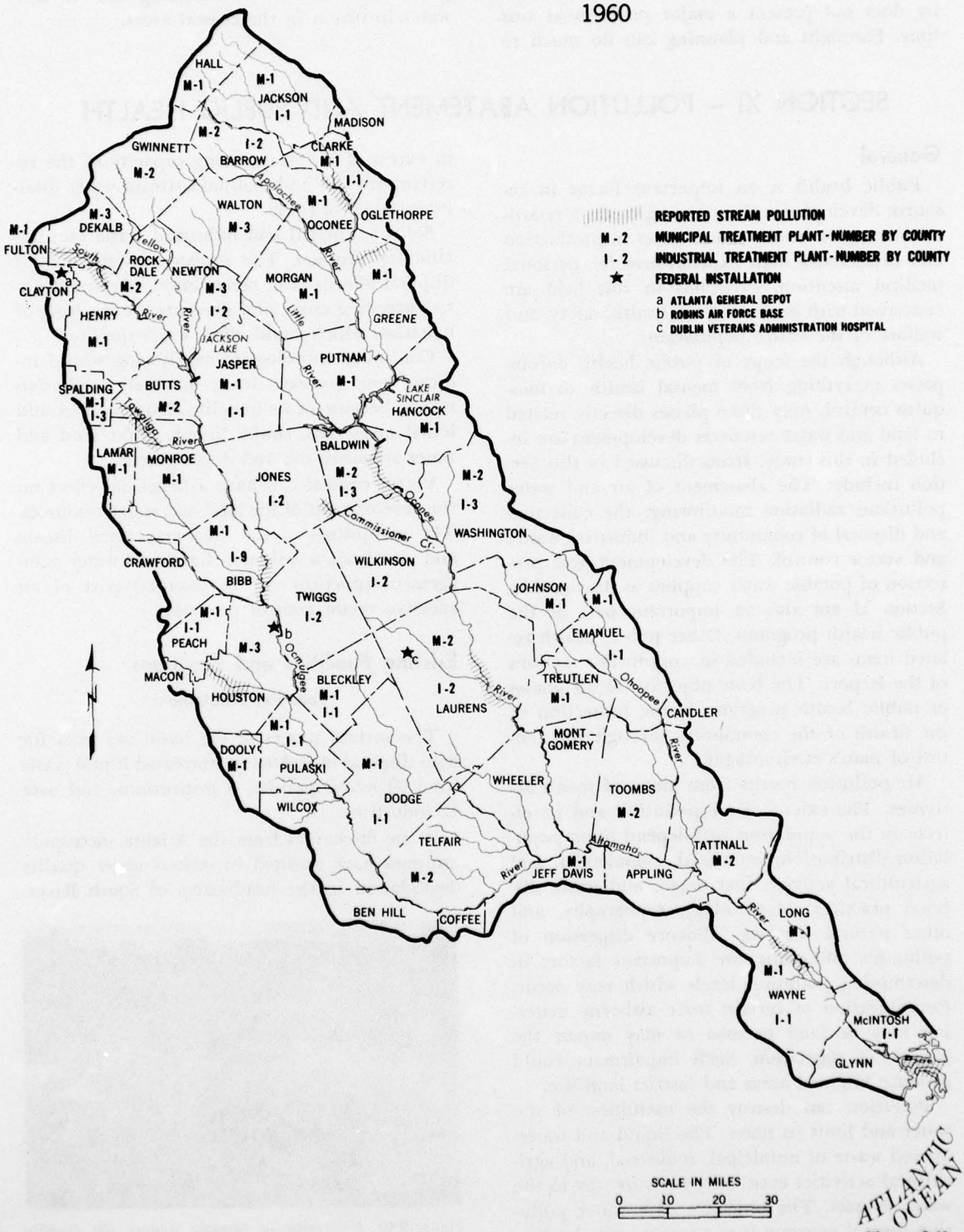


Figure 2.41

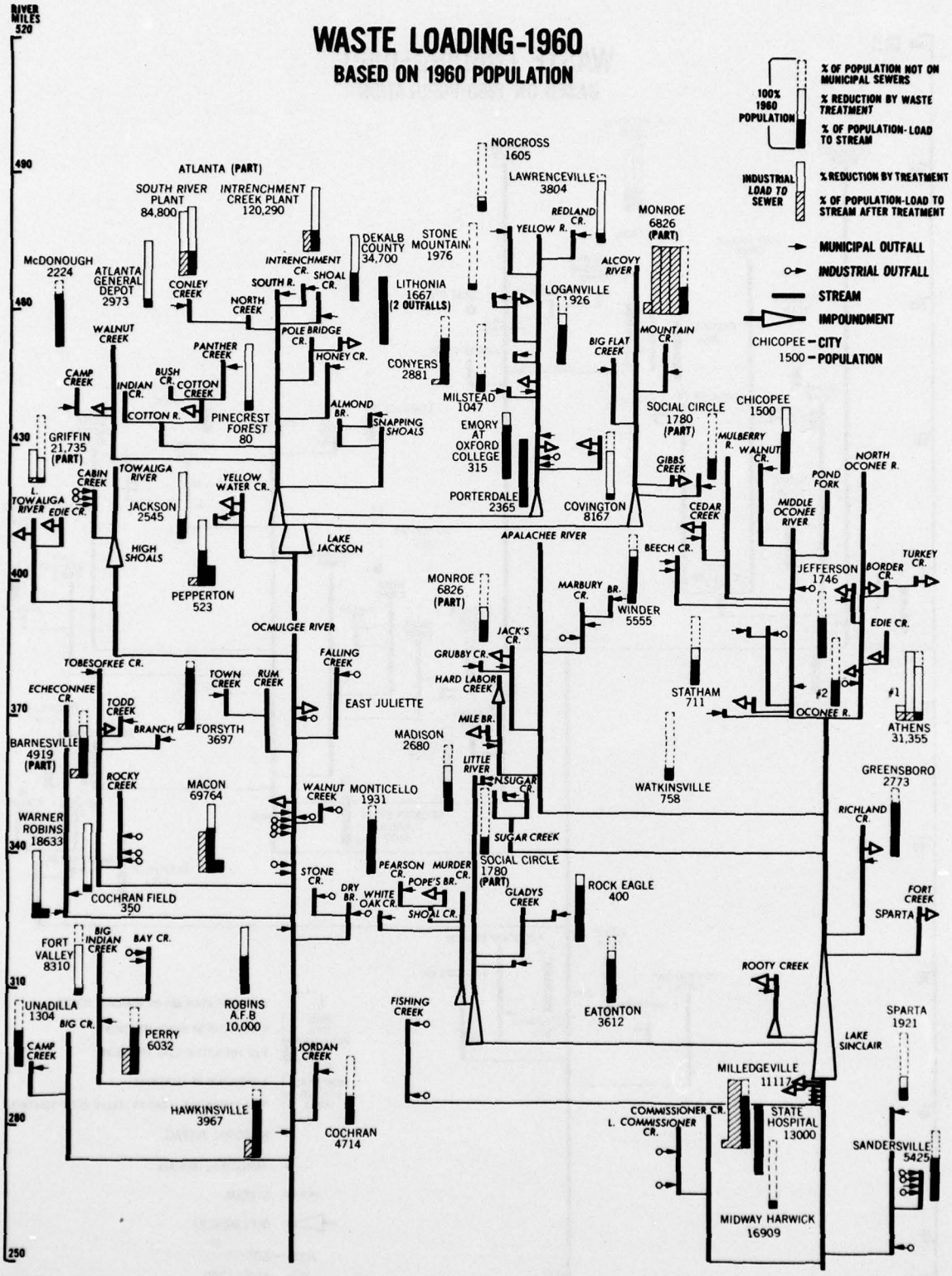

WASTE LOADING-1960
BASED ON 1960 POPULATION
RIVER MILES
520
490
480
430
400
370
340
310
280
250
100% 1960 POPULATION
% OF POPULATION NOT ON MUNICIPAL SEWERS
% REDUCTION BY WASTE TREATMENT
% OF POPULATION-LOAD TO STREAM
INDUSTRIAL LOAD TO SEWER
% REDUCTION BY TREATMENT
% OF POPULATION-LOAD TO STREAM AFTER TREATMENT
MUNICIPAL OUTFALL
INDUSTRIAL OUTFALL
STREAM
IMPOUNDMENT
CHICOPEE – CITY
1500 – POPULATION
ATLANTA (PART)
SOUTH RIVER PLANT 84,800
INTRENCHMENT CREEK PLANT 120,290
NORCROSS 1605
LAWRENCEVILLE 3804
MONROE 6826 (PART)
McDONOUGH 2224
ATLANTA GENERAL DEPOT 2973
CONLEY CREEK
INTRENCHMENT CR.
SHOAL CR.
DEKALB COUNTY 34,700
STONE MOUNTAIN 1976
REDLAND CR.
YELLOW R.
ALCOVY RIVER
SOUTH R.
NORTH CREEK
LITHONIA 1667 (2 OUTFALLS)
LOGANVILLE 926
WALNUT CREEK
POLE BRIDGE CR.
HONEY CR.
CONYERS 2881
BIG FLAT CREEK
MOUNTAIN CR.
PANTHER CREEK
CAMP CREEK
BUSH CR.
INDIAN CR.
COTTON CREEK
COTTON R.
PINECREST FOREST 80
ALMOND BR.
SNAPPING SHOALS
MILSTEAD 1047
EMORY AT OXFORD COLLEGE 315
SOCIAL CIRCLE 1780 (PART)
CHICOPEE 1500
MULBERRY R.
WALNUT CR.
GRIFFIN 21,735 (PART)
L. TOWALIGA RIVER
CABIN CREEK
EDIE CR.
TOWALIGA RIVER
YELLOW WATER CR.
JACKSON 2545
HIGH SHOALS
PEPPERTON 523
LAKE JACKSON
PORTERDALE 2365
COVINGTON 8167
GIBBS CREEK
CEDAR CREEK
NORTH OCONEE R.
POND FORK
MIDDLE OCONEE RIVER
APALACHEE RIVER
BEECH CR.
TURKEY CR.
BORDER CR.
JEFFERSON 1746
MONROE 6826 (PART)
MARBURY CR.
BR.
WINDER 5555
OCMULGEE RIVER
JACK'S CR.
GRUBBY CR.
HARD LABOR CREEK
FALLING CREEK
TOBESOFKEE CR.
TOWN CREEK
RUM CREEK
EAST JULIETTE
ECHECONNEE CR.
TODD CREEK
BRANCH
FORSYTH 3697
MILE BR.
MADISON 2680
LITTLE RIVER
STATHAM 711
#2
#1
OCONEE R.
ATHENS 31,355
EDIE CR.
BARNESVILLE 4919 (PART)
ROCKY CREEK
MACON 69764
WALNUT CREEK
MONTICELLO 1931
SUGAR CREEK
WATKINSVILLE 758
GREENSBORO 2773
RICHLAND CR.
WARNER ROBINS 18633
STONE CR.
PEARSON CR.
MURDER CR.
SOCIAL CIRCLE 1780 (PART)
DRY BR.
WHITE OAK CR.
POPE'S BR.
SHOAL CR.
GLADYS CREEK
ROCK EAGLE 400
COCHRAN FIELD 350
FORT CREEK
SPARTA
FORT VALLEY 8310
BIG INDIAN CREEK
BAY CR.
ROOTY CREEK
UNADILLA 1304
BIG CR.
CAMP CREEK
PERRY 6032
ROBINS A.F.B 10,000
FISHING CREEK
EATONTON 3612
SPARTA 1921
LAKE SINCLAIR
JORDAN CREEK
MILLEDGEVILLE 11117
HAWKINSVILLE 3967
COCHRAN 4714
COMMISSIONER CR.
L. COMMISSIONER CR.
STATE HOSPITAL 13000
SANDERSVILLE 5425
MIDWAY HARWICK 16909

Figure 2.42 (a)

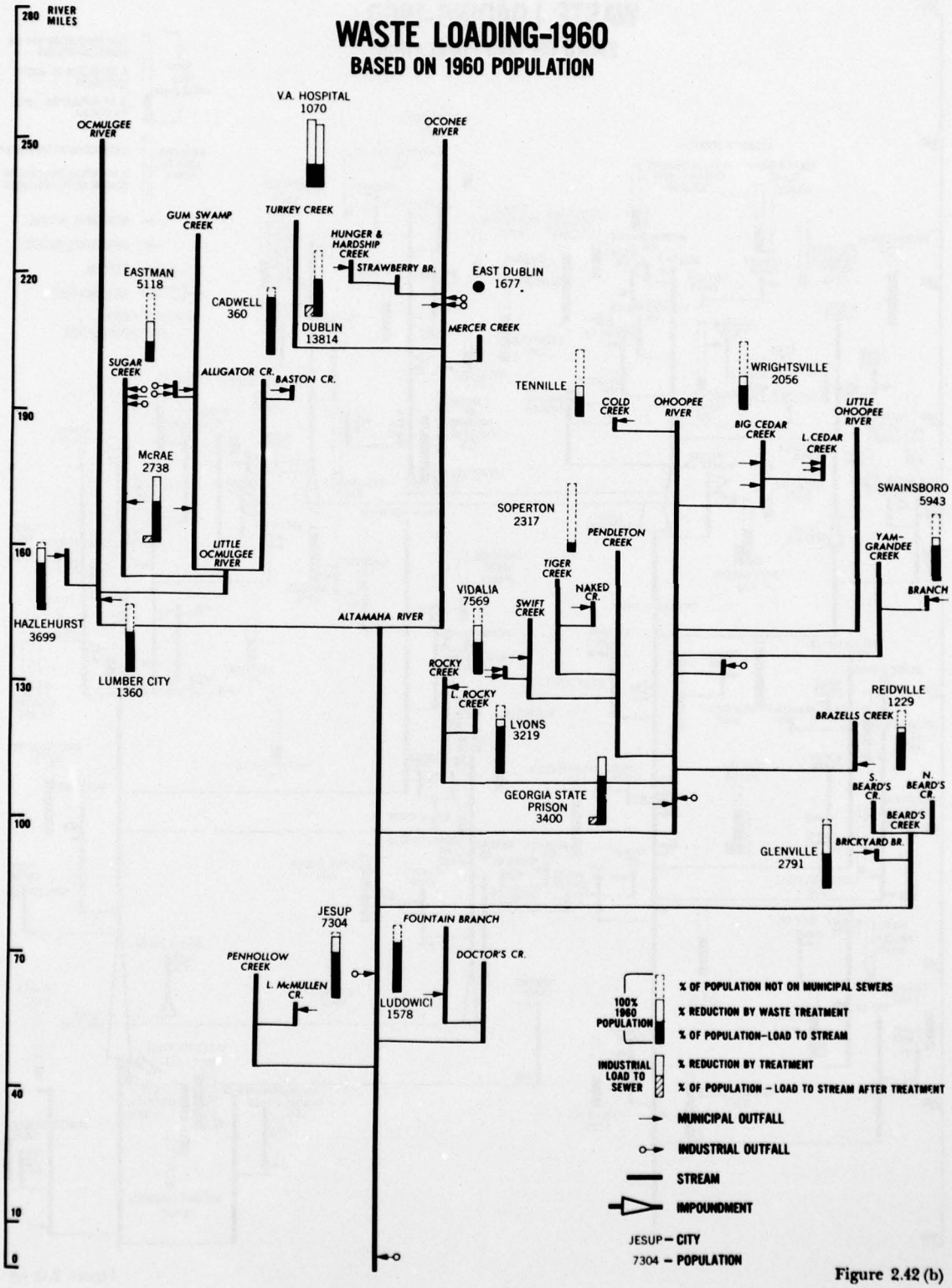

WASTE LOADING-1960
BASED ON 1960 POPULATION
RIVER MILES
280
250
220
190
160
130
100
70
40
10
0
V.A. HOSPITAL
1070
OCMULGEE RIVER
OCONEE RIVER
TURKEY CREEK
GUM SWAMP CREEK
HUNGER & HARDSHIP CREEK
STRAWBERRY BR.
EAST DUBLIN
1677
EASTMAN
5118
CADWELL
360
DUBLIN
13814
MERCER CREEK
SUGAR CREEK
ALLIGATOR CR.
BASTON CR.
TENNILLE
COLD CREEK
OHOOPEE RIVER
WRIGHTSVILLE
2056
LITTLE OHOOPEE RIVER
BIG CEDAR CREEK
L. CEDAR CREEK
McRAE
2738
SOPERTON
2317
PENDLETON CREEK
SWAINSBORO
5943
YAM-GRANDEE CREEK
BRANCH
LITTLE OCMULGEE RIVER
TIGER CREEK
NAKED CR.
VIDALIA
7569
SWIFT CREEK
HAZLEHURST
3699
ALTAMAHA RIVER
ROCKY CREEK
L. ROCKY CREEK
LUMBER CITY
1360
LYONS
3219
REIDVILLE
1229
BRAZELLS CREEK
S. BEARD'S CR.
N. BEARD'S CR.
BEARD'S CREEK
GEORGIA STATE PRISON
3400
BRICKYARD BR.
GLENVILLE
2791
JESUP
7304
FOUNTAIN BRANCH
PENHOLLOW CREEK
L. McMULLEN CR.
DOCTOR'S CR.
LUDOWICI
1578
100% 1960 POPULATION
% OF POPULATION NOT ON MUNICIPAL SEWERS
% REDUCTION BY WASTE TREATMENT
% OF POPULATION-LOAD TO STREAM
INDUSTRIAL LOAD TO SEWER
% REDUCTION BY TREATMENT
% OF POPULATION - LOAD TO STREAM AFTER TREATMENT
MUNICIPAL OUTFALL
INDUSTRIAL OUTFALL
STREAM
IMPOUNDMENT
JESUP - CITY
7304 - POPULATION

Figure 2.42 (b)

Depressed oxygen levels and high bacteria concentrations have been reported for several miles downstream. Waste discharges from large industrial water users in Macon and Jesup, Georgia, have, in the past, adversely affected stream water quality in both the Ocmulgee and Altamaha Rivers. The oyster industry in the tidal estuary of the Altamaha River has been closed for many years because of the high coliform bacteria concentrations in the water.

Stream surveys conducted by the Georgia Game and Fish Commission have indicated that the water quality of several stream reaches within the basin are adversely affected by municipal and industrial waste discharges. Polluted conditions have been observed in South River above Jackson Reservoir and in the Ocmulgee River below Macon, Warner Robins, and Hawkinsville. Periodic fish kills during periods of low water and high temperatures have been reported in the Ocmulgee River below Macon. Industrial waste discharges have created polluted conditions on the Oconee River below Athens, Milledgeville, near the Laurens-Wilkinson County line, and below Dublin.

Fish kills have occurred in the Altamaha River below Jesup. Conditions in this reach have been improved by better handling of the wastes. Research is being continued in an effort to completely correct conditions which, in the past, have seriously affected the shad industry in the river below Jesup.

In 1960, an estimated 537,500 persons were served by 68 municipal and industrial sewerage systems which discharged into the Altamaha basin. The population equivalent was estimated at 748,900 persons before treatment. After treatment, the total population equivalent discharged to the stream was estimated to be about 438,000 persons. Some 20 municipalities and institutions in the basin provide primary treatment for the sewage collected from an estimated 112,000 persons. Some of these plants are overloaded or improperly maintained and provide little treatment. Nineteen sewerage systems provide secondary treatment of the sewage collected from 319,000 persons. However, one of these plants was inoperative in 1960 and was providing no reduction of the biochemical oxygen demand of the waste. Sewage from eight systems flows through septic tanks before discharge to the streams. Six of these tanks were overloaded, and are ineffective as treatment facilities.



Figure 2.43 *Untreated Waste Discharges Adversely Affect Water Quality.*

No treatment is provided for 21 systems which serve approximately 60,000 people. In 1960, an estimated 42,000 additional persons not served by municipal sewerage systems discharged their untreated waste to the surface waters.

Of the 42 industries inventoried in 1960, only 7 provided adequate treatment for liquid wastes. One industry had the equivalent of primary treatment. One provided conventional secondary treatment, and three used stabilization ponds. Twelve industries provided sedimentation for liquid waste, and two others provided aeration and sedimentation of the waste before discharge. Two industries only adjusted the *p*H of the waste. Some had septic tanks, screens, or grease removal units, and 19 provided no treatment of the wastes.

Observation of streams below waste discharge points and reports on the stream conditions indicate that the wastes were handled unsatisfactorily in some areas.

TABLE 2.17
Sources of Municipal Pollution — 1960

Municipality	Population[1]		Treatment			Receiving stream
	1960	Served	Type[2]	Design capacity PE (1,000)	Waste load PE[3] (1,000)	Load to stream
Athens #1	31,355	24,000	(2)	50.0	61.5	North Oconee River; PE 10,000
#2	--	12,400	None	--	12.4	Middle Oconee River; PE 12,400
Atlanta (part), South River (part)	--	[4]84,800	(2)	210.0	168.0	South River; PE 58,000
Intrenchment Creek (part)	--	[5]120,290	(2)	140.0	153.0	Intrenchment Creek, South River; PE 59,000
Atlanta General Depot	--	2,973	(2)	12.0	1.6	Creek, South River; PE 150
Barnesville	4,919	3,950	(1)	10.0	4.5	Tobesofkee Creek, Ocmulgee River; PE 3,400
Cadwell	360	300	None	--	0.3	Batson Creek, Ocmulgee River; PE 300
Chicopee (unincorporated)	--	1,500	(1)	[6]	1.5	Walnut Creek; Oconee River, PE 1,000
Clayton County Pinecrest Forest Subdivision	--	80	(2)	0.1	0.1	North Panther Creek, South River; PE 10
Cochran	4,714	2,300	(1)	[6]	2.3	Jordon Creek, Swamp, Ocmulgee River; PE 2,000
Conyers	2,881	1,850	None	--	2.0	Branch, Yellow River; PE 2,000
Covington	8,167	6,000	(2)	10.0	6.0	Dried Indian Creek, Yellow River; PE 600
DeKalb County	256,782					
Shoal Creek (part)	--	34,700	(2)	30.0	30.0	Shoal Creek, South River; PE 15,000
Snapfinger (part)	--	[7]10,300	(2)	20.0	--	South River
Dublin	13,814	7,900	None	--	10.0	Oconee River; PE 10,000
V.A. Hospital	--	1,070	(2)	1.5	2.0	Hunger and Hardship Creeks, Oconee River; PE 700
Eastman #1	5,118	2,000	(2)	[6]	2.0	Sugar Creek, Little Ocmulgee River; PE 1,000
#2	--	1,000	(2)	[6]	1.0	Gum Swamp Creek, Little Ocmulgee River; PE 500
Eatonton #1	3,612	1,450	(1)	2.0	1.4	Little River, Lake Sinclair; PE 1,050
#2	--	1,450	None	--	1.4	Rooty Creek, Lake Sinclair; PE 1,450
Rock Eagle Park	--	400	(0)	[6]	0.4	Little Grady Creek, Little River; PE 350
Forsyth	3,697	3,300	None	--	3.5	Tobesofkee Creek, Ocmulgee River; PE 3,500
Fort Valley	8,310	6,000	(2)	10.0	6.0	Bay Creek, Big Indian River, Ocmulgee River; PE 600
Glennville	2,791	2,660	(2)	4.0	2.7	Branch, Beards Creek, Altamaha River; PE 1,300
Greensboro	2,773	2,270	None	--	2.3	Richland Creek, Oconee River; PE 2,270
Griffin (part)	--	8,000	(2)	20.0	18.0	Cabin Creek, Ocmulgee River; PE 2,000
Hawkinsville	3,967	3,380	None	--	4.5	Ocmulgee River; PE 4,480
Hazlehurst	3,699	3,200	(1)	3.0	3.2	Branch, Ocmulgee River; PE 2,100
Jackson	2,545	2,500	(2)	2.0	2.5	Yellow Water Creek, Ocmulgee River; PE 750
Jefferson	1,746	1,100	None	--	1.1	Curry Creek, North Oconee River; PE 1,100
Jesup	7,304	7,000	(1)	6.0	7.0	McMullen Creek, Altamaha River; PE 4,500
Lawrenceville	3,804	3,600	(2)	6.3	3.6	Redland Creek, Yellow River; PE 750
Lithonia #1	1,667	1,000	None	--	1.0	Branch, Yellow River; PE 1,000
#2	--	1,000	None	--	1.0	Haney Creek, South River; PE 1,000
Loganville	926	700	(1)	[6]	0.7	Big Flat Creek, Alcovy River; PE 500
Ludowici	1,578	1,200	None	--	1.2	Fountain Branch, Altamaha River; PE 1,200
Lumber City	1,360	800	None	--	0.8	Ocmulgee River; PE 800
Lyons	3,219	2,400	(0)	[6]	2.4	Swift Creek, Pendleton Creek, Ohoopee River; PE 2,400
McDonough	2,224	1,800	None	--	1.8	Branch, Walnut Creek, South River; PE 1,800
McRae #1	2,738	2,200	(1)	1.8	2.5	Sugar Creek, Little Ocmulgee River; PE 1,500
#2	--	450	None	--	0.4	Gum Swamp Creek, Little Ocmulgee River; PE 450
Macon #1	69,764	60,000	(1)	120.0	80.0	Ocmulgee River; PE 60,000
#2	--	20,000	None	--	40.0	Ocmulgee River; PE 40,000
Cochran Field	--	350	(2)	[6]	0.4	Echeconnee Creek, Ocmulgee River; PE 30

(continued)

TABLE 2.17 — Continued

Municipality	Population[1]		Treatment			Receiving stream
	1960	Served	Type[2]	Design capacity PE (1,000)	Waste load PE[3] (1,000)	Load to stream
Madison #1	2,680	1,500	(1)	2.1	1.5	Branch, Hard Labor Creek, Apalachee River; PE 900
#2	--	300	(1)	0.4	0.3	Branch, Sugar Creek, Oconee River; PE 200
Midway-Harwick	16,909	1,800	None	--	1.8	Oconee River; PE 1,800
Milledgeville	11,117	8,000	None	--	31.0	Oconee River; PE 31,000
State Hospital	--	12,650	None	--	13.2	Oconee River; PE 13,240
Colony Farm	--	350	(0)	[6]	0.4	Reedy Creek, Oconee River; PE 350
Milstead	1,047	250	None	--	0.2	Yellow River; PE 250
Monroe #1	6,826	1,200	(2)	1.5	1.2	Branch, Jacks Creek, Apalachee River; PE 100
#2	--	2,850	None	--	23.8	Mountain Creek, Alcovy River; PE 23,840
#3	--	2,450	None	--	2.4	Jacks Creek, Apalachee River; PE 2,450
Monticello #1	1,931	750	(2)	1.2	0.8	Persons Creek, Murder Creek, Oconee River; PE 750
#2	--	750	(2)	1.2	0.8	Whiteoak Creek, Murder Creek, Oconee River; PE 750
Norcross	1,605	315	(0)	[6]	0.3	Branch, Beaver Ruin Creek, Yellow River; PE 275
Metro Mobile Homes Park	--	250	(2)	0.4	.02	Beaver Ruin Creek; Yellow River; PE 0
Oxford						
Emory-at-Oxford College	--	315	(1)	[6]	0.3	Branch, Yellow River; PE 250
Pepperton	523	690	(1)	0.5	0.8	Branch, Yellow Water Creek, Ocmulgee River; PE 500
Perry	6,032	4,000	None	--	7.3	Indian Creek, Ocmulgee River; PE 7,300
Porterdale	2,365	2,365	None	--	2.4	Yellow River; PE 2,400
Reidsville	1,229	825	(0)	[6]	0.8	Brazells Creek, Ohoopee River; PE 750
Reidsville Prison	--	3,400	(1)	1.5	3.8	Ohoopee River; PE 3,000
Robins Air Force Base #1	--	10,000	(1)	30.0	[6]	Ditch, Horse Creek, Ocmulgee River; PE [5]
#2	--	--	(2)	8.2	[6]	Ditch, Ocmulgee River; PE [5]
Sandersville	5,425	3,200	None	--	3.2	Limestone Creek, Oconee River; PE 3,200
Social Circle #1	1,780	400	None	--	0.4	Branch, Little River; PE 400
#2	--	400	None	--	0.3	Branch, Little River; PE 400
#3	--	260	None	--	0.3	Branch, Little River; PE 260
Soperton	2,317	250	(0)	[6]	0.2	Tiger Creek, Oconee River; PE 225
Sparta	1,921	700	(2)	[6]	0.7	Buffalo Creek, Oconee River; PE 400
Statham	711	360	(1)	0.5	0.4	Barber Creek, Oconee River; PE 250
Stone Mountain	1,976	150	(1)	0.5	0.2	Mountain Creek, Yellow River; PE 150
Swainsboro	5,943	4,000	(1)	2.5	4.0	Branch, Yamgrandee Creek, Ohoopee River; PE 3,200
Tennille	1,837	850	(1)	[6]	0.8	Ohoopee River; PE 700
Unadilla	1,304	700	(0)	[6]	0.7	Lamp Creek, Ocmulgee River; PE 700
Vidalia #1	7,569	1,875	(1)	2.8	1.9	Rocky Creek, Ohoopee River; PE 1,250
#2	--	3,775	(1)	4.0	3.8	Swift Creek, Pendleton Creek, Ohoopee River; PE 2,500
Warner Robins	18,633	21,500	(2)	[6]	21.5	Echeconnee Creek, Ocmulgee River; PE 7,000
Watkinsville	758	100	None	--	0.1	Town Creek, Oconee River; PE 100
Winder #1	5,555	1,300	None	--	1.3	Marburg Creek, Apalachee River; PE 1,300
#2	--	700	None	--	0.7	Cedar Creek, Mulberry River; PE 700
#3	--	2,000	(1)	[6]	2.0	Beech Creek, Mulberry River; PE 1,000
Wrightsville	2,056	1,000	(0)	[6]	1.0	Cedar Creek, Ohoopee River; PE 1,000

NOTES: [1] Actual inventory data.
[2] Treatment: None = no treatment; (1) = primary; (2) = secondary; (0) = septic tank.
[3] Includes some industrial wastes; volumes and strength of combined wastes are estimated: PE = population equivalent, based on pollution effect of waste. The PE shown is the estimated theoretical loading on the streams, based on the degree of treatment.
[4] Serves portions of Atlanta, East Point, Hapeville, and Clayton County.
[5] Serves portions of Atlanta and DeKalb County.
[6] Undetermined.
[7] Under construction at time of survey.

Vector Control

Vector control is concerned with disease-carrying vermin, primarily mosquitoes, and secondarily, flies, fleas, chiggers, ticks, rats, and other pests. In 1960, the vector control program of the basin consisted of a few local mosquito control programs and several countywide rodent control programs. Most of the mosquito control activity was limited adulticiding measures. Robins Air Force Base had a limited vector control program. Periodic mosquito control programs, using airplanes to spray DDT when mosquitoes reached significant levels to cause annoyance, were operated at two large power reservoirs by the Georgia Power Company.

Local governmental units have authority under State law to perform mosquito control work. The State Board of Health is concerned with the vector problems which may accompany the construction of farm ponds and has regulations pertaining to the impounding of water. Health agencies throughout the State provide technical assistance to construction and operating agencies in planning and carrying out vector control operations. There is, however, no statewide legislation for the establishment of mosquito or other vector control districts.

Air Pollution Monitoring

A 1959 report of industrial hygiene service of the Georgia Department of Public Health indicates that 34 industries in the basin contribute pollution to the atmosphere. The dust, smoke, gasses, fly ash, odors, and particular matter discharged to the atmosphere by municipal, commercial, and individual establishments also contribute to air pollution, cause discomfort, and give rise to health problems.

National air network sampling stations are located at Macon and Atlanta. Other stations at Savannah, Augusta, and Columbus, Georgia, and Jacksonville, Florida, are just outside the basin. The Georgia Department of Public Health cooperates with the Public Health Service in operating the network sampling stations. A survey was begun January 1961 to locate all sources of air pollution in Georgia. The State Department of Health, with the assistance of the Public Health Service, will analyze the data and prepare a report.

Radiation Monitoring

There are no nuclear reactors in the basin. The Atomic Energy Commission controls the radioactive materials and has licensed a number of industries and hospitals in the Athens, Atlanta, and Macon areas to use isotopes.

Limited radiological health programs in the basin are conducted by the Georgia Department of Public Health. A surface water monitoring program to collect background data is planned. All Federal and State agencies concerned with land and water resources development also have responsibilities in this field.

At the request of the U. S. Study Commission, Southeast River Basins, the Public Health Service collected weekly composite samples of river water and analyzed them for radioactivity. Most of the samples analyzed showed detectable amounts of radioactivity, but there were no concentrations of significance.

Solid Waste Disposal

Most of the communities of the basin collect and dispose of their solid wastes as a governmental service. In a few instances, however, the collection and disposal is left to individuals producing the waste or to private collectors who charge a fee for the service. State and local health departments have authority to control the storage collection and disposal of solid waste.

Seven cities and DeKalb County were operating satisfactory landfills in 1960. Modified sanitary landfills were used to dispose of refuse from seven other communities. Complete data are not available on all of the communities of the basin. However, it has been assumed that the remaining 64 communities disposed of their wastes in open dumps.

Needs and Opportunities

Pollution Abatement

A policy of pollution prevention as well as abatement is needed. Treatment should be provided for all industrial and municipal waste prior to their discharge to the water courses of the basin. The polluting effect of organic wastes not amenable to conventional types of treatment and all inorganic wastes need to be reduced to satisfactory limits before discharge. Special han-

TABLE 2.18

Industrial Pollution Discharged to Streams[1]

Industry[2] Type, number, and employees	Volume of waste (m.g.d.)[3]	PE or type of waste (1,000)[4]	Type of treatment	Receiving stream
Food	0.010	1,250	None	Branch, Oconee River
12				
1,171	0.300	11,000	Stabilization pond	Marburg Creek, Apalachee River
	0.122	4,900	None	Ocmulgee River
	0.100	1,830	Septic tank	Pond
	0.033	[5]	None	North Oconee River
	0.015	1,200	None	Gum Swamp Creek, Lower Ocmulgee River
	0.042	8,400	Screens	Sugar Creek, Lower Ocmulgee River
	0.003	[5]	Grease removal	Lower Ocmulgee River
	0.050	1,445	Pond	Ohoopee River
	0.750	80,000	Screens	Fishing Creek, Oconee River
	0.360	[5]	None	Altamaha River
	0.350	23,760	None	Ditch, Bay Creek, Ocmulgee River
Textile	0.008	50	None	Branch, Oconee River
13	1.550	[5]	Primary	Sewer to Oconee River
8,763	0.600	[5]	Lagoon	Ocmulgee River
	0.300	Dyed finish	Stabilization pond	North Oconee River
	0.024	Process and sanitary	None	Ocmulgee River
	1.000	8,200	None	Ditch, Swamp, Oconee River
	3.100	48,180	None	Ditch, Oconee River
	0.005	Dye	None	Yellow River
	0.001	Process	None	Dried Indian Creek, Yellow River
	0.075	195	None	Ocmulgee River
	0.060	250	None	Branch, Cabin Creek, Ocmulgee River
	0.010	150	None	Branch, Cabin Creek, Ocmulgee River
	2.000	79,200	Settling	Pond, Cabin Creek, Ocmulgee River
Chemical	0.160	Acids	None	Ocmulgee River
2	0.070	Acids	*p*H adjustment	Walnut Creek
91				
Mining	0.072	Clay tailings and acids	Settling	Ocmulgee River
9	1.150	Feldspar	Settling pond	Tributary, Falling Creek, Ocmulgee River
2,179	[5]	Kaolin process	None	Stone Creek, Ocmulgee River
	0.860	Inorganic and acids	Settling	Ocmulgee River
	0.012	Clay tailings	Settling lagoon	Limestone Creek, Ocmulgee River
	0.216	Clay tailings and acids	Settling lagoon	Limestone Creek, Ocmulgee River
	0.025	Clay tailings	Settling lagoon	Limestone Creek, Ocmulgee River
	2.160	Clay tailings	Settling lagoon	Commissioner Creek, Oconee River
	1.000	Inorganic tailings and acids	Settling lagoon	Oconee River
Metal	0.030	Anodizing and plating	*p*H adjustment	Tributary, Barbour Creek, Apalachee River
3	0.200	Plating	None	Ocmulgee River
810	0.005	85	Secondary	Ocmulgee River
Pulp and paper	15.300	134,000	Aeration and settling	Ocmulgee River
3				
2,265	40.000	250,200	Aeration and settling	Altamaha River
	1.200	[5]	Settling	Rocky Creek, Tobesofkee Creek, Ocmulgee River

NOTES:
[1] Industries discharging to land surface or water course.
[2] This data covers only plants which have outfall sewers.
[3] Million gallons per day.
[4] Population equivalent to indicate the industrial waste loadings.
[5] Undetermined.



Figure 2.44 *Wastes from Kaolin Processing Plants Pollute Receiving Streams.*

dling may be required for some industrial waste. The type of treatment required will depend on the volume and character of the waste to be treated and the assimilative capacity of the receiving stream. Separate determinations will be needed in each case.

Where critical streamflows are too small to provide proper dilution of the effluents of secondary treatment plants, either additional dilution water or a higher degree of treatment will be needed to adjust the waste loading to minimum streamflow conditions.

In estimating sewerage facility needs, all towns of population over 800 have been included. Also included are smaller towns which had sewerage systems in 1960. There is a need for 44 complete new sewerage systems prior to 1975 and 7 additional new systems before the year 2000.

Primary treatment of municipal sewage and equivalent treatment of industrial wastes effecting substantial removal of settleable solids is the minimum accepted treatment to assure continued growth and expansion within the basin.

Additional water quality study of the Altamaha basin is needed. This study should obtain basic data on the waste loading of streams and water quality characteristics to determine existing conditions. The effects of pollution resulting from use of agricultural chemicals and the pollutional effects of any other activities which might adversely affect the water quality should be measured. There is a need for research to develop more effective treatment methods for handling all wastes.

Because of the volume of wastes discharged, it will not be feasible in some areas to provide sufficient additional water to assimilate effluent from secondary treatment plants. Other methods or means should be developed to assure satisfactory water quality in the receiving streams. Each situation should be studied individually and additional treatment provided, or the treated waste should be pumped to other streams or water courses if the effluent can be satisfactorily handled in this manner without damage to the water resources.

Vector Control

There is a need for a mosquito-control district to efficiently and economically control salt-marsh mosquitoes, houseflies, and other vectors in the coastal area. Countywide water management systems and programs of permanent control works are needed. The major inadequacies of the present drainage work are manifestly the lack of large canal systems and the lack of coordination between town and county units and the individual farm water management forces. There is also a need for general maintenance of existing drainage systems.

The development of countywide refuse collection and disposal systems utilizing sanitary landfills is also needed to assist in vector control work.

Counties having large water impoundments report difficulty in financing mosquito control and general sanitation activities. There is a need

TABLE 2.19

Municipal Sewerage Needs

Period	Population served in 1975 & 2000	Number of places requiring:			
		Primary treatment	Secondary treatment	Stabilization ponds	Sewers
1960-1975	993,000	8	32	24	67
1975-2000	1,637,000	1	18	8	71

AD-A041 838 UNITED STATES STUDY COMMISSION SOUTHEAST RIVER BASINS--ETC F/G 8/6
PLAN FOR DEVELOPMENT OF THE LAND AND WATER RESOURCES OF THE SOU--ETC(U)
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Figure 2.45 *Insanitary Solid Waste Dumps Provide Harborage for Rodents and Other Disease Carriers.*

for State-aid programs such as those which have proven successful in Florida and South Carolina.

For the vector control programs to be properly handled with other multiple-purpose functions, it is essential that there be coordination among agriculture, wildlife conservation, and health agencies.

Air Pollution Monitoring

Measurement and identification of sources of air pollution by statewide surveys are urged. Such surveys form a sound basis for industrial zoning and should be used in planning and developing a program of air pollution abatement for the basin. Most of the data available in 1960 were reports of industrial air pollution. There is a need to determine the extent of air pollution from other sources. Burning garbage and refuse in open dumps is a major source of air pollution which needs to be corrected. This was common practice in most of the smaller communities in 1960.

It is believed that industrial development and municipal growth in the basin will introduce no new major air problems by the year 2000. Existing problems need additional investigation, and research is needed to help reduce airborne pollutants being released to the atmosphere.

Radiation Monitoring

Expanded programs will be needed to assure adequate control of the potential health hazards resulting from the use and disposal of radioactive isotopes.

Solid Waste Disposal

There is a need to provide sanitary landfills for waste disposal in all communities of over 500 population. Larger metropolitan areas may have to construct incinerators to reduce the volume of their solid waste where land areas for sanitary landfills are not conveniently available at reasonable costs.

Proper disposal of all solid wastes would greatly reduce or eliminate fly and rodent problems.

The urbanized areas of Athens, Macon, and DeKalb County have sufficient population to justify the installation of incinerators. Athens had an incinerator in operation in 1960. The 1975 population for these three areas is estimated at 389,000 persons. By 1975, there will be a need for 81 sanitary landfill operations to serve approximately 303,000 persons.

Those communities without proper local or county regulations to permit the development of satisfactory refuse collection and disposal programs need to adopt such regulations.

Means of Meeting the Needs

Pollution Abatement

By 1975, an estimated 993,000 people will be served by municipal sewerage systems. By the year 2000, the number is expected to increase to 1,637,000 persons. Waste treatment facilities needed prior to 1975 include 8 primary treatment plants, 32 secondary treatment plants, and 24 stabilization ponds. Sixty-seven places need to extend existing collection systems or construct new ones. In addition, after 1975 and prior to the year 2000, other improvements needed are 7 complete sewerage systems, the extension of 64 systems, a primary plant, 18 secondary plants, and 8 stabilization ponds for treatment of the municipal waste.

Industrial waste discharges by 32 industries having an estimated 1975 population equivalent before treatment of 840,000 should be adequately treated. Not included are waste loads from 18 industries discharging unknown volumes of organic or inorganic liquid waste or those industries of the basin which discharge their wastes to municipal sewers.

Industrial waste treatment facilities should be constructed for each industry. Detailed studies should be made of the industrial waste to determine the pollution abatement needs and the

degree of treatment required. Industries located in the tidewater area should provide treatment equal to that afforded by conventional primary treatment plants.

In determining the municipal and industrial waste treatment needs, the entire development of the area should be taken into consideration. As development occurs, field studies will be necessary to determine the degree and type of treatment required to prevent pollution of the receiving streams. Low-flow augmentation will be required in some instances to maintain suitable water quality in the streams. Low-flow augmentation, however, should be considered only after secondary treatment of all wastes has been provided.

Provisions could be made for the combined treatment of some industrial wastes with municipal sewage. This could prove mutually beneficial both to the industry and to the municipality, particularly where industries operate on a seasonal basis.

The construction program providing facilities for adequate treatment of the wastes should be scheduled in accordance with a comprehensive water pollution control program. The responsibility for the development of such programs will rest with the State of Georgia and local communities and should be based on factual data obtained by monitoring the waste discharges and the receiving stream. The program should develop long-range plans for the protection of the water resources, provide technical assistance to the polluters, and regulate all waste discharges.

The polluter should assume his responsibility for providing waste treatment. The degree of treatment to be provided should be based on the volume of pollutional effect of the waste, the physical situation, and the intended downstream water uses of the receiving stream. From the standpoint of water quality, the best use of water resources will occur when the waste assimilating capacity of the stream is used to the maximum extent consistent with other water uses. However, a safety factor should be included to provide for unexpected situations.

A stepped-up comprehensive water pollution control program will be necessary to assure adequate protection of the water resources for the future. Educating the general public about the water pollution control needs and the inherent benefits of clean streams will help municipalities and industries to recognize their responsibility to finance necessary sewers and treatment works. Existing legislation needs to be implemented. Funds should be budgeted for adequate staff and equipment to insure the collection of good basic data and to assure the development of a sound water resources program for the State.

The metropolitan area of Atlanta and other large urban industrial complexes need to develop coordinated plans for the proper handling of all wastes. The maintenance of water quality in the receiving streams adequate to meet all water needs is essential for full development of basin resources.

Vector Control

All existing 1960 vector control programs need to be enlarged. Suitable control programs need to be developed in 18 urban areas which had no vector control programs in 1960. Mosquito control districts need to be established, particularly along the coast in McIntosh and Glynn Counties.

A master plan for countywide water management systems and programs using many low areas in the basin for sanitary landfill would reduce the vector breeding areas. Sanitary landfills are included in the State-aid vector control programs of Florida and South Carolina because of their beneficial effects. Enabling legislation in Georgia is recommended so State funds and technical assistance can be provided to vector control districts. The Federal Government could assist the State by supplementing its programs.

The importance of vector control to the economy and welfare of the basin should be stressed in comprehensive planning programs for the area.

Air Pollution Monitoring

Effective control program will require full cooperation of the cities and industries and leadership by the designated State agencies. State legislation would permit expansion of existing municipal and industrial air pollution abatement programs. The statewide survey made by the Industrial Hygiene Service of the Georgia Department of Public Health, with cooperation by the Public Health Service, should serve as the basis for the development of such legislation.

Radiation Monitoring

The control and use of radioactive isotopes are a State responsibility. Funds, personnel, and legislative authority need to be made available to permit the State to have a balanced and effective program. Levels of radiation should be reported and continuous monitoring systems employed to detect any increase in radiation which could adversely affect development of land and water resources. Existing State programs should be continued and expanded.

Solid Waste Disposal

For smaller communities the sanitary landfill method should be adopted throughout the basin for the disposal of solid wastes. Landfill disposal, properly controlled, will help control breeding of flies and other vermin, eliminate the nuisance of burning open dumps, and afford an opportunity to reclaim marshland or swampland for beneficial use. Cities with populations of 50,000 persons and with limited land areas for disposal of solid waste may require incinerators.

Sanitary landfills serving an estimated 303,000 persons in 81 communities need to be placed in operation, and incinerators need to be constructed to handle the refuse from 309,000 persons in three urban areas prior to 1975.

The sanitary landfill operations will need to be increased prior to the year 2000 to serve an estimated 585,000 persons living in 88 communities. The solid wastes from 770,000 persons living in the Athens, Macon, Warner Robins, and DeKalb County urban areas should be incinerated before disposal. Where incineration is not used, sanitary landfills should be placed in operation for all communities with over 500 people. Clayton and Gwinnett Counties should operate countywide programs using sanitary landfills.

SECTION XII – OTHER BENEFICIAL PURPOSES
BEACH EROSION CONTROL AND HURRICANE PROTECTION

General

Preserving the shoreline and preventing loss of lives and damages to property caused by high tides, waves, and winds from hurricanes are of great importance in this area.

The chain of islands fronting the Atlantic coast of Georgia is one of the greatest undeveloped resources in the basin. The islands so impressed the first Spanish explorers they named them the Golden Isles. However, the islands in the Altamaha basin are largely low lying, marshy, and undeveloped. The beach areas are of such limited extent and use that beach erosion has not presented any significant problems to date. The mainland in the coastal area from Darien northward is thickly populated and could sustain substantial damages in the event of a hurricane. The islands, if developed in the future, would be particularly vulnerable to hurricanes.

Existing Facilities and Programs

Beach Erosion Control

There are no significant beach erosion control programs or facilities in the basin. Some individuals have used riprap, sheet piling, and brush mats to protect their fishing docks or boat ramps in the coastal area, but this practice is limited.

Hurricane Protection

The period during which the hurricane threat is at a maximum along the Atlantic coast of the study area is from late June to mid-October. Since 1757, according to available records, there have been 3 storms in June, 5 in July, 15 in August, 28 in September, 16 in October, and 3 others outside of this period. Of the 70 storms, many were not of hurricane intensity as usually defined. Nine very destructive storms have passed over the Atlantic coast area since 1881. Of these nine, five occurred in August, one in September, and three in October.

The U. S. Weather Bureau, as part of its responsibility for improving hurricane warning services, has been instrumental in getting the Georgia State Civil Defense Organization and the Chatham-Savannah Defense Council to direct operational procedures in natural disasters for Chatham County and the Georgia and lower South Carolina Tidewater District. The Chatham-Savannah Defense Council has published a

HURRICANE PATHS
BEACH EROSION AND ACCRETION

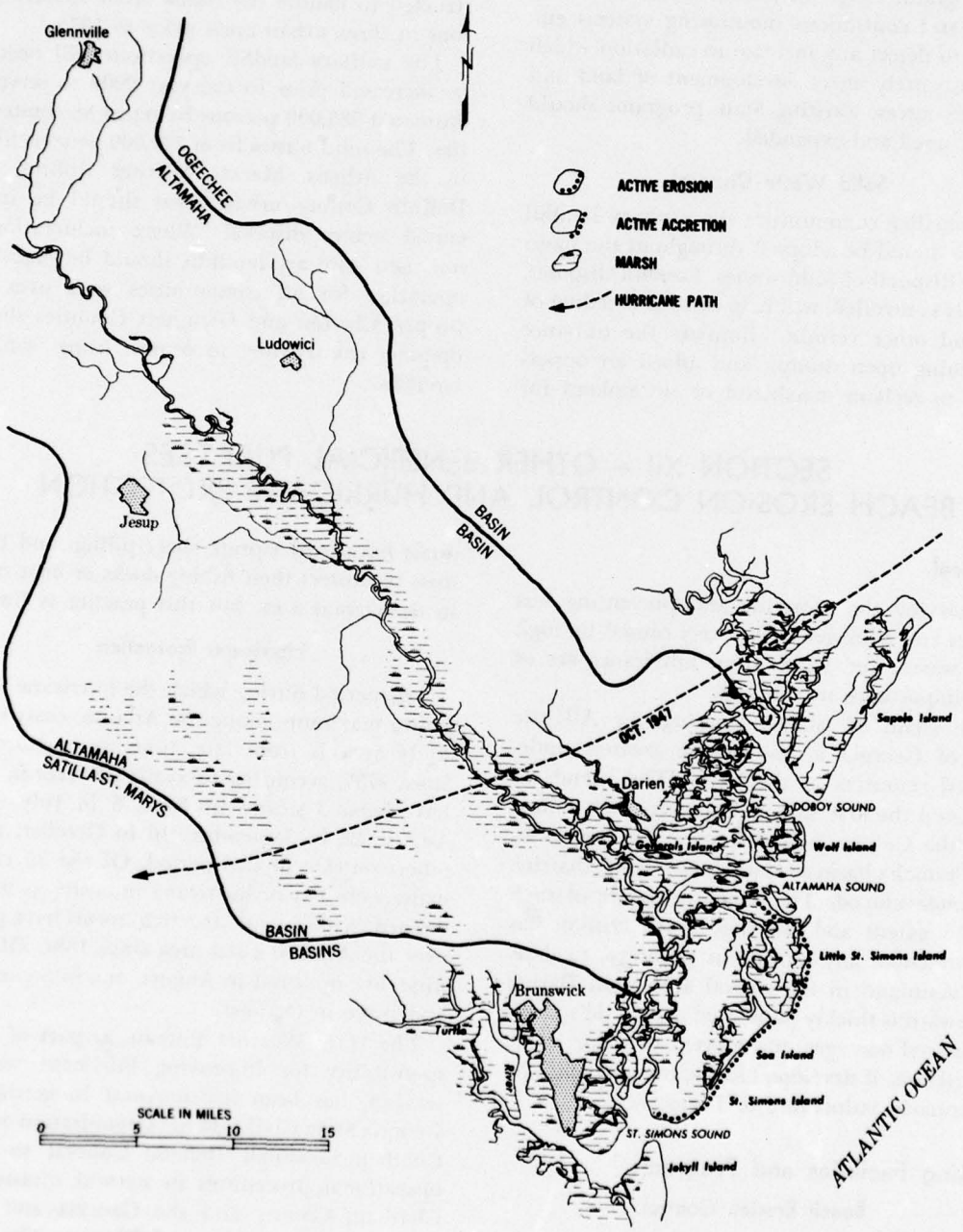


Figure 2.46

booklet of operational procedures. The various services covered therein have been organized and are ready to function. Problems of communication, welfare, transportation, policing, and rescue have been investigated and solutions found. The Civil Defense Division of the Georgia Department of Defense has conducted conferences and organized the people responsible for hurricane relief activities in the Georgia and South Carolina coastal counties into disaster districts. Hurricane warning service for these coastal counties is supplied by the Savannah office of the U.S. Weather Bureau. The Weather Bureau issues the warnings, and the district disaster organization notifies all responsible parties.

During the last 3 years, much publicity via press, radio, and television has been disseminated in Chatham County, in which Savannah is located, by the Weather Bureau, Red Cross, and Civil Defense authorities in connection with hurricane emergencies. The people living in the coastal islands should now be thoroughly aware of inherent hurricane dangers. Plans have been completed for evacuation during an emergency, although forced evacuation is not planned.

Needs and Opportunities

Beach Erosion Control

Beach erosion involves the removal or shifting of beach materials by wind and wave action, tidal currents, or coastwise currents. A beach is transitory and is molded and remolded with every breaking wave. Where shores are undeveloped or where development occurs well back from the shore, variations in the beach cause little concern. However, beaches, dunes, and the low areas adjacent to the shore are becoming increasingly important for development for recreation and for construction of homes. Shoreline modifications by erosion and accretion have important effects on the associated animal and plant life. Changes may be economically important to the shellfish industry and physically and biologically important to wildlife, if these activities develop significantly in the islands and coastal areas.

Hurricane Protection

The Weather Bureau estimates that a storm with the intensity of the October 1954 hurricane, Hazel, which killed 20 people and caused $163 million worth of damages, will occur in the area between Jacksonville, Florida, and Cape Hatteras, North Carolina, once in 50 years. Such a storm is likely to cross the coastline and strike any one locality about once in 300 years.

The population increase now occurring will no doubt create a demand for accelerated development of the coastal areas of the Altamaha basin. The low-lying mainland and islands are subject to direct assault by hurricane wind,

TABLE 2.20

Georgia Tropical Storm Data[1]

Date	Recorded maximum velocity (m.p.h.)	Pressure (inches of mercury)	Tide height[2]	Loss of lives	Surge and wave damage ($1,000)	Total damage ($1,000)
Aug. 1881	—	29.08	20	[3]	300	2,000
Aug. 1893	72	28.31	22	1,500	2,000	4,000
Sept. 1896	75	29.00	----	25	400	3,000
Aug. 1898	76	29.23	----	----	100	1,000
Oct. 1898	60	29.46	20-B	200	1,700	8,020
Aug. 1911	88	29.02	----	----	100	600
Aug. 1940	90	28.78	11	----	150	10,000
Oct. 1944	80	28.94-J	12	----	300	460
Oct. 1947	95	28.77	11.5	----	200	2,000

NOTES: [1] At Savannah, Georgia (except as noted).
B—At Brunswick, Georgia.
J—At Jacksonville, Florida.
[2] Tide height — feet above mean low water.
[3] Several hundred.

waves, and tidal surge. The best way to prevent the loss of human lives on these areas during a severe hurricane is to evacuate the population to safe shelters. As the coastal areas and islands develop, it will become necessary to warn or alert and then evacuate the public before an oncoming hurricane could endanger the lives of the people present or prevent them from reaching safe, high land. The U. S. Weather Bureau is responsible for alerting the appropriate areas about the seriousness and arrival of hurricanes.

Persons living in coastal areas, particularly, should be alert to the announcement of a Hurricane Watch which is issued by the U. S. Weather Bureau via the press, radio, and television when a tropical storm or hurricane becomes a threat to a coastal area. This announcement is to alert individuals in an area that a hurricane is nearby. Residents in such areas are advised to listen for subsequent announcements and be ready to take precautionary action in case Hurricane Warnings are issued.

A Hurricane Warning indicates that hurricane winds of 74 miles an hour or higher, or a combination of dangerously high water and very rough seas, are expected in a specified coastal area. When a Hurricane Warning is announced, hurricane conditions can be expected immediately or at least within 24 hours, and precautionary actions should be instituted immediately.

The problem of evacuating people from islands is complicated by the possibility of the evacuation routes being blocked by floodwaters before flooding conditions become critical on the islands.

It is difficult to convince the inhabitants of the danger of the only escape route from an island being inundated when the island itself is not yet flooded. The greatest problem would be created by holiday visitors who are reluctant to leave when there is no visible danger.

Means of Meeting the Needs

Beach Erosion Control

Beach erosion protection can be accomplished by adding sand artificially and possibly augmenting the sand addition by auxiliary structures. Artificial nourishment itself has the least adverse effect on a locality and appears to offer the best solution, provided a sufficient quantity of material for beach nourishment is available. Wind erosion protection can be provided by vegetation or sand fences. Both are effective in forming and stabilizing dunes. Dunes act as barriers to high water and strong onshore winds, but they are more important as a source of beach material.

Wave action resulting from storms is the main cause of shoreline changes. Hurricanes, being violent storms, frequently cause rapid and extensive shoreline changes. In addition to those changes, damages from hurricanes include tidal inundation and wave action from above-normal water levels. Hurricane surges, the raising of the water level resulting from lowered barometric pressures, wind stress on the water, and occasionally the configuration of the shoreline often raise the water level at the shore to disastrous heights.

The Federal Government, through the Corps of Engineers and the U. S. Geological Survey and other Federal agencies, cooperates with the States and other public groups in making detailed beach erosion studies. Because of the many factors involved in beach erosion and the possible effects of one beach upon another, no specific remedial measures can be proposed for the erosion problems of these beaches without such a study.

Hurricane Protection

The recent advent of Federal assistance in hurricane protection has presented new opportunities for the development of coastal engineering criteria and has stimulated further research. Multiple-purpose planning in solving coastal problems is increasing. Such planning involves coordination and stabilization of navigation inlet channel improvement and maintenance and hurricane protection. Projects of this type are likely to develop in the future along the Atlantic shore where barrier beaches are prevalent.

Individual recognition of the potential hurricane hazards is the most effective protection against damage. The location of structures and their design and construction to withstand storms will materially reduce damages.

Adequate warning systems and preplanned evacuation routes and facilities will reduce or minimize the loss of life.

A model community hurricane preparedness plan has been prepared by the Weather Bureau in collaboration with the Corps of Engineers.

The plan was issued in 1959 as Report No. 28 of the National Hurricane Research Project. The report is titled "A Model Hurricane Plan for a Coastal Community." Copies may be obtained from the Weather Bureau, U. S. Department of Commerce, Washington, D. C. Report No. 28 is a useful guide in setting up a hurricane preparedness committee, appraising potential danger, taking precautionary measures, preparing for emergency procedures, and in detailed planning.

Some of the measures that should be considered in any development of the coastal areas and islands are:

(1) An adequate hurricane warning system and evacuation routes and facilities.

(2) Adopting and enforcing adequate zoning and building codes.

(3) Provision of auxiliary power supplies.

(4) Protective seawalls or similar structures where practical.

PART THREE – COMPREHENSIVE PLANNING

The procedures used in developing the comprehensive and coordinated plan are briefly summarized in the following four steps: (1) An inventory was made of basic resources and related developments within the basin; (2) needs for goods and services were projected to the year 2000 for the basin; (3) alternative ways to meet needs for each purpose were studied; and (4) projects and programs that would best serve all purposes and meet requirements for resource conservation, utilization, and development were selected.

The character and effect of plans in other basins were considered in connection with the formulation of the Altamaha basin plan, and adjustments were made to permit optimum interbasin uses.

Throughout the planning process, many factors such as those associated with geology, hydrology, engineering practices, and social characteristics are expressed in economic terms for convenience in making comparisons. Additional information on planning and plan formulation is provided in the Planning, Economics, Hydrology, and Engineering and Cost Appendixes.

SECTION I – OBJECTIVES AND GUIDELINES

Objectives and specific planning guidelines adopted to govern the study and Report are as follows:

(1) A coordinated comprehensive plan for the development of the land and water resources of the Southeast River Basins through the year 2000 will be presented in the Report.

(2) The comprehensive plan will be recommended to the Governors and legislatures of the States of the study area and to the President and the Congress for use as a guide for land and water resources development in the Southeast River Basins area.

(3) The plan will set forth an early action phase which will include projects and programs found to be needed, feasible, and desirable for accomplishment by 1975.

(4) It will be recognized that additional studies of recommended programs and projects may be required to support specific requests for State and Federal support and for development by private agencies.

(5) All of the purposes enumerated in the Act will be given equal attention. In the completed plan, each purpose will be developed to that level consistent with the needs and economic capacity of the individual basin. Treatment of industrial development will be limited generally to indications of the effects of the plan on rates of development and to development implied in the projections of manufacturing employment. Recreation studies will be limited to public outdoor recreation related to land and water resources and to types beyond those normally provided by individuals and municipalities. Public health studies will be oriented toward determining the effects upon public health associated with the development of land and water resources.

(6) In determining the composition of the comprehensive plan, each separable component will be considered on the basis of the contribution that it makes in net benefits to the Altamaha basin, the Southeast River Basins, and the Nation. When intangible considerations play a major part in the decisions affecting an element of the program, they will be explained as fully as possible in narrative form.

(7) The comprehensive plan will: Provide information on benefits and costs, including monetary and nonmonetary values; contain information on the expected economic impacts created by the recommended elements of the plan; include general recommendations on cost sharing, reimbursement, and project payout; designate whether recommended developments should be implemented primarily by non-Federal or Federal entities; and designate which of the Federal agencies has the major responsibility for the Federal aspects of a project or program.

(8) The comprehensive plan will recognize

and protect the rights and interests of individuals and of the States in determining the development of land and water resources and the preservation and protection of established uses.

(9) The comprehensive plan will include the existing, authorized, and formally proposed works and programs of the Federal and non-Federal agencies with proposed modifications limited to those found desirable, feasible, and consistent with the study objectives.

(10) Recommendations will be made for periodic review of the comprehensive plan. This review will serve as a basis for keeping the plan current and for subsequent action.

SECTION II – PLANNING ASSUMPTIONS AND CRITERIA

Assumptions

The comprehensive plan is based upon a series of assumptions. The broadest of these are: (1) That the Nation is entering a period of relative stability in international relations with no worsening of the cold war and no widespread outbreak of hostilities; and (2) that throughout the period covered by the plan, to the year 2000, the Federal Government and non-Federal interests will cooperate in encouraging and implementing economic growth and development throughout all segments of society and all areas of the Nation.

Population Growth

Three principal assumptions concerning the rate of national population growth were adopted: (1) The present fertility level, 1955-57 average, will remain constant to sometime between 1975 and 1980, then decline to the 1949-51 level by 2005-2010; (2) there will be moderate declines in mortality rates to the end of this century; and (3) net migration from abroad will be constant at about 300,000 per year. State and area population estimates were made in conformance with the general assumptions, but special attention was given to conditions reflected by study and analysis of individual areas.

Economic Growth and Development

The assumptions concerning trends toward world peace and United States and regional population growths are paralleled by assumptions of upward trends in employment, production, and foreign trade. For planning purposes the gross national product was projected to increase from about $500 billion in 1960 to $888 billion by 1975 and to $2,300 billion by the year 2000.

A continuation of the trend in the human diet toward more red meats and more of some fruits and vegetables is reflected in the projections and plans for food production and land use. It was assumed that per capita consumption of food would increase until about 1975 and then remain about constant.

In line with the general expansion of the national and regional economy, it was assumed that investment capital required to attain projected industrial growth and resource development will be available and that the education and technical skills necessary for an expanding industrial economy also will be available. It was further assumed, as a working procedure for preliminary studies, that land and water resources and electric-power supply would not be limiting factors in attaining the projected economy of the Altamaha basin. It was recognized in the study of the Altamaha basin that the economy of the basin is an integral part of the regional and national economies.

National and Regional Viewpoints

Because of the widespread effects of land and water resource development, a responsibility falls on all levels of government and on the private economy to participate in resource planning and in the execution of resource programs.

In developing the Southeast River Basins plan, national needs for food and fiber and for services are included at those levels warranted by the comparative advantage and existing economic potential of the Southeast River Basins area in relation to national resources and needs. Thus, the primary benefits shown for projects and programs provide a reliable index of project efficiency from the national point of view as well as the principal measure of regional and local benefits. Secondary benefits and impact

studies provide additional evidence of the regional and local effects of resource development.

In developing projects and programs in the Altamaha basin plan, consideration was given to national policy guides pertaining to land and water resources development that have resulted from legislation and to administrative policies or decisions that have prevailed. Policy guides and statements of national objectives used in the planning processes are discussed in the technical appendixes.

Criteria

Price Levels

Price levels prevailing in or about January 1960 were used for evaluating all present and future benefits and costs, except that an adjustment was made in agricultural prices based upon an assumption of a long-range parity ratio of 89 between prices paid and prices received by farmers.

Interest Rates

An interest rate of 2⅝ percent was used as far as practicable in analyzing costs and benefits in project formulation. In certain instances, benefits and costs were extracted from available data, and it was impractical to adjust this interest rate when the interest rate mix of the data was uncertain. The 2⅝ percent interest rate meets the need for a relatively risk-free and inflation-deflation-free rate for use in evaluation of the economic effects of Federal resource projects and programs. For converting certain non-Federal costs and benefits to an annual equivalent basis, a 4¼ percent interest rate was used.

Life of Projects and Period Covered by Analysis

The period of analysis used in the studies for this Report was the economic life of each project or 50 years, whichever was the lesser. The possibility of a longer maximum period, up to 100 years, was considered in recognizing certain long-range effects of intangibles and other impacts, but effects beyond 50 years were not evaluated in monetary terms.

The plan was formulated to meet only those needs expected to develop to the year 2000, and the evaluations generally reflect no increase in use of facilities after the year 2000. Needs will naturally continue to grow after the year 2000, and many of the proposed projects and programs, by adding facilities, will have the capacity to absorb some of the growth. The potential of the plan to meet needs that develop after the year 2000 has not been evaluated.

The assumptions and criteria used are considered conservatively low. If more liberal criteria had been used, such as a period of analysis of 100 years and an increasing need after the year 2000, the projects and programs included in the plan would appear even more favorable.

Basis for Comparison of Projects Effects

Comparison and evaluation of the proposed projects and programs in the plan were made to determine the most effective use of economic resources, such as land, water, labor, and materials. In this way, actions and opportunities throughout the economy form a check on what is economically justified in the way of new plans and efforts.

The value of the projects or programs included in the plan is computed on the basis of future conditions "with" the projects or programs included in the plan as compared to future conditions "without" the projects or programs included in the plan.

The future "with" conditions for individual project or program analysis include all development which would be expected to occur during the period of analysis with the project or program in existence.

The future "without" conditions include all developments that are existing or under construction as of January 1960 assuming adequate operation and maintenance of those developments. Technological gains not directed associated with the projects and programs in the basin plan were recognized as part of the "without" condition. It was assumed that no part of the project or program would develop in the absence of the project or program. This is not to deny that, in the absence of the comprehensive plan, other plans would develop which might include many features similar to those in the recommended plan.

Timing of Development

Plans covering long periods into the future provide for needs which have not yet developed.

Not all developments are needed at once or at the same time. Plan implementation should, therefore, be scheduled to meet the needs as they occur. A precise schedule of year-to-year development was not considered necessary, but a general order of priority was established. Those developments needed first are included in an early action phase and are generally based on filling the needs to the year 1975. If need arises, however, projects scheduled in the 1975-2000 period may and should be initiated earlier. Likewise, the rate of project initiation may be slowed down if conditions warrant slower action.

Discount Principles

Program or project benefits and costs, which are estimated to accrue at different times and over varying periods of time, were converted to annual equivalent values by use or compound interest or discount rates. The resulting values reflect the present worth at the inception of each program or project and provide a common basis of measurement.

Benefits

The ultimate aim of resource projects and programs, in common with all other productive activity, is to satisfy human needs and desires. Goods and services are produced to achieve this end. These goods and services have value in accordance with the demand for them and their availability. Benefits are of two general kinds, primary and secondary. Primary benefits are the increase in the value of goods or services directly resulting from a project, less all associated nonproject costs incurred in their realization. Primary benefits are usually evaluated at the first point in the chain of effects of a project where the goods or services produced have an actual or estimated market value. Secondary benefits are the value of goods and services created in secondary activities affected by the project, less all associated costs incurred in their realization. The major part of the value of these goods and services is not measured from the national public point of view because it as assumed that an investment similar to that made in the project would create a similar effect in secondary activities if invested in other projects or other areas. However, overall secondary benefits are considered appropriate in illustrating the significance of projects from a regional point of view.

Primary Benefits

Primary tangible benefits, which in this Section are referred to as primary benefits, represent the estimated increase in the value of the actual goods, services, and satisfactions of a project or program expected for the period under study and from which any induced losses to other projects or programs have been deducted.

The primary benefits from drainage and flood-loss prevention, resulting from the upstream watershed projects, are derived from net values for expected changes in land use, the increased productivity of land, the reduction of direct damage to agricultural crops and fixed improvements, and reduction of management costs.

The facilities included in the plan for drainage, irrigation, and soil conservation are based on the increased net return to the farmer from the estimated production response.

The primary benefits from hydroelectric power are estimated as the cost of equivalent power from a modern steam-electric powerplant.

Primary benefits from the forestry program are estimated as the net stumpage value of increased production and the net leasing values received from the increased number of faces expected to be worked for production of gum-naval stores.

The primary benefits of the commercial fishery program are the estimated value of increased landings of commercial fish.

Primary benefits from the sport fisheries and wildlife programs are the estimated value of projected increases in user-days of hunting and fishing.

Benefits used in the monetary evaluation of the recreation program consists of the estimated value of increased user-days of recreational activity.

The benefits for domestic, municipal, and industrial water supplies are assumed to be at least equal to the cost of obtaining water of similar quality and quantity from the cheapest alternative source and are evaluated in monetary terms only for water supply storage in multiple-purpose reservoirs.

Primary benefits of flood control are derived from the difference in flood losses "with" and "without" protection. For upstream watershed

and local protection projects, enhancement and restoration benefits are also included where applicable.

Benefits of navigation are taken to be the savings in rate differential; the savings in shipping time; the reductions in operation and maintenance costs; the value of any filled land obtained through spoiling; and, for new deep-draft harbor facilities, the increased gross revenues (increased costs associated with cargo handling are included as project costs); and savings due to use of larger tankers.

Justification of programs for vector control, solid-waste collection and disposal, air pollution and radiation monitoring, and pollution abatement except storage for augmenting low streamflows is found in intangibles. In multiple-purpose projects including storage to provide for low flow augmentation, the pollution abatement benefits were taken as equal to the average cost of the tertiary treatment to provide the same improvement or protection of water quality as that obtainable by dilution.

Secondary Benefits and Impacts

Although for purposes of this study a monetary evaluation of secondary economic effects of various resource projects and programs was not made, the importance of these secondary effects of resource development was recognized.

The projects and programs involving increased production of commodities would require additional raw materials, processing equipment, and more services to sustain the processing operation. These increased activities would extend throughout the basin. Trade and services especially would be stimulated by recreation, sport fishing, and wildlife developments. These impacts would particularly affect fishing camps, marinas, commercial boat docks, motels, sporting goods stores, service stations, boat dealers, restaurants, and many related new businesses.

Construction projects create a temporary influx of workers who spend money in local areas but, at the same time, such projects will create problems of housing, schooling, transportation, and other community services. The solution of these short-term problems should result in long-range gains with construction of facilities that would be needed to meet future expansion.

There are 18 counties located wholly or partially in the Altamaha basin which have been designated redevelopment areas, as of April 1962, by the Area Redevelopment Administration of the U. S. Department of Commerce. These counties have been so designated because of varying reasons such as low median family income and low farm family income. Execution of the plan for the basin would assist in the relief of these conditions and aid in raising the economic level of the people. Substantial net secondary benefits are most frequently realized in areas where resource development projects make it possible to utilize unemployed and underemployed labor and unused facilities.

Intangible Benefits

Intagible benefits are those which are not evaluated in monetary terms. Like tangible benefits, these may be primary or secondary in character. Many programs and projects make substantial contributions to public security, to private and public health, and to public safety and tranquility, all of which include large elements of intangible values. Intangible benefits and costs are recognized in programs and projects analyses.

Costs

Costs are the value of labor, goods, and services exchanged to gain goods and services valued more highly. Where the costs are tangible values, the assumption is made that the needs of the project are taken from present uses at marginal unit prices and, therefore, the values foregone represent the least important uses that the market would allow. In a resource program as complex as that recommended for the Southeast River Basins, there are also many intangible costs involved.

The costs of proposed projects and programs include the initial investment which would be incurred in one or more stages of construction and the annual expenditures required for operation, maintenance, and replacements. Taxes which would be paid by a private utility were included as a project cost for hydroelectric power projects without regard to whether governmental or private interests would develop the project. Investment costs include the capital expenditures associated with constructing a project and carrying out a program. However, interest during

construction is omitted where the period of construction was not expected to exceed 2 years. Where the period of construction was estimated to be more than 2 years, the investment included simple interest on one-half of the construction costs for the period of construction.

Captial investment and operation and maintenance costs of multiple-purpose projects were allocated to the several purposes served so as to form a basis for reimbursement and cost-sharing arrangements that may be required.

Intangible Costs

In evaluating resource programs and projects, many important program and project effects cannot be adequately measured in monetary terms. Loss of scenic values is an example of an intangible cost frequently associated with resource development. Treatment of these intangible effects has been subjected to many of the requirements applicable to tangible effects. These include: (1) Considering effects in terms of difference "with" the project and "without" the project, and (2) considering intangible costs to the same degree or extent as intangible benefits.

Cost Sharing

Cost sharing is concerned primarily with the distribution of costs among the participating interests. The division of cost is shown in two groups: Federal and non-Federal. For each specific project or program, the actual division of cost among the Federal and non-Federal interests was determined by the nature of the development and on the basis of circumstances expected to prevail during the evaluation period.

Generally, where the impacts of projects and programs are largely local, the costs are the responsibility of non-Federal interests. Projects and programs of national significance are the responsibility of the Federal Government. Between these two extremes there are a number of projects and programs where the costs are to be shared by the Federal and non-Federal groups.

In determining the degree of Federal participation in programs and projects of less than national significance, consideration was given to: (1) The need for demonstrating new approaches to resource development and use; (2) the usefulness of a local project or program in research and experimentation which has more than local implications; (3) the support of projects or programs which by policy or legislation have become accepted as Federal or part Federal responsibilities, such as flood control; and (4) the possible justification for Federal participation in the cost of local works and improvements where counties, areas, or regions are designated as distressed and in need of economic assistance.

Financing

Determination of effective ways for financing land and water development is an essential part of resource planning. Financing as used here relates to the immediate source of funds needed for construction and management of proposed works. Financing requirements were developed only as Federal and non-Federal although in the analyses State, county, municipal, and private financing were considered. Special groupings for purposes of financing, such as development corporations and special improvement districts, are also discussed.

The following criteria were used in determining appropriate methods for financing land and water resource developments.

(1) Developments of natural resources that do not involve national consideration will be the responsibility of private, local, and State interests.

(2) Where the costs of projects and programs are to be shared between the Federal and non-Federal interests, each will provide for the financing of its share, except as noted under item (3) following. The Federal share will be provided under such laws and regulations as are applicable at the time of financing. In addition to direct government and private appropriations for the non-Federal share, development funds, authority funds, special bond issues, and revenue bonds are available for financing.

(3) For projects such as hydroelectric power and water supply, Federal financing may be needed, with provisions for reimbursement from non-Federal beneficiaries, as is now practiced. Federal financing may also be required for projects of the types not adequately covered by traditional approaches. This includes large-scale recreation projects and some types of fish and wildlife work.

(4) When the Federal Government assumes the full cost of a project or program, the Federal Government will be responsible for full financing of the work.

SECTION III – PLAN FORMULATION

Selecting and fitting planning segments together and considering alternatives in the search for the proper programs, the proper number of projects, and the best size for each element of the overall plan required extensive analysis. By a series of approximations using the incremental approach and limited by consideration of alternatives and judgment, a plan was formulated containing those programs and projects that will usually result in maximum benefits above the costs in meeting needs to the year 2000.

General Character of Resource Planning

Generally, resource planning recognizes the consequences of land and water resource development and the need to anticipate the future requirements for land and water essential to growth and welfare. The physical and economic aspects of the planning task have been emphasized, particularly as they relate to the scale, sequence, and timing of development plans. However, these considerations have been tempered by the recognition of social, legal, and political factors.

The plan has been developed on the basis that free enterprise persists in the area and the Nation with Federal and State Governments undertaking those tasks which are beyond individual or voluntary group capacity or which require such action for special physical, economic, social, or other reasons. Local and regional viewpoints were recognized in formulating the plan.

Guides for Plan Formulation

A number of general land and water resource development guides and planning aids were used in weighing and selecting those alternatives which were fitted into an effective plan. In all cases, the effective use of these guides and planning techniques required careful adherence to the assumptions and criteria outlined in Section II.

Plan Evaluation

Comparison of benefits with costs was one of the principal guides used in plan formulation. These comparisons attempted to cover all beneficial and adverse effects. While favorable primary tangible benefit-cost relations were generally the principal basis used in selecting programs and projects, intangible costs and benefits were also considered in making the plan. Measurements made reflected existing and probable future economic conditions, including estimates of the probable needs for the many goods and services which land and water development make possible. Benefit-cost data were applied to a range of interdependent physical and social possibilities and the resulting scale used for judging and selecting the means of development, the scope of facilities needed, and the site or area involved.

Increments and the Scale of Development

To achieve a reasonable scale of development, it was necessary in the formulation process to divide the work into manageable units. Planning units, usually called separable segments or increments, were the smallest units on which there was a practical opportunity for inclusion in or omission from the plan.

To meet the general objectives of maximizing net economic returns and satisfactions from the economic resources used in the plan, each part of the plan was formulated to include each separable segment or increment which would provide benefits at least equal to the cost of that segment or increment with full consideration of intangible values. Plan formulation was completed when analyses demonstrated that (1) there was need for the goods and services produced, (2) total benefits exceeded total costs, (3) each separable segment or purpose provided benefits at least equal to its cost, (4) the scale of development was such as to provide the maximum net benefits, and (5) there were no more economical means of accomplishing the same purposes.

The Nucleus Plan and the Multiple-Purpose Concept

A specific initial proposal generally was chosen as the nucleus around which planning proceeded

This nucleus usually represented a project or program which seemed to offer promise of meeting a major objective or objectives.

After the initial proposals of development were selected for analysis and benefits and costs measured, consideration was given to larger or smaller scales of development. Variations in the scope of each separable increment were made and tested, and the possibility of additions or omissions examined. Early in this process, the possibility of multiple-purpose projects was considered. By the process of elimination, the most promising combination of projects and programs was identified and tested to determine where a justified nucleus had been found. The incremental analysis was continued by adding segments of size, purpose, or means, and by evaluating the resulting increments of benefits and costs. Thus, the incremental analysis was a series of comparisons of alternative plans "with" and "without" the inclusion of particular segments. Short cuts were frequent and necessary but those principles were followed. By this fitting process, modifications were made in the initial plan. This process was continued within practical limitations until the best combination was evolved to meet the established needs.

Sequence of Development

The sequence of project development is basic to maximizing overall project benefits. Project benefit and cost comparisons are misleading unless they represent the incremental benefits and costs of projects in a specified sequence of development. This problem was recognized in the studies by dividing proposed developments into those requiring early action and those which could be accomplished by later action. Further refinement in timing could lead to some changes in incremental benefits and costs.

General Information and Basic Data

Some of the general information essential to planning in the basin was available but not always in the most useful form. Much of it required reorganization prior to analysis. While little original research was undertaken, professional interpretation of data and problems was frequently sought in the planning processes. The available data on past and current programs and on resource plans underway by Federal, State, and, to some degree, private agencies became a part of the basic planning information.

As the studies progressed, the lack of certain basic data became increasingly evident. Adequate topographic maps with satisfactory contour intervals and horizontal scales for planning, such as the 7½-minute quadrangle sheets, were available for only about 6 percent of the basin. Hydrologic data are available, on at least a short-term basis, for most major streams, but data for many of the tributaries are inadequate. Ground water information is meager. Only limited data are available on water quality. Geologic information, which is very important, is limited to local areas and to generalized data. Pertinent economic statistics have been less than adequate, except during the last few years. Much of this lack of data can be attributed to the fact that the basin has never approached full development of its resources. Consequently, there has been minimum efforts to collect basic data. However, greater competition for resource use is beginning, and selection between uses will be increasingly important as the demands increase. Adequate basic data are essential in making proper selections; therefore, steps need to be taken to insure that information will be available when it is needed.

Single-Purpose Planning

Single-purpose planning for each purpose was carried to the point of establishing needs and determining most likely ways of meeting the needs with the least expenditure of resources. Studies for some purposes were carried into more detail than others in examining alternative ways of meeting needs. Where it was apparent that a single-purpose plan could be used without major modification in the comprehensive plan, the single-purpose studies were carried to more detail.

Multiple-Purpose Planning

Information developed in single-purpose planning and the special problems of the area were the initial bases for development of a multiple-purpose plan for the Altamaha basin.

The programs and projects which served as nuclei for the initial planning were based on the character of the resources, the nature of the

problems, and the nature of the land and water projects already established or planned as portrayed in the single-purpose plans. Proposals considered for the inclusion in the plan came from many sources. Citizens throughout the area and local development organizations expressed interest in projects of many kinds and suggested combinations of resource use and development which they believed would meet particular needs. Federal and State agencies were also the source of much information on possible projects and project combinations.

Consideration was given to complementary land and water uses. Following the development of single-purpose ways for meetings needs, studies of compatible resource uses and areas of potential conflict in resource use were made. It was found that needs for forestry, recreation, and fish and wildlife could frequently be met by proper utilization of the same land resource. Similarly, water resource development plans could acceptably serve the purposes of flood control, hydroelectric power, water supply, fishing, and recreation, although operating adjustments had to be considered so that the most favorable multiple-purpose operating arrangements could be assured to maximize overall net benefits.

When sufficient preliminary study had been made, a series of detailed studies were undertaken to choose from among the alternatives those filling the needs most effectively. In this process, the problem of deciding among competing uses sometimes arose and there was always present the need to seek arrangements whereby the greatest play of complementary values would occur. This process involved a repetitious series of adjustments, in varying degrees of refinement, combined with progressively refined economic, hydrologic, and engineering comparison, until the best combination of proposed developments was found.

Nature and Treatment of Alternatives

In resources planning, comparison of alternatives is a vital part of the planning process. It is necessary to understand the nature of projects and programs rejected and the reasons for rejection, as well as the character of those accepted in the plan. Information on alternatives considered is summarized in Part Four. Additional details concerning the nature of the alternatives considered and the reasons for their acceptance or rejection in the final plan is included in Appendix 12, Planning.

Competitive Uses

Many resource uses are competitive in character. The principal guidelines established and generally followed in determining the use of land and water resources are summarized as follows: (1) Resource utilization was based on and limited to the projected future needs, and (2) economic efficiency was a major governing criterion in deciding between alternative uses of a given resource, with due consideration given to social, political, and physical factors. Some of the situations requiring special attention are: (1) Existing, reserved, or special use land and water resources; (2) public health; (3) special requirements involving areas that provide a particular type of land or water use that cannot be duplicated elsewhere at a reasonable cost; and (4) those resources to which priority considerations should be given because of long established or firmly fixed development trends.

Adjustment Among Basins in Planning

Interbasin relations were recognized, to the extent practicable, when Southeast River Basins needs were developed and distributed among basins to provide planning objectives for each basin. For example, user-days of recreation demand for a given population center were distributed to all basins within reasonable travel distance from the center, rather than being allocated exclusively to the basin within which the center lies. Nevertheless, a check was made to insure that the overall cost of meeting each need was not inflated by unreasonable disparities in unit costs. Adjustments between the Altamaha and other basins were made where reasonable alternatives were available and where overall efficiencies could be improved by the adjustments.

PART FOUR – BASIN PLAN

SECTION I – COMPREHENSIVE BASIN PLAN

The coordinated comprehensive plan for the Southeast River Basins includes land and water resource developments that contribute to meeting the needs projected to the year 2000. Resource developments existing and under construction as of 1960 are a necessary part of the plan to meet the needs. However, only proposals in the Altamaha basin for new developments and for expansion of existing developments to be made during the period 1960-2000 are presented in Part Four and their costs and benefits evaluated. Projects and programs that are necessary to meet the area needs in the immediate future are included in the early action phase.

The plan includes continuing programs such as those for public health and soil conservation and utilization that are carried on from year to year and individual projects which involve rela-

TABLE 4.1

Comprehensive Plan for Development
(thousands of dollars)

Project or program	Purpose[1]	Benefits[2]	Costs		
		Annual equivalent	Annual equivalent		Investment
			Total	Operation, maintenance, and replacements	
Abbeville	P, R, F&W	3,406	2,671	445	50,760
Big Flat Creek	R, F&W	963	471	234	6,573
Curry Creek	R, F&W, WS	620	530	170	9,987
Coopers Ferry	P, R, F&W	2,400	2,153	296	40,900
Goose Creek	P, R, F&W	5,750	5,495	581	98,120
Laurens Shoals	P, R, F&W	7,040	4,170	924	72,260
New Bethel	R, F&W	1,895	648	348	8,300
Peachstone	P, R, F&W	2,350	1,345	485	22,200
Townsend	D, FC	600	350	142	5,790
Buffalo Creek	F&W	112	104	24	2,500
Water-access areas	R, F&W	1,270	375	225	4,140
Upstream watersheds	FC, D	1,185	755	182	15,840
Water supplies[3]	WS	[4]	5,055	3,476	64,150
Navigation to Doctortown	N	1,240	852	222	18,130
Irrigation	I	3,614	1,620	1,399	6,113
Drainage[3]	D	123	14	9	131
Soil conservation	SC	5,320	3,970	2,434	42,490
Forest conservation	F	8,440	2,935	905	90,300
Fish and wildlife[3]	F&W	3,443	2,068	2,012	1,380
Recreation[3]	R	20,650	5,595	3,408	73,960
Pollution abatement	PA	[5]	5,232	1,526	152,900
Public health	PH	[5]	2,445	2,305	5,900

NOTES: [1] FC —Flood control
WS —Water supplies
N —Navigation
I —Irrigation
D —Drainage
P —Hydroelectric power
SC —Soil conservation
F —Forest conservation
F&W—Fish and wildlife
R —Recreation
PA —Pollution abatement
PH —Public health

[2] Primary tangible only; the intangible and secondary benefits and impacts considered are presented in narrative.

[3] Data presented are exclusive of costs and benefits associated with multiple-purpose developments.

[4] Benefits are assumed to be at least equal to the cost of the cheapest alternative project and are assigned monetary values only for multiple-purpose developments.

[5] Justification is based largely on intangible benefits.

tively large but short-term construction expenditures that will have benefits accruing over many years. Many of the programs are already underway and the expected changes involve intensity or magnitude of development rather than the type of development.

Beneficial physical and economic changes will accompany the implementation of the plan during the 1960-2000 period. The plan is formulated to meet the needs of the projected growth. Additional detailed studies will be needed as portions of the plan are implemented. The plan should be reviewed and updated to maintain harmony with actual growth and to consider unanticipated needs and technological improvements that may develop.

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ALTAMAHA BASIN PLAN

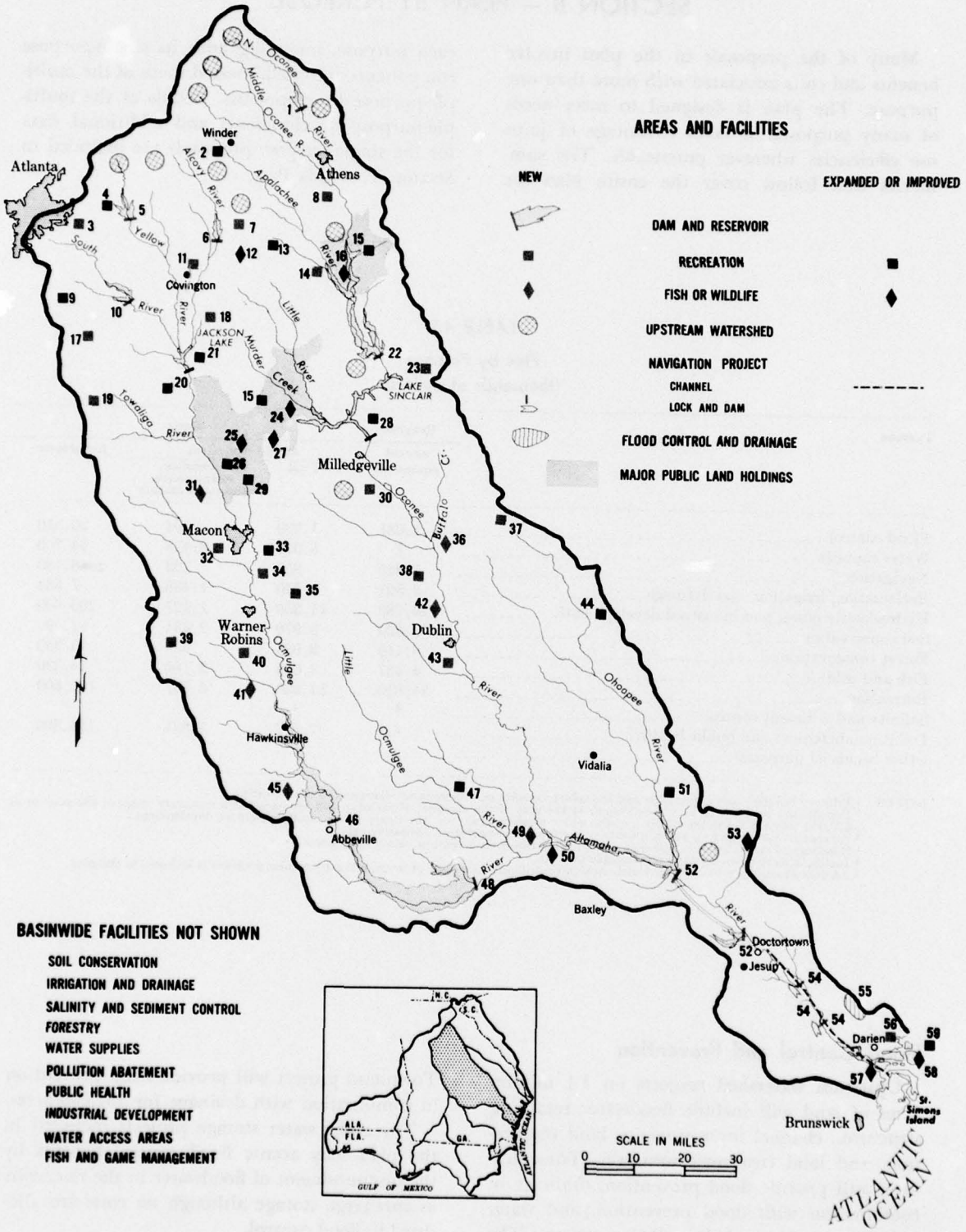


Figure 4.1

SECTION II – PLAN BY PURPOSE

Many of the proposals in the plan involve benefits and costs associated with more than one purpose. The plan is designed to meet needs of many purposes; it takes advantage of joint use efficiencies wherever practicable. The summaries that follow cover the entire plan for each purpose, including both its single-purpose components and the allocated share of the multiple-purpose developments. Details of the multiple-purpose developments and additional data for the single-purpose proposals are included in Section V of this Part.

TABLE 4.2

Plan by Purpose
(thousands of dollars)

Purpose	Benefits[1]	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Flood control	1,631	1,029	294	20,310
Water supplies	[2]	5,076	3,478	64,700
Navigation	1,240	852	222	18,130
Reclamation, irrigation, and drainage	3,891	1,710	1,438	7,564
Hydroelectric power and industrial development[3]	10,780	11,350	1,127	200,600
Soil conservation	5,320	3,970	2,434	42,490
Forest conservation	8,440	2,935	905	90,300
Fish and wildlife	4,437	3,034	2,166	24,330
Recreation	34,630	11,220	5,857	165,600
Salinity and sediment control	[4]	[4]	[4]	[4]
Pollution abatement and public health	[5]	7,677	3,831	158,800
Other beneficial purposes[6]	--	--	--	--

NOTES: [1] Primary tangible only; intangible and secondary benefits and impacts are discussed in the narrative.
[2] Benefits are assumed to be at least equal to the cost of the cheapest alternative and are assigned a monetary value in the amount of $52,000 only for the water supply benefits which would accrue from the Curry Creek multiple-purpose development.
[3] No specific proposals in plan for industrial development—narrative discussion only.
[4] Benefits and costs included with soil conservation, forest conservation, and flood control.
[5] Justification is based largely on intangible benefits.
[6] Additional studies necessary for beach erosion control and hurricane protection but no regular program is included in the plan.

Flood Control and Prevention

Upstream watershed projects on 1.1 million acres of land will include floodwater retarding structures, channel improvements, land stablization, and land treatment measures. These features will provide flood prevention, drainage in combination with flood prevention, and water resource development for other purposes. The Townsend project will provide flood prevention in combination with drainage for 161,000 acres.

The eight water storage projects included in the plan may accrue flood control benefits by the impoundment of floodwater in the reservoirs as surcharge storage although no costs are allocated to flood control.

TABLE 4.3

Flood Control Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Upstream watersheds*	1,173	749	180	15,700
Townsend*	458	280	114	4,610
Total	1,631	1,029	294	20,310

*Flood control benefits and allocated costs only.

Water Supplies

The program for water supplies includes improved and additional supplies for domestic, municpal, and industrial uses to the year 2000. The domestic water supply program includes new drilled wells, sealing and covering of wells, and power pumps and pressure systems. The program would serve about 138,500 people and provide about 13.8 million gallons of water per day. The municipal water supply program includes source improvement, treatment, elevated storage, and enlarged distribution systems. This program would serve about 1,646,000 people in 91 communities and would provide about 329.2 million gallons of water per day.

The industrial water supply program includes new wells and expansion of municipal distribution systems. The program would provide about 162.4 million gallons of water per day, in addition to that furnished industries by municipal systems.

Navigation

Navigation improvements proposed to the year 2000 in the basin would provide slack water navigation from the Altamaha Sound upstream to Doctortown by two low-lift locks and dams and channel improvements.

TABLE 4.4

Water Supplies Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Domestic	[1]	799	210	19,640
Municipal	[1]	3,231	2,437	35,450
Industrial	[1]	1,025	829	9,060
Curry[2]	52	21	2	550
Total	[1]	5,076	3,478	64,700

NOTES: [1] Benefits are assumed to be equal to or greater than the project or program costs, but are not assigned a monetary value. Justification is based largely on intangible benefits.
[2] Water supply benefits and allocated costs only.

TABLE 4.5

Navigation Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Navigation project, Altamaha Sound to Doctortown	1,240	852	222	18,130

Reclamation, Irrigation, and Drainage

It is estimated that about 44,200 additional acres of cropland will be irrigated by individual sprinkler systems on individual farms by the year 2000. Principal crops to be irrigated include tobacco, cotton, orchards, truck crops, and other speciality crops. Water supply requirements will be provided by farm ponds, individual wells, and streams. It is estimated that some 8,700 additional acres of cropland and pastureland will be drained by individual landowners installing onfarm and small group drainage facilities by the year 2000. Principal crops to be grown on drained lands include tobacco, cotton, peanuts, and truck and other speciality crops. Practices include construction, enlargement, and improvement of open-drainage ditches.

It is expected that most of the irrigation and drainage measures included in the plan would require individual or group actions by the farm owners or operators. Woodland drainage is included in the forest conservation program.

The upstream watershed projects on 1.1 million acres of land will include channel improvements which provide for drainage in combination with flood prevention. The Townsend project will provide drainage and flood control benefits to 161,000 acres of land.

Hydroelectric Power and Industrial Development

Hydroelectric power development was found to be feasible in connection with other purposes for five water storage projects. However, the power sources within the basin will continue to be inadequate for the needs and power will be imported. The distribution system will be expanded as required. By the year 2000, the

TABLE 4.6

Irrigation and Drainage Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance and replacements	
Irrigation programs[1]	3,614	1,620	1,399	6,113
Drainage				
Individual farm[1]	123	14	9	131
Upstream watersheds[2]	12	6	2	140
Townsend project[2]	142	70	28	1,180
Subtotal for drainage	277	90	39	1,451
Total	3,891	1,710	1,438	7,564

NOTES: [1] Annual returns to farmers.
[2] Drainage benefits and allocated costs only.

TABLE 4.7

Hydroelectric Power Benefits and Costs

Project or program	Installed capacity (kilowatt)	Benefits[1]	Costs ($1,000)[1]		
		Annual equivalent ($1,000)	Annual equivalent		Investment
			Total[2]	Operation, maintenance, and replacements	
Laurens Shoals	95,000	2,520	2,860	284	51,200
Peachstone	13,000	360	346	73	4,850
Goose Creek	180,000	4,900	4,900	463	84,750
Coopers Ferry	50,000	1,500	1,606	145	29,850
Abbeville	50,000	1,500	1,638	162	29,950
Total	388,000	10,780	11,350	1,127	200,600

NOTES: [1] Hydroelectric power benefits and allocated costs only.
[2] Includes an allowance for taxes foregone.

basin electric energy requirements are expected to be over 23 billion kilowatt-hours with a demand of some 4.3 million kilowatts.

The hydroelectric power now developed furnishes about 245 million kilowatt-hours annually, mostly for peaking. The proposed five multiple-purpose projects, which include hydroelectric power, will have an installed capacity of 388,000 kilowatts and will produce about 670 million kilowatt-hours annually, most of which will be used as peaking power. Three of these installations will be in the lower river development area.

No attempt has been made to identify or locate specific industrial enterprises that are expected to come into the Altamaha basin, but a significant part of the overall plan is directed toward establishing a general setting that will be attractive to new or expanding industrial plants.

Soil Conservation and Utilization

It is expected that about 1,216,000 additional acres of cropland, pasture, and range will be treated by installation of annual and enduring soil conservation measures by the year 2000. These measures will include the establishment or reestablishment of vegetative cover, reduction of overgrazing, protection from fire, erosion control, and management of soil, water, livestock, and vegetation. It is estimated that about 20,000 additional farm ponds will be installed to provide water for livestock and irrigation and, in addition, would provide for some of the small impoundment fishing demands and recreation needs.

It is estimated that 202,000 acres of woodland, pasture, and other lands will be converted to cropland and that some 272,000 acres of cropland, woodland, and other lands will be converted to pasture.

TABLE 4.8

Soil Conservation and Utilization Benefits and Costs (thousands of dollars)

Project or program	Annual returns to farmers	Costs		
		Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Basinwide	5,320	3,970	2,434	42,490



Figure 4.2 *Macon, Georgia, the Largest City Located Entirely Within the Altamaha Basin.*

Expected Land Use in Year 2000

Cropland and pastureland	2,577,000 acres
Woodland	5,710,000 acres
Other land	760,000 acres

Most of the soil conservation and utilization measures included in the plan involve individual or group actions by the farm owners or operators.

Forest Conservation and Utilization

The program for forest conservation and utilization will cover the 5.7 million acres of woodland in the basin by the year 2000. The program includes fire protection, grazing control, tree planting, water control and forest roads, timber-stand improvement, management and utilization of the woodlands, and other measures. The program would provide for an annual timber cut of some 386 million cubic feet and production of about 470,000 barrels of gum-naval stores by the year 2000.

The forestry program will be developed, financed, and administered by the timber owners and with some Federal participation in fire prevention and other aspects of the program.

TABLE 4.9

Forest Conservation and Utilization Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Basinwide	8,440	2,935	905	90,300

Fish and Wildlife

The fish and wildlife program will extend throughout the Basin. The program includes eight multiple-purpose reservoir projects, 66 water-access areas, and single-purpose features for fish and wildlife.

The wildlife program includes improvement of existing State owned lands and existing facilities, development of eight new management areas, and extensive habitat development. The sport fishing program includes the preservation and development of the Altamaha River and tributaries, the renovation and more intensive management of existing and new large and small impoundments, the improvement of present access areas and development of new access areas to the rivers and coastal waters, the expansion of existing fish hatcheries, and new separate salt-water facilities.

The plan would, by the year 2000, provide annually for some 1,365,000 user-days of hunting, about 3,561,000 user-days of sport fishing, and produce about 6.6 million pounds of commercial food fish.

Programs installed in the period 1960-2000 would provide, by the end of the period, for a net annual increase of 601,000 user-days of hunting, 2,268,000 user-days of sport fishing, and about 3.5 million pounds of commercial fish. The program provides for mitigating losses of 56,000 user-days of hunting and 25,000 user-days of fishing that would result from inundation of streams and valleys.

Recreation

The recreation program will extend basin-wide. Included are 8 multiple-purpose reservoir projects and 10 water-access areas. The program includes expansion and improvement of 14 existing areas of which 6 are high-density use type and the development of 40 new areas of which 7 will be high-density use areas, 29 general outdoor recreation areas, and 4 historic and cultural areas.

These features and existing facilities will, by the year 2000, provide annually about 36 million user-days of recreation.

TABLE 4.10

Fish and Wildlife Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Abbeville*	266	265	33	6,450
Big Flat Creek*	3	3	1	73
Curry Creek*	14	13	2	307
Coopers Ferry*	230	224	33	5,350
Goose Creek*	220	215	21	5,370
Laurens Shoals*	60	60	7	1,560
Peachstone*	16	14	1	350
New Bethel*	3	3	1	50
Water-access areas*	70	65	31	940
Buffalo Creek	112	104	24	2,500
Sport fisheries	1,602	1,186	1,166	720
Wildlife	1,611	663	652	390
Commercial fisheries	230	219	194	270
Total	4,437	3,034	2,166	24,330

*Fish and wildlife benefits and allocated costs only.

TABLE 4.11

Recreation Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Abbeville*	1,640	768	250	14,360
Big Flat Creek*	960	468	233	6,500
Curry Creek*	554	496	166	9,130
Coopers Ferry*	670	323	118	5,700
Goose Creek*	630	380	97	8,000
Laurens Shoals*	4,460	1,250	633	19,500
New Bethel*	1,892	645	347	8,250
Peachstone*	1,974	985	411	17,000
Water-access areas*	1,200	310	194	3,200
Recreation areas	20,650	5,595	3,408	73,960
Total	34,630	11,220	5,857	165,600

*Recreation benefits and allocated costs only.

Salinity and Sediment Control

Neither salinity nor sediment are major problems in the basin. There is considerable damage to roads and ditches by roadside erosion, but the offsite sediment damages are minor. Programs for soil conservation, forest conservation, facilities for flood prevention, and impoundments for flood control and other purposes will accrue benefits to sediment control, but these benefits have not been evaluated separately.

Pollution Abatement and Public Health

The pollution abatement and public health programs will be basinwide. The program for pollution abatement consists of new and extended sewerage systems for 83 communities,

TABLE 4.12

Pollution Abatement and Public Health Costs
(thousands of dollars)

Project or program	Costs		
	Annual equivalent		Investment
	Total	Operation, maintenance, and replacements	
Pollution abatement			
Municipal	5,111	1,500	149,200
Industrial	121	26	3,700
Subtotal	5,232	1,526	152,900
Public health			
Solid-waste disposal	2,212	2,072	5,900
Vector control	203	203	0
Air pollution monitoring	30	30	0
Subtotal	2,445	2,305	5,900
Total	7,677	3,831	158,800

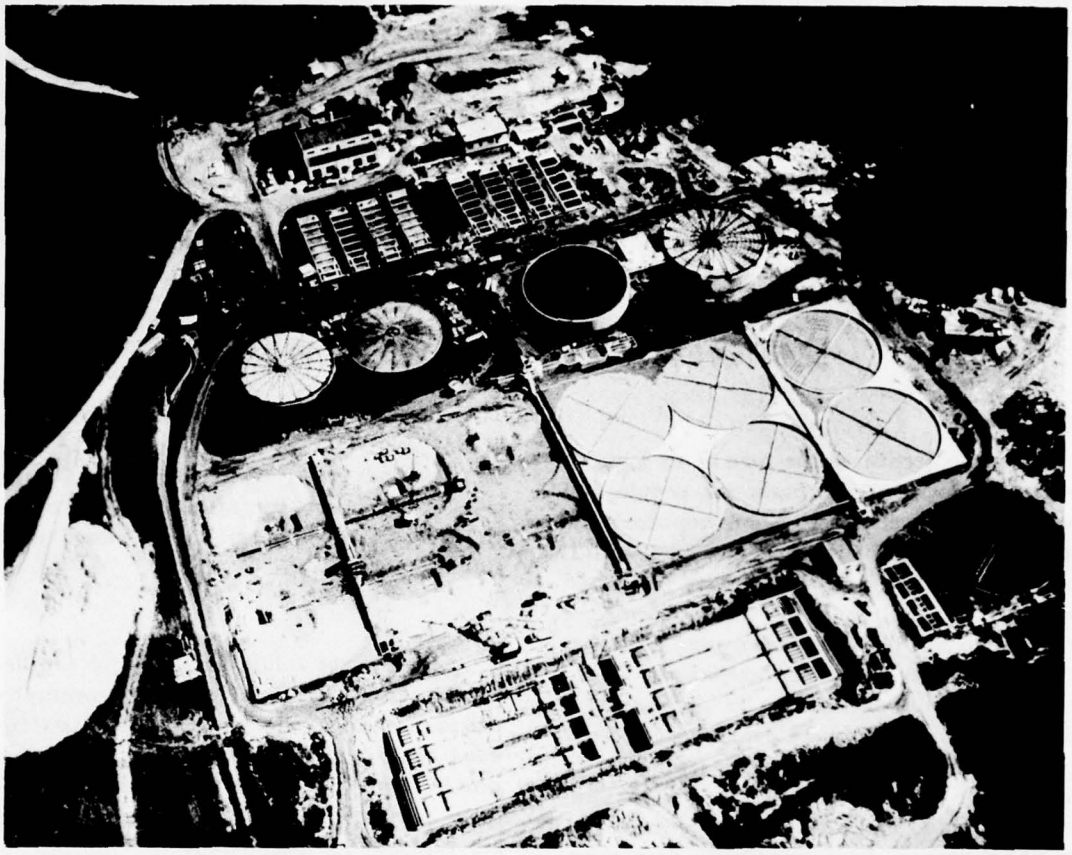


Figure 4.3 *A Modern Sewage Treatment Plant in Southeast Atlanta Contributes to the Health of the City.*

primary treatment facilities at 10 places, secondary treatment facilities at 42 places, and stabilization ponds for 31 places. It will provide adequate facilities for handling the wastes expected from 1,637,000 persons served by municipal sewerage systems.

The program for public health consists of drainage and spraying for vector control, sanitary landfill operations at 100 locations and 3 incinerators for solid-waste disposal and fly and rodent control, and participation in statewide programs for air pollution and radiological monitoring. The health aspects of other projects and programs relate to the prevention of additional hazards to health; and these costs are, therefore, included in the other purpose costs.

These programs will contribute to the general health and welfare of basin residents, tourists, and recreationists, including fishermen and hunters.

Other Beneficial Purposes

There are beach erosion and hurricane damage problems in the basins. These are expected to increase as coastal areas develop. The plan provides for existing hurricane warning systems to continue to be improved and proposes studies of beach erosion control and hurricane protection possibilities. Also provided are programs for obtaining topographic and geologic mapping, hydrologic data, data on water quality and water use, and on land use changes to improve and add to the store of basic data on the area resources.

The forecasting of streamflow is essential in the proper management of water resources. Flood

forecasting is well known for reservoir operation and for warnings in areas unprotected by physical control of floodwater. Future use and regulation of streams will require forecasts of flow, both high and low, as far in advance as is practicable. All river-related purposes, such as recreational boating and fishing, navigation, hydropower operation, water supply, pollution abatement, public health, irrigation, and flood control, are benefited by advance information as to the expected flows. The costs of forecasting are relatively small and are included in the overall project and program costs. The benefits are also included in the assumption that the best possible forecasts will be available. These benefits are not achieved automatically. A deliberate program which recognizes the necessary lead time for development of reporting network and other facilities is required to maintain satisfactory results.

SECTION III – IMPACTS OF THE PLAN

Economic

A major objective of the plan is to improve the environment of the basin for people and their economic well being. These improvements are not all measurable in tangible terms. Identifiable primary tangible benefits have been used for monetary evaluation of the projects and programs in this plan. It is recognized, however, that many values stem from benefits not identified or given full recognition in the monetary justification. These nonevaluated benefits may be either or both primary and secondary in nature. The primary benefits used in justification of programs and projects are presented earlier. This Section deals principally with those effects not measured adequately by the primary benefits.

The impact of programs and projects which involve increased production of commodities would be felt in the general community by requiring additional production materials and processing equipment and more services to provide the material, maintain the equipment, and to sustain its operation. These increased activities would stimulate a substantial exchange of money throughout the basin. Similarly, it is expected that there will be very sizable impacts from recreation and sport fishing and wildlife projects and programs. Fishing camps, motels, sporting goods stores, service stations, boat dealers, restaurants, and related new businesses would be required.

The extent to which river basin development of the Altamaha basin will influence the economy of adjacent areas is difficult to predict, but such development could affect the entire State of Georgia as well as the entire Southeast River Basins area. Certain impacts can be felt, also, over a much wider region. Some of the more significant impacts for each purpose served by the plan of development are discussed in the following paragraphs.

Flood Control

Under present conditions, most of the flood damages in the basin occur in the upstream tributaries. Many of the economic impacts from flood control measures will be reflected in improved land utilization for agricultural and other purposes. Lands now in the flood plains are valuable for pastureland or cropland, but are idle or in woodland use because of flood hazards. If the flood plains are utilized better because of flood control, marginal lands elsewhere could be used for such purposes as woodlands and hunting and recreational areas. Some of these lands to be protected are adjacent to navigable waterways and will offer sites for industry. Thus, successful flood control programs may set in motion a chain of land use shifts which could have far-reaching consequences.

Water Supplies

Water availability governs all human activity. Abundant supplies of water often set the stage for rapid economic development. One should not let present availability diminish the value of water and its benefits. The availability of good quality water in ample supplies determines to a considerable extent the character and degree of community and industrial development. Availability of water can start or continue an

expansion that will result in great economic benefits to any locality. Therefore, in reality, the value of water to an area as a natural resource to be preserved for the future should be considered as much greater than the low cost of obtaining it today in the basin.

Navigation

The navigation project proposed for the basin will provide an opportunity for industrial growth by industries that utilize water transportation in the Doctortown area. The high banks in the area provide sizable flood-free sites for plant location.

Industries that supply or consume large amounts of bulk commodities suitable for water transport generally find it advantageous and profitable to locate on navigable inland waterways. These improved waterways become parts of mass production lines for moving bulk materials and component parts or finished commodities at low cost. If other factors, such as raw materials, markets, land transportation, power, and suitable sites, are available, industrial development could very well be an outgrowth of waterway improvement.

Industries that utilize or produce agricultural products, steel or iron, coal, petroleum, chemicals, pulp and paper, building materials, transportation equipment, and farm machinery are the big users of navigable waterways. These industries have been responsible for billions of dollars of industrial development on navigable waterways since World War II. Notable examples are the industrial growth in Memphis, Tennessee; Evansville, Indiana; along the Tennessee River near Paducah, Kentucky; along the Hiwassee River near Chattanooga, Tennessee; and Houston, Texas. The Houston Ship Canal, connecting a land-locked city with the Gulf of Mexico, has had a multimillion dollar industrial development along its 52-mile length. A similar expansion of the petrochemical industry on the Gulf Intracoastal Waterway is evidence of the attraction of navigable waterways to industrial development. It is in this subsequent development that the real economic impacts are found.

Irrigation, Drainage, Flood Prevention, and Soil Conservation and Utilization

About 12 percent of the basin work force is employed in agriculture other than forestry. Traditionally, agriculture has been of great economic importance to the basin. Many of the communities and their industries, business establishments, financial institutions, and trading habits were founded on the basis of an agricultural economy.

Agriculture will continue to have a significant impact on the basin economy, even though fewer people will be employed. The acreage in cropland and pastureland is projected to increase slightly by year 2000 and the production to increase more than twofold in most commodities, as will total cash receipts. The net income from agriculture by 2000 should be over $100 million, whereas it totalled approximately $40 million in 1959.

It has been estimated that for every dollar of net income derived from primary industries including agriculture and recreation there is at least an additional $1.25 to $1.50 in income generated in the community. This effect is shown in increased business activity in trade, services, and financial establishments.

By 2000, estimated annual expenditures for agricultural production will exceed $306 million of which $93 million will be for feed, $22.7 million for livestock, $6.8 million for seed, $33 million for fertilizer and lime, $35.6 million for repairs and maintenance, $44 million for labor, $5.7 million for taxes, $4 million for interest, and over $60 million for other expenses. Supporting retail, wholesale, service, and financial activities will be affected greatly by these expenditures.

As a source of raw materials to sustain the food-processing industries, agriculture will continue to hold great importance. Secondary benefits from agricultural development are expected to continue to have real and lasting effects on the basin communities. Benefits will accrue through improved efficiencies of farm operations; reduction of turbidity of many streams; prolongation of the useful life of storage reservoirs; some alleviation of flood and sediment damage to roads, bridges, roadfills, livestock, and real and personal property; improved wildlife habitat and

recreation facilities; and abatement of stream pollution. They also facilitate proper utilization of agricultural lands by providing protection from erosion, permitting more intensive utilization, and contributing toward an adequate agricultural and nonagricultural water supply for the people of the basin.

Hydroelectric Power and Industrial Development

Several projects in the basin were considered that would produce hydroelectric power. Electric power, like water, is an economic element carefully considered by industry in looking for a place to expand or establish a plant. The comprehensive plan of development for hydroelectric power, combined with the expansion of steam generation in or near the basin, will make the Altamaha basin attractive in these two elements. Many additional transmission lines, substations, and related facilities will be needed to meet the growing demands.

Industrial expansion in the upper basin area, particularly around metropolitan Atlanta, Macon, and Athens, demonstrates the economic effects often resulting from such activities. Capital expenditures made for plants, facilities, materials, and services provided a stimulus to local economies. For instance, an industrial plant in one of the principal cities represents an investment of over $20 million, with annual expenditures for materials, services, and utilities close to $1 million. Wages and salaries annually exceed $2 million, most of which is spent in the area for materials, services, housing, and food.

Manufacturing employment in the basin is projected to more than double by 2000. All industry categories should show an increase, except textiles. Industries that show the greatest increases are apparels; stone, clay, and glass; and metal processing. Food processing also shows a substantial increase.

Capital expenditures for industrial expansion in the basin are expected to average about $27 million annually. An annual average of 2,700 new jobs are anticipated in manufacturing and approximately 5,600 new jobs in service, trades, and professional categories. Much of this growth will continue to concentrate in the metropolitan Atlanta, Athens, and Macon areas.

New manufacturing employees and those in supporting industries will buy new homes, new cars, new furniture, food, drugs, and services. They will also pay taxes and demand governmental services for their tax dollar. Therefore, with economic progress comes community demands for services. In the cities, it means demand for transportation, streets, water, sewerage, and protection. Communities that keep abreast, or even ahead, of these demands will be in a position to grow.

Forest Conservation

Over 69 percent of the Altamaha basin is in woodland. Nearly 12,000 people are employed in harvesting and manufacturing this resource. Timber production should more than double by 2000, and the acreage devoted to woodland will decline slightly. This increased production will have an impact on the basin and regional economy.

Increased timber production is of great importance to the basin because of the raw materials needed to advance a segment of the manufacturing potential. Pulp and paper industrial employment should more than double by 2000, and lumber and wood products will make a substantial gain. Increased employment will be forthcoming from reforestation, management, and fire protection, as well as the harvesting and transporting of the timber products and raw materials. All of these activities can be of great importance to the smaller, rural communities. These activities mean increased expenditures for equipment, supplies, taxes, services, payrolls, and housing.

In addition, in the hilly and rolling terrain the forestry program would improve the condition of the soil and reduce erosion and storm runoff. Recreation possibilities would be enhanced and better wildlife habitat would be provided.

Fish and Wildlife

The expenditures of sportsmen in the recreation areas, as well as in the towns or cities where they reside, often add much to the basin economy. Additional employment opportunities would be afforded by many small businesses engaged in boat building and supplies, operation

of fishing and hunting camps, and in services and sales of food, gasoline, arms and ammunition, fishing tackle, live bait, and other sporting goods and supplies.

Less easy to identify are the benefits derived by general enhancement of the recreational opportunities afforded by a given locality. The growth of many towns and cities in this portion of the Southeast will depend to a great extent on their attractiveness and proximity to lands and waters affording good hunting and fishing.

Table 4.13 summarizes some of the percentages of expenditures which could be expected from hunting and fishing in the basin. These are compiled from national averages but are considered illustrative of the general distribution of anticipated expenditures for hunting and fishing.

TABLE 4.13

Percentage Distribution of Expenditures Hunting and Fishing—1960

Expenditure item	Hunting	Fishing
Food	7	8
Lodging	2	2
Transportation	15	14
Equipment	49	48
Licenses, tags, permits	5	2
Leases, fees, other	22	26
Total	100	100

The commercial fishing industry generally is plagued by the vagaries of weather, seasonal fluctuation of supply, precarious market conditions, and lack of good conservation practices. As a result, this industry is not attracting energetic young men. The benefits which could be realized, however, are of such magnitude as to justify a vigorous effort toward attracting new men into the industry.

Secondary benefits include increased employment in the fishing and seafood industries and in boat building, boat maintenance, and boat supply enterprises. More services would be required and sales of food, gasoline and oil, fishing supplies, and other equipment would increase.

Recreation

Recreation activities may contribute to economic stability for some areas, including the coastal areas of the Altamaha basin and the offshore islands. Several segments of industry, such as boat building, recreation equipment, and camping equipment, that are wholly dependent upon outdoor recreation pursuits have evidenced phenomenal growth in the Nation in the last decade. As leisure time and per capita income increase, this growth is expected to continue.

Outdoor recreation produces many primary benefits. Some of these benefits are not easily expressed in economic terms. Recreation provides the healthful exercise necessary for physical fitness. It promotes mental health and offers esthetic values. The community as well as the individual is affected by recreation activities.

Secondary benefits produced by recreation activities are reflected in the economy of the area, the community, and the Nation. Some of these secondary benefits are: Stimulation of travel and travel services; development of business activity in areas within, adjacent to, or enroute to recreation areas, increasing retail trade and new construction; stimulation of business activity relative to the manufacture of recreation equipment; increased property evaluation in and around recreation areas; and increased miscellaneous net tax revenue after deducting increased governmental expenditures for associated governmental services.

Surveys have been made in many areas of recreation and related expenditures, but the effectiveness of these surveys depends upon how they were developed and for what purpose. Some of the surveys give individual expenditure estimates running from $4 to $7 per day and analyses of expenditures for food, lodging, and transportation. A recent Georgia survey determined that $4 is spent daily by each recreationist. These expenditures are reflected in the economic activities mentioned above. Even if this rate does not increase in the next 40 years, persons expected to seek outdoor recreation in the Altamaha basin by 2000 would be spending annually over $144 million, much of which would be by persons living outside the study area, or who had moved to the area because of

the improved opportunities presented in this plan.

Water-based recreation is of special importance to outdoor recreation. Clean, unpolluted reservoirs, lakes, streams, and gulf and ocean beaches generate more recreational activity than any other recreation factor. A recent 10-year study of selected counties in the Arkansas-White-Red River Basins with significant reservoir shorelines showed an increase in per capita income of 57 percent, an increase in bank deposits of 57 percent, and an increase in tax levies of 64 percent. Also significant was an increase in investment in overnight lodging facilities, annual expenditure on private home construction, and new school construction. Counties in the same areas without shorelines fell far short of this rate of growth.

While all of the economic gains in these reservoir counties cannot be directly attributed to the presence of new lakes, it cannot be overlooked that the new recreational activities had a pronounced effect. The reservoir counties are better off by nearly all economic yardsticks. However, it should be pointed out also that these counties were comparatively depressed prior to the construction of the reservoirs. The impact of the recreation dollar was more dramatic in this situation than it would be in an area of greater economic activity. It must be remembered that types of recreation demand are subject to change in response to public interest and that, where there is reasonable access to water areas, additional facilities cannot be expected to have the same impact as the initial project had.

Pollution Abatement and Public Health

Pollution abatement enhances the well-being of people and influences their choice of place of residence, employment, and recreation. Thus, this is important in sustaining a healthy environment and in attracting others to the basin.

Pollution abatement is frequently necessary to realize fishing, hunting, and recreational opportunities. In turn, it improves land and property values which have a great impact on economic development. Industries are particularly interested in establishing new plants in areas where waste can be handled effectively and where provision has been made for orderly expansion of public facilities needed for pollution abatement.

Pollution occurs in varying degrees in the streams of the basin. The pollution is primarily from municipal and industrial wastes and is quite serious in the vicinity of Macon, Athens, Jesup, metropolitan Atlanta, Dublin, and Milledgeville, as well as other localized areas. To properly treat all of the wastes in the basin will require over $53.5 million in treatment systems and sewer lines by 1975. Construction of these facilities would provide employment in 75 communities in the basin. Other expenditures of over $72 million will be required between 1975 and 2000 to keep abreast of the population growth throughout the basin.

It is difficult to assess the effect of a pollution abatement program. There are intangible benefits from improved waters as mentioned above. In this particular basin where recreational and industrial development are so very important to the future economic development, water quality assumes even greater importance. Pollution abatement now would constitute insurance for future usefulness as well as for immediate purposes.

Public health programs for control of vectors, mainly mosquitoes, are also important, particularly in the Altamaha basin where recreation is so important. Tidal marshland, as well as inland swamp areas, offers breeding places for mosquitoes. Much of this can be eliminated by better drainage. Elimination of vectors could help the economy of the area.

Other Economic Impacts

Besides the impacts of the functional programs, other noteworthy economic impacts relate to several or all of the programs.

Land enhancement impacts—Land and water resources improvements have not been planned specifically for enhancement of land. However, the land enhancement benefits that would result from reservoir construction and certain other projects would be considerable. Many public costs are associated with rising land values, so that the entire amount of these values cannot be looked upon as net benefits. Waterfront property, particularly that suitable for homesites and

recreational and industrial development, is generally marketable at a higher value than nonwaterfront property with all other factors being equal. Land that was previously woodland or tidal marsh is subdivided into more expensive lots. Other areas become important for industrial property because of stable, ample, and unpolluted water supplies.

Rapid development of lake shore property for recreation and commercial use has followed reservoir development throughout the Southeast River Basins area. This development, with resultant increase in property values, has naturally been greater and more rapid in those areas located near major population centers. Reconnaissance studies in the Lake Lanier area suggest that property values in the vicinity of reservoirs used extensively for recreation have increased tenfold during the first 10 to 12 years of development.

All land enhancement values of projects outlined in the comprehensive plan will not be of the same magnitude. Several factors influence land enhancement and are listed as follows:

(1) Proximity to urban population,
(2) shoreline topography,
(3) fluctuation in water level,
(4) water quality,
(5) accessibility and shoreline ownership, and,
(6) size of water body.

In the future, as available waterfront property becomes more scarce as a result of increases in population and leisure time, the enhancement of land will be an even greater secondary effect of water project development.

Impact from tax revenues—Increased tax revenues usually come as a result of increased economic activity, increased land and resource productivity, more intensive land use, and more real property. Counties that today have a uniform or declining economic activity, low level forest and farm productivity, poor land use, and little new construction are not in a favorable position to realize greater tax revenues. Even tax equalization is difficult under such a situation. Without sufficient tax revenues, government efficiency and extension of community services are almost impossible.

Development of projects and programs anticipated in the comprehensive plan will do much toward alleviating this situation. Increased economic activity will follow as a result of the implementation of the projects and programs. The forestry program will result in increased forest productivity. The soil conservation, reclamation, irrigation, and drainage programs will mean increased farm productivity. Increased economic activity will result in more residential and commercial construction. All of these effects coupled with judicious tax equalization and governmental administration will mean increased tax revenues and more governmental services.

Inundated reservoir lands and lands taken out of production for other projects and purposes may create a loss in taxable property to the county tax rolls. However, these tax revenue losses do not necessarily have to be permanent. In the case of reservoir lands through proper development and management of the shoreline area, the land enhancement and new construction resulting will practically always outweigh the losses. In the study of selected counties following reservoir construction in an underdeveloped area in the Arkansas-White-Red River Basins, it was found that taxes levied were up 64 percent at the end of 10 years. Nearby counties without reservoirs increased less than 4 percent in tax revenues. This study also pointed out that the 10-year average annual revenues paid to the counties in lieu of taxes far exceeded the first year tax loss from inundated property. In some cases, this average annual revenue amounted to over 10 times the first year tax loss. On the whole, the average annual revenue was a gain of over 320 percent above the first year tax loss. This revenue is not included in the 64 percent increase in taxes levied mentioned above.

Impacts from construction activities—The construction of storage works and other facilities will provide an economic stimulus to the local area during the construction period. This is brought about by the temporary influx of workers for the project who desire housing, food, services, and entertainment and by the fuller employment and higher payment to workers from the local labor force. Much of this economic activity, stemming from wages and salaries, is felt locally.

It has been estimated that about 60 percent of the total construction cost is labor cost. The proportion of this which would be spent locally would vary with the individual projects and their proximity to urbanized area. The remaining 40 percent is for materials, equipment, maintenance, and services, and most of these costs would affect a larger area, even the national economy, and are less impressive to any individual locality. The community is subject to substantial cost as a result of increased population engaged in construction and this cost must be considered in appraising the local benefits.

Impacts from migration—A high birth rate, a relatively dense population for an agricultural area, and limited employment opportunities have produced in the Southeast River Basins an extremely mobile population. This out-migration and regional urbanization have been good, in many respects, as safety valves which have prevented population pressures from reaching even more undesirable proportions in the rural areas. Migration since the 1930's has also brought about a loss to the area, however, because these out-migrants represent lost manpower and lost expenditures to the area for the rearing, educating, and training of the migrants.

At the same time, the Southeast River Basins area has evidenced a growing amount of in-migration. Generally, the amount of education, training, and income represented on a per capita basis by this group has been relatively higher than that for the out-migrants. As a result, the economic losses from out-migration have been tempered somewhat by the economic gains from in-migration.

A migration projection study was made for the Southeast River Basins area as a whole without any attempt to isolate or separately identify the amount of change directly attributable to the plan of development. The results of the study did not provide specific data to show the overall effect of migration on the Altamaha basin. However, the trends indicated by the study are assumed to be applicable to the Altamaha basin.

The study shows that during the period of 1960-75 out-migrants should continue to outnumber in-migrants but not to the extent which was evident from 1930-60. Because the in-migrants are expected to be better educated and skilled than the out-migrants, the area should evidence a modest economic gain when comparisons are made of the cost of rearing, training, and educating the migrants. During the period of 1975-2000, this economic gain should be even greater because the in-migrants should then begin to outnumber the out-migrants.

A comparison was made of the personal income of the migrants and anticipated migrants. Under this comparison, the period of 1960-75 should sustain an economic loss but not nearly so great as that sustained during the 1930-60 period. However, during the period of 1975-2000, the area should start to gain in personal income.

Impacts to redevelopment areas—Of the 59 counties falling wholly or partially in the Altamaha basin, 18 had been designated redevelopment areas as of April 20, 1962, under Section 5 (b) of the Area Redevelopment Act of 1961. These were so designated because of low median family income, low farm family income, and persistent and substantial unemployment.

Some of the projects and programs proposed for the basin should help remedy these conditions. The food and fiber program would improve farm and forest production and income throughout the basin, increasing per capita income, especially for farm families. The commercial fisheries program would increase fish production and assist in increasing employment in the coastal counties. The projects to provide more and better recreational areas would increase per capita income, as well as provide additional employment in the vicinity of the individual projects. Many of the projects would create temporary employment during the actual construction phase.

Assistance is available to these counties under the provisions of the Area Redevelopment Act. This assistance is in the form of loans for industrial and commercial projects, loans and grants for public facilities, technical assistance, occupational training, and retaining subsistence payments.

Physical

In general, the land and water resources of the basin are more than adequate both in quan-

tity and quality to meet all demands for use, conservation, and development by the year 2000. Land and water need not be limiting factors in the attainment of high economic levels of development by the basin residents.

Drainage, land management, and even urbanization will effect streamflow in some localities but in the aggregate these will be minor. Ground water aquifers extend far beyond the basin boundaries, and the small projected withdrawals will be spread over a large area and have negligible effect on ground water availability, except possibly in and below reservoirs.

Water quality should remain relatively unchanged, except for improvement in the localities where there is now pollution. Projected ground water withdrawals are dispersed so that no saline intrusion of aquifers along the coast is expected.

Ground water and surface water are intimately related in this basin. Regulation or withdrawal of one will affect the other. However, the total use of water is expected to be so small a fraction of the available natural quantities that the balance between ground water and surface water will not be disturbed, except in localized areas.

SECTION IV – PLAN IMPLEMENTATION

Cost Sharing

Resource development costs should be shared so as to serve best the public interest by: (1) Encouraging sound resource development and economic and social stability and growth; (2) promoting maximum efficiency in use of private and public funds; (3) obtaining an equitable relationship between the incidence of costs and benefits; (4) preventing unnecessary waste, unwarranted windfall gains, and undesirable destructive competition; (5) serving as a check on project desirability and encouraging desirable types and sizes of enterprises; (6) securing consistency between the various purposes of resource development; and (7) promoting public understanding and cooperation in resource development.

Two types of costs are shown for cost-sharing analyses: (1) Investment costs, which include all of the costs of project construction including lands and rights-of-way, estimated for the period of full development of the project; and (2) operation, maintenance, and replacements costs, shown as an annual cost, and estimated on the basis of full development. All costs shown are for the full program to the year 2000.

Of the total investment costs, about 19 percent will be borne by the Federal Government and about 81 percent by the non-Federal interests. For operation, maintenance, and replacements costs, approximately 5 percent will become the responsibility of the Federal Government and 95 percent the responsibility of the non-Federal groups involved in land and water developments.

Hydroelectric power costs totaling $200,600,000 represent the largest investment cost. Recreation and pollution abatement and public health at costs of $166 million and $159 million, respectively, are also sizable investments. Although the Federal Government may make the total initial investment for hydroelectric power at Federal projects, the sale of energy repays the investment and, therefore, the cost is considered non-Federal.

Programs relating to agriculture, including the flood control program, are significant items of cost in the plan, totaling over $160 million for investment cost with annual cost for operation and maintenance of over $5 million. By far the largest of the programs related to agriculture is that for forest conservation and utilization, where the initial investment cost is about $90 million. The soil conservation and utilization program for the basin will require an investment cost of approximately $42 million. The cost of the forestry program will be about 35 percent Federal and 65 percent non-Federal for investment cost and 30 percent Federal and 70 percent non-Federal for operation and maintenance. The operation and maintenance cost of the soil conservation and utilization program will be entirely the responsibility of non-Federal interests.

The pollution abatement and public health problem in the Altamaha basin will require

TABLE 4.14

Cost Sharing—Comprehensive Plan

Purpose or project*	Investment costs					Annual operation, maintenance, and replacements costs at year 2000				
	Total ($1,000)	Federal ($1,000)	Federal (pct.)	Non-Federal ($1,000)	Non-Federal (pct.)	Total ($1,000)	Federal ($1,000)	Federal (pct.)	Non-Federal ($1,000)	Non-Federal (pct.)
Purpose										
Flood control	20,310	10,940	54	9,370	46	294	--	0	294	100
Water supplies	64,700	--	0	64,700	100	6,391	--	0	6,391	100
Navigation	18,130	14,500	80	3,630	20	222	211	95	11	5
Irrigation	6,113	1,528	25	4,585	75	1,399	--	0	1,399	100
Drainage	1,451	363	25	1,088	75	39	--	0	39	100
Hydroelectric power	200,600	--	0	200,600	100	1,127	--	0	1,127	100
Soil conservation	42,490	12,750	30	29,740	70	2,434	--	0	2,434	100
Forest conservation	90,300	31,600	35	58,700	65	1,215	365	30	850	70
Sport fisheries and wildlife	24,060	10,400	43	13,660	57	3,141	18	1	3,123	99
Commercial fisheries	270	162	60	108	40	352	211	60	161	40
Recreation	165,600	20,070	12	145,530	88	8,100	840	10	7,260	90
Pollution abatement	152,900	44,800	30	108,100	70	2,644	--	0	2,644	100
Public health	5,900	--	0	5,900	100	4,328	--	0	4,328	100
Projects										
Abbeville	50,760	6,815	13	43,945	87	478	47	10	431	90
Big Flat Creek	6,573	--	0	6,573	100	239	--	0	239	100
Curry Creek	9,987	--	0	9,987	100	172	--	0	172	100
Coopers Ferry	40,900	4,100	10	36,800	90	298	23	8	275	92
Goose Creek	98,120	4,685	5	93,435	95	603	21	3	582	97
Laurens Shoals	72,260	2,925	4	69,335	96	1,124	125	11	999	89
New Bethel	8,300	--	0	8,300	100	357	--	0	357	100
Peachstone	22,200	2,550	11	19,650	89	693	93	13	600	87
Townsend	5,790	2,600	45	3,190	55	142	--	0	142	100
Buffalo Creek	2,500	1,000	40	1,500	60	24	--	0	24	100
Water-access areas	4,140	1,656	40	2,484	60	225	34	15	191	85
Upstream watersheds	15,840	8,670	55	7,170	45	182	--	0	182	100
Navigation to Doctortown	18,130	14,500	80	3,630	20	222	211	95	11	5

* Costs for purposes and projects are not additive. Costs of projects are included as part of the cost by purpose.

about a $159 million investment cost to carry out the plan to the year 2000. It is proposed that the Federal Government share 28 percent of the investment cost for pollution abatement and about 5 percent of the operation and maintenance cost.

The investment cost and the annual operation, maintenance, and replacements costs for each purpose in the plan and for the reservoir projects and the water-access areas are listed in Table 4.14.

Operation, maintenance, and replacements costs for use in cost-sharing determinations are based on full use of the facilities that are specifically proposed. Since the ultimate need during the period studied will not normally develop until the year 2000, the full operation, maintenance, and replacements costs for the facilities included in the plan are shown as "OM&R at year 2000." The comprehensive plan is designed to meet needs to the year 2000, so additional needs, costs, and benefits that may develop after that year have not been evaluated. This does not ignore or preclude the possibility of adding facilities after the year 2000, to the then existing projects and programs to meet additional needs.

The cost-sharing figures are only illustrative and are subject to change as more detailed studies are made.

Financing

In 1960, Federal, State, county, local, and private expenditures for resource development in the Altamaha basin totaled about $30 million. This was equivalent to about 2 percent of the basin total personal income of $1.6 billion. An estimated 15 percent of this expenditure is for training, technical aid, and other items not included in the comprehensive plan. Thus, the equivalent of 1.7 percent of the personal income was made available for operation, maintenance, and replacements of existing facilities and for new and additional developments similar to those in the plan.

The projects and programs covered by this Report involve some private expenditures and some items of public expenditure which have been made since January 1, 1960, the starting date used for the evaluation. During the period of analysis, the annual personal income in the basin is expected to reach about $2.8 billion by the year 1975, and about $6.5 billion by the year 2000. If the current proportion of personal income is continued to be invested in resource development to the year 2000, funds would be more than adequate to accomplish the plan.

The annual rate of expenditure needed to accomplish the developments of the plan, in total and in relation to personal income, is higher than the previous or current rate during the first 10 to 15 years and diminishes slightly during the last 25 years. This is due to: (1) An immediate demand for facilities not now developed; and (2) the omission of some developments which undoubtedly will be needed in the latter portion of the period 1975-2000, but which were not planned for because the long-range projection of economic conditions used in establishing resource needs was not carried beyond the year 2000.

During the first 10 to 15 years of plan implementation, therefore, there is expected to be a need for additional financing at a rate somewhat higher than that presently prevailing. The developments that should be undertaken are consistent with the needs and opportunities expected to prevail during the period.

Studies indicate that the early action plan to expedite developments now in demand involves capital outlay and operation, maintenance, and replacements costs, during the period 1960-75, that would require raising the annual expenditures about $7 to $8 million above the amounts which would normally be available for work in this basin. The exact amount would depend upon the promptness in implementing the early action phase of the plan.

The Federal expenditure rate in the Altamaha basin is expected to be increased, thus providing part of the needed funds. The remaining funds for this acceleration period are expected to come from non-Federal sources such as: State and local governments, and private individuals and enterprises. In order to avoid overstressing the current tax base and to enable funds in the hands of private individuals and enterprises to be currently available for the private components of the plan, the additional non-Federal funds could come from bond issues, development funds, and State financing.

Responsibility

The responsibility for initiating the plan basically rests with the State and local interests. Even in those fields where a Federal agency is normally the organization which actually performs the detailed planning and construction, the impetus for the planning study must originate with those whom the programs and facilities will benefit.

The comprehensive plan for the Altamaha basin is a combination of projects and programs formulated to meet the needs of the people for land and water resource development. In most cases, the Commission studies have not been carried beyond the reconnaissance level and thus additional detailed planning is required prior to implementation of the plan. The authorizing Act specifically provides that the Commission plan shall not include final project designs and estimates.

The proposed assignment of responsibility for initiating the developments is made in the knowledge that timely and active interest on the part of the State and local leadership is required.

The designations included in Table 4.15 are made in accordance with the following criteria:

(1) If an existing project or program is to

be expanded by the addition of facilities, or acceleration of activity, then the assignment of major responsibility for planning, construction and/or development, and operation is to the agency already having jurisdiction over the existing project or program. For example, if additional facilities are to be provided at a project which is already a Federal project under the administrative supervision of the Corps of Engineers, then this agency would be given major responsibility for planning and construction even though the work might be actually done by other Federal or non-Federal entities.

(2) Where additional facilities are proposed at a project already under non-Federal jurisdiction, then the non-Federal interest is assigned the major responsibility.

(3) Non-Federal programs such as forestry, soil conservation, recreation, fish and wildlife, reclamation, drainage, irrigation, public health, and pollution abatement would continue under non-Federal sponsorship, except where such programs apply to national forests, military reservations, and other Federal holdings. Where a clear-cut conclusion is not readily apparent, then selection is to be made on a case-by-case basis, giving due weight to the pertinent circumstances.

(4) New projects or programs are assigned to Federal agencies for planning, construction, and operation where there is a substantial involvement of hydroelectric power and navigation since this is the general historical pattern. Exceptions are made in the case of navigation improvements where the major portion of the benefits are other than commercial navigation and for hydroelectric power facilities where it was found desirable that such facilities be constructed by non-Federal interests either in their entirety or by contractual agreement with Federal interests.

(5) Historical patterns are also observed in the case of flood control. If the project involves the provision of local protection works on the main stream, then the Federal interests would be responsible for construction and non-Federal interests would be responsible for operation and maintenance. In the case of flood plain management and small reservoir developments located in headwater areas to serve flood control purposes, planning, construction, and operation are designated as non-Federal, although local groups may call upon Federal agencies for assistance in planning.

(6) In the application of the criteria, the incidence of benefits is considered in determining appropriate responsibility. Where benefits are of national significance, Federal responsibility is indicated; where they are local, non-Federal responsibility is indicated. Where these benefits are of regional significance, the matter is decided on a case-by-case basis, considering all of the related circumstances.

(7) In the designation of non-Federal and Federal interest for the major responsibility, there is no intention that such selection would ignore the other interests that may be concerned in planning the details of the proposed program or project. This applies also to construction and operation.

The designation of Federal agencies to have major responsibility for projects and programs generally is made on the basis of the agency usually associated with the purpose having the largest portion of the total allocated costs except for projects involving hydroelectric power which are assigned to the Corps of Engineers.

Where projects and facilities have been historically constructed by Federal agencies and turned over to local groups for operation and maintenance, it is intended that this practice be continued. An example of this is a local flood protection levee on a principal stream.

The non-Federal or Federal interests with the major responsibility for accomplishment, including coordinating the preauthorization planning, obtaining final approval or authorization of specific works or facilities, budgeting for appropriations or other funding, design of structures, administration of construction or installation, and other matters pertinent to planning and construction are indicated in Table 4.15. The designation of Federal and non-Federal is not intended to prejudice joint non-Federal and Federal development of power and other features when and if such a proposal is presented to Congress for final resolution.

Designation of a Federal agency as having the major responsibility for the Federal aspects of each project, regardless of the magnitude of these Federal aspects, is not intended to reflect

TABLE 4.15

Responsibility for Implementing Projects

Major responsibility for implementing designated projects		Project	Early action phase[1]	Purpose[1]	Federal agency with major responsibility for Federal aspects
--	Federal	Abbeville	--	P, R, F&W	Corps of Engineers
Non-Federal	--	Big Flat Creek	--	R, F&W	Bureau of Outdoor Recreation, National Park Service[2]
Non-Federal	--	Curry Cr[illegible]	--	F&W, R, WS	Bureau of Outdoor Recreation, National Park Service[2]
--	Federal	Coopers Ferry	--	P, R, F&W	Corps of Engineers
--	Federal	Goose Creek	E	P, R, F&W	Corps of Engineers
Non-Federal	--	Laurens Shoals	E	P, R, F&W	Federal Power Commission
Non-Federal	--	New Bethel	--	R, F&W	Bureau of Outdoor Recreation, National Park Service[2]
--	Federal	Peachstone	E	P, R, F&W	Corps of Engineers
Non-Federal	--	Townsend	--	FC, D	Soil Conservation Service
Non-Federal	--	Buffalo Creek	E	F&W	Bureau of Sport Fisheries and Wildlife
--	Federal	Navigation to Doctortown	--	N	Corps of Engineers

NOTES: [1] E —Early action phase development
P —Hydroelectric power
R —Recreation
F&W—Fish and wildlife
N —Navigation
WS —Water supply
FC —Flood control
D —Drainage

[2] Designated agency depends on the established division of responsibility between the Bureau of Outdoor Recreation and National Park Service.

any lack of interest by other Federal agencies in a project; in fact, most of the Federal land and water agencies have some interest in each of the projects. In projects involving hydroelectric power where the major responsibility is Federal, the Corps of Engineers would have the major responsibility, and where the major responsibility is non-Federal, the Federal Power Commission would have the major responsibility.

In the general programs not shown in Table 4.15, the division between non-Federal and Federal principal responsibility is made on the basis of ownership of the land or area involved. For example, wildlife or soil conservation programs on non-Federal lands are the principal responsibility of non-Federal entities; forestry programs on a military reservation or national forest are a principal Federal responsibility; and recreation programs on a Federal multiple-purpose reservoir project, which envisions Federal acquisition of the general reservoir area, are a principal Federal responsibility.

Early Action Phase

Action to achieve the comprehensive plan for the 1960-2000 period must be continued throughout the period to develop the basin resources in an orderly manner. In order to meet immediate requirements for developing the basin resources and to help stimulate growth in the basin economic structure, certain projects and programs contained in the comprehensive plan for the basin should be initiated as quickly as detailed plans can be prepared for them and necessary financing and other arrangements can be made.

Basinwide programs for conserving, developing, and utilizing land and water resources have been in operation for some time. Their continuation, expansion, and improvement form an important part of the comprehensive plan. The more urgent projects and programs to be accomplished or in the process of accomplishment during the period from 1960 to 1975 have been included in the action phase of the plan.

Action for implementing these programs and projects would continue for the life of the plan and would generally increase gradually in proportion to population and economic growth. However, there are certain components of the program on which action should be started early. Included in this category are improvement works having a long timelag between initial action and full utilization; activities for conserving and protecting resources for future use; and items that require special emphasis or action to bring them in balance with general development.

Early action should be initiated on the Goose Creek, Peachstone, and Laurens Shoals projects. The lands should be acquired; the dams, reservoirs, and powerplants constructed; and the basic facilities installed for recreation and fish and wildlife to meet the needs to 1975. These projects will provide an installed capacity of 288,000 kilowatts of electrical power and will generate 416 million kilowatt-hours of electrical energy annually. Projects will provide for 2,050,000 user-days annually for recreation and some 200,000 user-days annually for fishing. It is estimated that about 95 percent of the total investment cost for the projects would be incurred in the early action phase.

Following feasibility studies, land should be acquired at an early date for the New Bethel and Big Flat Creek sites to prevent these sites from being preempted for other purposes.

Forty-two water-access areas should be developed in the early action phase for fish and wildlife and recreation. Three of these would be on salt water. It is estimated that about 83 percent of the investment costs for access areas will be incurred in the early action phase.

Upstream watershed projects should be developed for flood prevention and drainage on some 898,000 acres of land in the early action phase. Over 60 percent of the installation costs included in the plan will be incurred for this work.

Water supply facilities should be installed early to catch up with present needs and to keep abreast of increasing future needs. It is estimated that costs for water facilities in the early action phase will be about 100 percent of the ultimate plan for domestic, 36 percent for municipal, and 30 percent for industrial water supply.

The installation of irrigation and drainage programs will depend to a great extent on the desires and needs of individuals and small groups to replace marginal units, improve farm efficiency, improve land use, as alternatives to other improved management practices. It is estimated that about 38 percent of the total investment costs for these programs would be required in the early action phase.

While the utilization of soil resources will be largely controlled by current requirements, all reasonable effort should be expended to apply adequate soil conservation practices as quickly as possible on all land not now protected. All possible permanent conservation measures remaining to be applied should be installed in the early action phase. It is estimated that this would require about 38 percent of the total investment costs for this program.

To protect and conserve forests for future use, the major parts of tree planting and fire, insect, and disease control facilities should be installed in the early action phase. To facilitate the present and future operation of the forestry program, forestry education and research should be given early emphasis, and drainage and road facilities should be installed. It is estimated that about 39 percent of the installation costs for total forest conservation and utilization programs would be expended in the early action phase.

The improvement of existing wildlife facilities, extensive development and supporting programs of research, education, and enforcement activities should be initiated in the early action phase. Likewise for sport fishing, improvement of existing facilities on the rivers and small and large impoundments, new facilities on salt water, and supporting activities should be initiated in the early action phase. It is estimated that about 71 percent of the investment costs of the total fish and wildlife program would be expended for this part of the program.

The commercial fisheries program should be initiated and all investment costs expended in the early action phase to restore this basic local industry.

Some features of the recreation program will require action ahead of that required for gradual development to meet current needs. These are the designation of recreational areas

for future use, the acquisition of needed lands, and the installation of basic facilities required for future expansion. It is estimated that about 53 percent of the total investment costs would be expended in the early action phase.

Immediate action should be taken to develop a long-range plan for the adequate handling of the liquid wastes. Such wastes must ultimately be discharged into the water courses and volume will increase in direct proportion to growth and development. Early action on pollution control is one of the most critical needs in the basin. Treatment should be provided for all untreated effluent now entering the streams. It is estimated that 40 percent of the investment cost for pollution control for municipalities and 67 percent for industries will be incurred in the early action phase.

The public health programs of vector control, solid-waste collection and disposal, and air pollution and radiation monitoring programs should also be initiated to protect and maintain the healthful environment of the basin for the benefit of its residents and attraction for the location of industry, as well as tourists and recreationists. It is expected that these programs would be initiated and carried out on an annual operations and maintenance base.

The investment cost of the early action phase is about half that of the total investment cost of the projects and programs in the comprehensive plan. An analyses of the investment costs by projects and programs in the early action phase are shown in Table 4.16.

TABLE 4.16

Summary of Early Action Investment Costs (thousands of dollars)

Project or program	Investment to 1975
Goose Creek	97,780
Laurens Shoals	65,970
Peachstone	19,150
Buffalo Creek—Oconee River fish and wildlife project	2,500
Water-access areas	3,400
Upstream watersheds	9,820
Water supplies	35,370
Irrigation	2,377
Drainage*	53
Soil conservation	16,150
Forest conservation	35,000
Wildlife and sport fisheries*	926
Commercial fisheries	65
Recreation*	35,360
Pollution abatement	79,530
Public health	2,800

*Data presented are exclusive of investments associated with multiple-purpose projects.

SECTION V – PROJECTS AND PROGRAMS

The comprehensive plan for the Altamaha basin includes both specific projects, usually multiple purpose in concept, and general programs, usually single purpose in concept, but which often involve compatible multiple uses. The developments, both specific projects and general programs in combination, are necessary to meet the growing resources development needs. Resource developments either existing or under construction as of 1960 are a necessary part of the plan, however, only the proposals for new developments and for expansion of existing developments to be made during the period 1960-2000 are presented in this Section.

In order to bring the data for multiple-purpose developments together and to provide analysis of costs and benefits by States, each project and single-purpose development are summarized in the pages that follow. Data for entire projects and single-purpose developments are provided and investment costs to be incurred in the early action phase are also shown.

In addition to the impacts discussion for each project and program in this Section, more general economic impacts stemming from the comprehensive plan are discussed in Section III, Part Four, Impacts of the Plan.

All elevations shown are related to mean sea level. Spillway discharges shown were estimated for a reservoir water surface at maximum pool elevation.

ABBEVILLE PROJECT

Location

The Abbeville damsite is on the Ocmulgee River, about 1 mile north of Abbeville, Georgia, and 15 miles southwest of Eastman.

Plan

The plan provides for a dam and reservoir for hydroelectric power, recreation, and fish and wildlife. It includes a concrete gravity-type bulkhead section across the main channel with a rolled-earth embankment to the right and a concrete gravity spillway and rolled-earth embankment to the left.

The normal pool elevation will be at elevation 225 feet and will provide a 54,200-acre pool and 1,475,000 acre-feet of storage.

The project would have a 50,000-kilowatt hydroelectric powerplant and would generate 126.1 million kilowatt-hours annually. There will be 3,000 acres for recreation areas, including three access areas for fishing.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	4,500
Dam		
Top elevation	ft.	235
Maximum height	ft.	73
Length	ft.	23,700
Spillway		
Crest elevation	ft.	195
Effective length	ft.	682
Design discharge	c.f.s.	440,000
Reservoir		
Minimum design pool elevation	ft.	210
Normal full pool elevation	ft.	225
Maximum design pool elevation	ft.	230
Normal full pool area	acre	54,200
Minimum design pool area	acre	39,000
Normal full pool capacity	acre-ft.	1,475,000
Minimum design pool capacity	acre-ft.	776,000
Recreation and fishery development, three areas	acre	3,000
Recreation	user-day	850,000
Fishing	user-day	216,900
Hydroelectric powerplant		
Installed capacity	kw.	50,000
Annual energy output	million kw.-hr.	126.1

Benefits

Annual Equivalent Primary Tangible ($1,000)

Power	1,500
Recreation	1,640
Fish and wildlife	266
Total	3,406

Impacts

Significant benefits would stem from this project from sales of food, beverage, lodging, gasoline, and recreation and fishing equipment as a result of increased recreational activity. It is anticipated that land enhancement and home construction adjacent to and near the project would also tend to broaden the tax base. All of these items would have a great and lasting impact on the local economy and could assist in providing the repayment ability for the local share of project costs.

The availability of a large body of cooling water could induce much needed manufacturing and industrial development.

Costs ($1,000)

	Early action	Total
Investment		
Dam and reservoir	0	33,630
Power facilities	0	12,840
Recreation facilities	0	4,120
Fish and wildlife facilities	0	170
Total	0	50,760
Annual Equivalent		
Investment		1,841
Operation, maintenance, and replacements		445
Taxes foregone		385
Total		2,671

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Power	29,950	*1,638	162	162
Recreation	14,360	768	250	283
Fish and wildlife	6,450	265	33	33
Total	50,760	*2,671	445	478

*Includes $385,000 for taxes foregone.

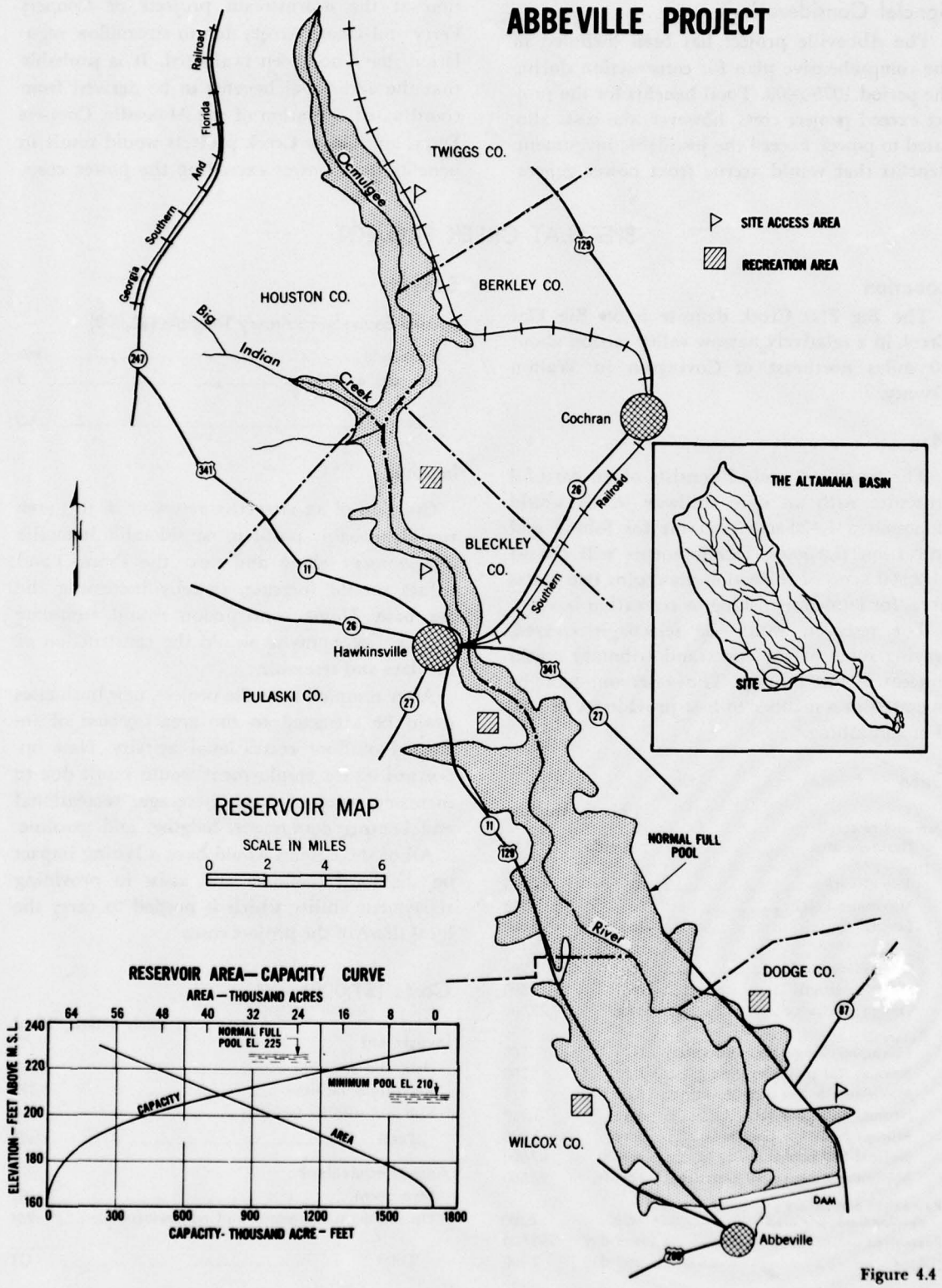

ABBEVILLE PROJECT
TWIGGS CO.
Ocmulgee
SITE ACCESS AREA
RECREATION AREA
HOUSTON CO.
BERKLEY CO.
Big Indian Creek
Cochran
THE ALTAMAHA BASIN
SITE
BLECKLEY CO.
Hawkinsville
PULASKI CO.
RESERVOIR MAP
SCALE IN MILES
0 2 4 6
NORMAL FULL POOL
River
DODGE CO.
WILCOX CO.
DAM
Abbeville
RESERVOIR AREA— CAPACITY CURVE
AREA — THOUSAND ACRES
64 56 48 40 32 24 16 8 0
NORMAL FULL POOL EL. 225
MINIMUM POOL EL. 210
CAPACITY
AREA
ELEVATION - FEET ABOVE M.S.L.
240 220 200 180 160
0 300 600 900 1200 1500 1800
CAPACITY- THOUSAND ACRE - FEET

Figure 4.4

Special Considerations

The Abbeville project has been included in the comprehensive plan for construction during the period 1975-2000. Total benefits for the project exceed project costs, however, the costs allocated to power, exceed the justifiable investment. Benefits that would accrue from power generation at the downstream projects of Coopers Ferry and Goose Creek, due to streamflow regulation, have not been evaluated. It is probable that the additional benefits to be derived from coordinated operation of the Abbeville, Coopers Ferry, and Goose Creek projects would result in benefits from power exceeding the power costs.

BIG FLAT CREEK PROJECT

Location

The Big Flat Creek damsite is on Big Flat Creek in a relatively narrow valley section about 10 miles northeast of Covington in Walton County.

Plan

The proposed project consists of an earthfill structure with an ogee spillway which would impound a 1,420-acre reservoir for fishing and recreation purposes. Developments will consist of 2,500 acres of recreation area, plus two access areas for launching fishing or recreation boats.

The reservoir would be selectively cleared, leaving some of the coves and tributary creeks uncleared for fishing. The reservoir will be operated in a manner to best provide for recreation and fishing.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	38
Dam		
Top elevation	ft.	720
Maximum height	ft.	70
Length	ft.	2,000
Spillway		
Crest elevation	ft.	709
Effective length	ft.	500
Design discharge	c.f.s.	23,500
Reservoir		
Minimum design pool elevation	ft.	709
Normal full pool elevation	ft.	709
Maximum design pool elevation	ft.	715
Normal full pool area	acre	1,420
Minimum design pool area	acre	1,420
Normal full pool capacity	acre-ft.	22,500
Minimum design pool capacity	acre-ft.	22,500
Recreation and fishery development, one area	acre	2,500
Recreation	user-day	750,000
Fishing	user-day	2,700

Benefits

Annual Equivalent Primary Tangible ($1,000)

Recreation	960
Fish and wildlife	3
Total	963

Impacts

Creation of an attractive reservoir in this area would probably result in considerable homesite development along and near the shore. Land values should increase, thereby increasing the tax base. Home construction would stimulate the local economy as would the construction of the dam and reservoir.

After completion of the project, new businesses could be attracted to the area because of increased outdoor recreational acitvity. New opportunities for employment would result due to increased sales of food, beverage, recreational and boating equipment, lodging, and gasoline.

All of these items would have a lasting impact on the local economy and assist in providing repayment ability which is needed to carry the local share of the project costs.

Costs ($1,000)

	Early action	Total
Investment		
Dam and reservoir	0	2,783
Recreation facilities	0	3,775
Fish and wildlife facilities	0	15
Total	0	6,573
Annual Equivalent		
Investment		237
Operation, maintenance, and replacements		234
Total		471

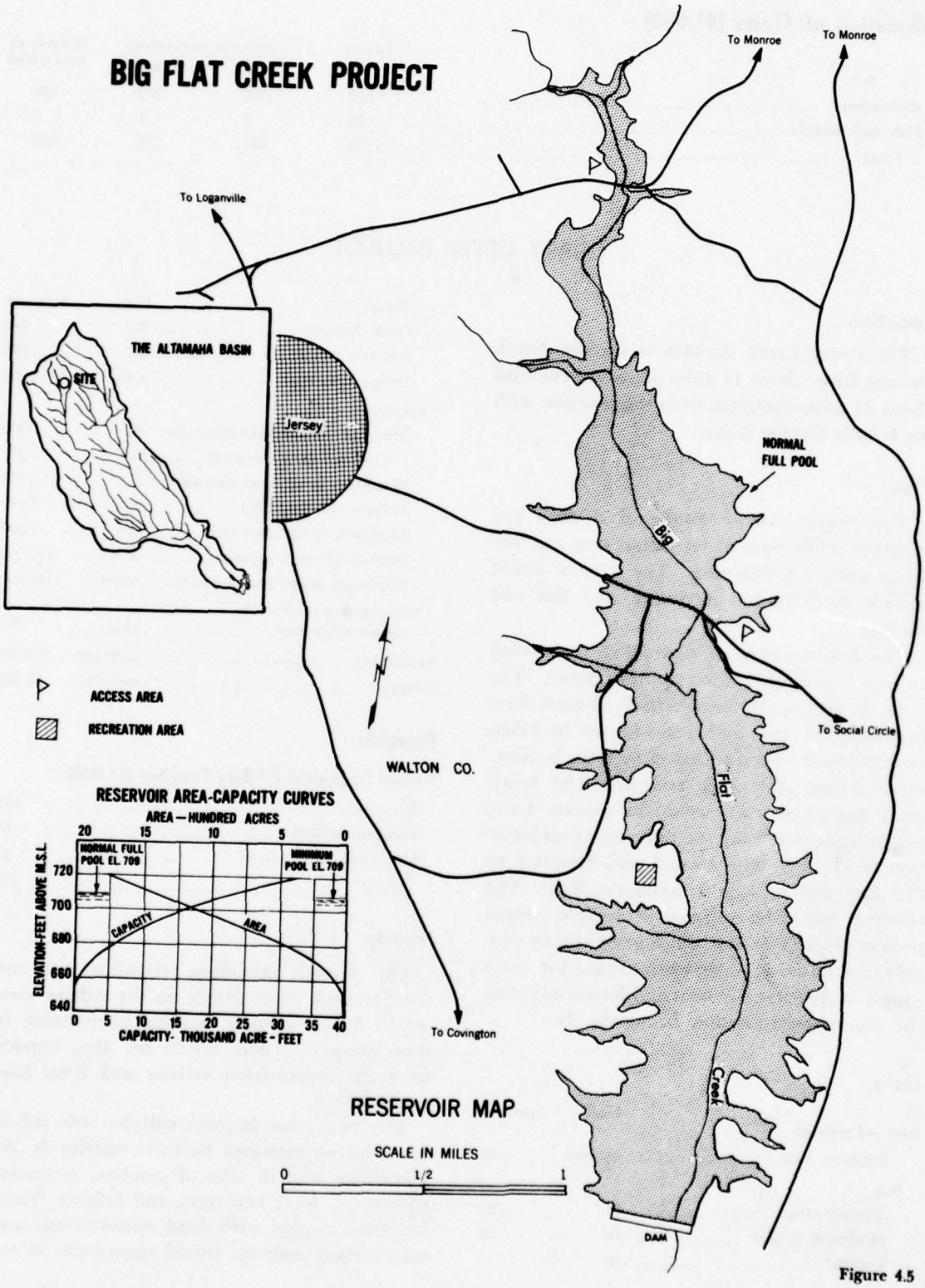

BIG FLAT CREEK PROJECT
To Monroe
To Monroe
To Loganville
THE ALTAMAHA BASIN
SITE
Jersey
NORMAL FULL POOL
Big
Flat
Creek
To Social Circle
ACCESS AREA
RECREATION AREA
WALTON CO.
RESERVOIR AREA-CAPACITY CURVES
AREA — HUNDRED ACRES
20 15 10 5 0
NORMAL FULL POOL EL. 709
MINIMUM POOL EL. 709
ELEVATION-FEET ABOVE M.S.L.
720
700
680
660
640
CAPACITY
AREA
0 5 10 15 20 25 30 35 40
CAPACITY- THOUSAND ACRE-FEET
To Covington
RESERVOIR MAP
SCALE IN MILES
0 1/2 1
DAM

Figure 4.5

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Recreation	6,500	468	233	238
Fish and wildlife	73	3	1	1
Total	6,573	471	234	239

CURRY CREEK PROJECT

Location

The Curry Creek damsite is on the North Oconee River about 12 miles above Athens, and about 23 miles upstream from the junction with the Middle Oconee River.

Plan

The project would consist of a dam and reservoir, 4,000 acres of recreation area and two access areas for fishermen. The project would include facilities for recreation and fish and wildlife.

The dam would be an earthfill structure with an ogee spillway section in the center. The reservoir area would be selectively cleared, leaving uncleared coves and creeks for use by fishermen and larger open waters cleared for boating, water skiing, and other activities. The beach areas and access areas would be cleared. Land would be acquired for the reservoir to an elevation of 715 feet. The normal pool elevation at 710 feet will provide a 5,800-acre pool. The reservoir would be operated at as near normal pool as practicable, but sluice gates will be provided for releasing water when needed for water supply at the city of Athens and for maintaining the minimum streamflow below the dam.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	181
Dam		
Top elevation	ft.	720
Maximum height	ft.	78
Length	ft.	1,840
Spillway		
Crest elevation	ft.	710
Effective length	ft.	900
Design discharge	c.f.s.	110,000
Reservoir		
Minimum design pool elevation	ft.	709
Normal full pool elevation	ft.	710
Maximum design pool elevation	ft.	715
Normal full pool area	acre	5,800
Minimum design pool area	acre	5,600
Normal full pool capacity	acre-ft.	172,000
Minimum design pool capacity	acre-ft.	168,000
Minimum flow required in stream below dam	c.f.s.	9.6
Recreation	user-day	350,000
Fishing	user-day	11,400

Benefits

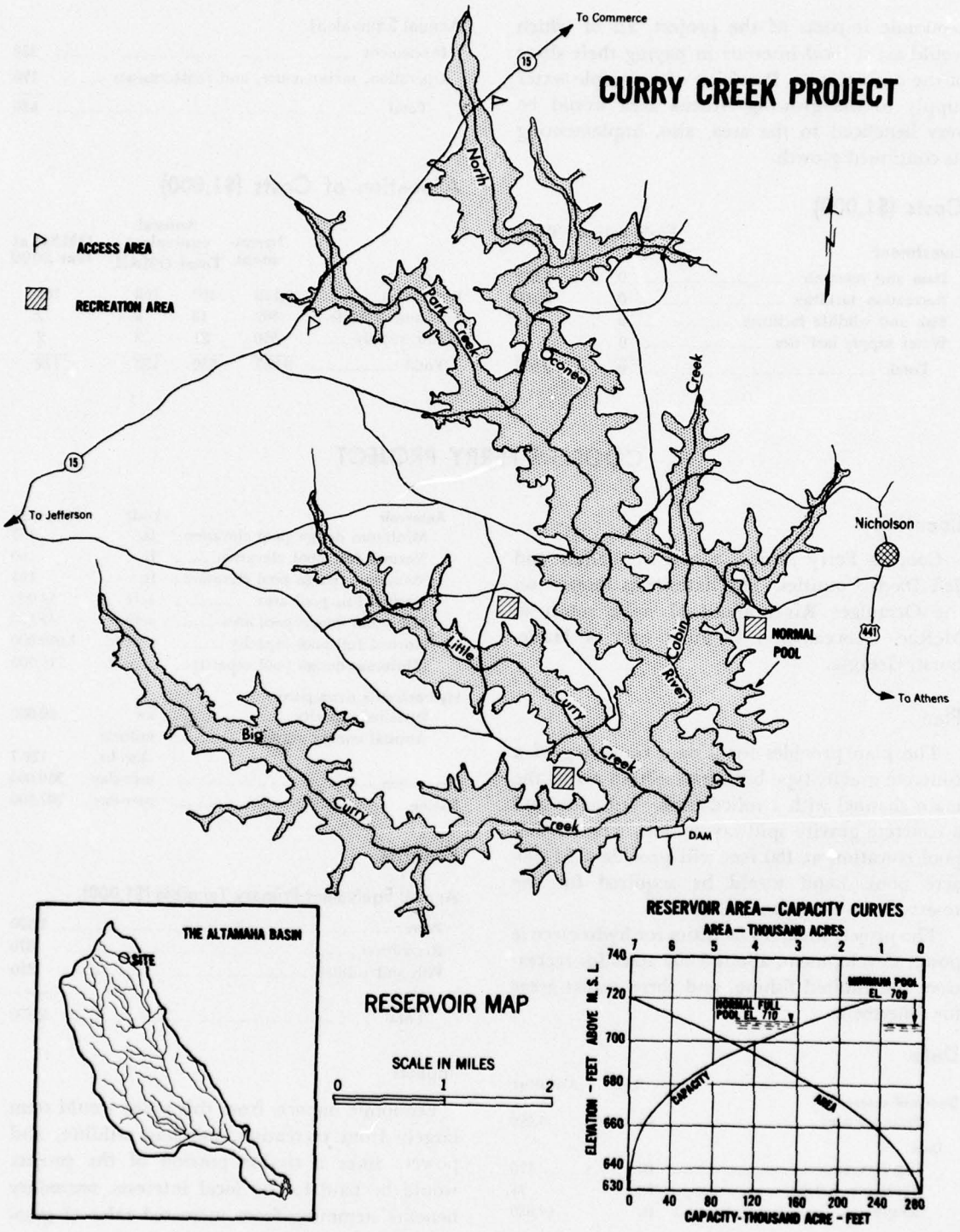
Annual Equivalent Primary Tangible ($1,000)

Recreation	554
Fish and wildlife	14
Municipal water supply	52
Total	620

Impacts

This project, providing recreation, fish and wildlife, and water supply to the Athens area, would have economic impacts attributable to these projects. There would be, also, impacts from the construction activity and from land enhancement.

The recreation impacts will be reflected in the form of increased business activity in the immediate area in sales of gasoline, recreation equipment, food, beverages, and lodging. These benefits, coupled with land enhancement and construction activity, would contribute to the



RESERVOIR MAP

SCALE IN MILES

0 1 2

Figure 4.6

economic impacts of the project, all of which would assist local interests in paying their share of the project costs. Provision of an ample water supply to the growing Athens area would be very beneficial to the area, also, implementing its continued growth.

Costs ($1,000)

Investment	Early action	Total
Dam and reservoir	0	7,272
Recreation facilities	0	2,700
Fish and wildlife facilities	0	15
Water supply facilities	0	—
Total	0	9,987

Annual Equivalent

Investment	360
Operation, maintenance, and replacements	170
Total	530

Allocation of Costs ($1,000)

	Investment	Annual equivalent Total	Annual equivalent OM&R	OM&R at year 2000
Recreation	9,130	496	166	168
Fish and wildlife	307	13	2	2
Water supply	550	21	2	2
Total	9,987	530	170	172

COOPERS FERRY PROJECT

Location

Coopers Ferry project site is in Telfair and Jeff Davis Counties. The damsite is located on the Ocmulgee River about 17 miles south of McRae, Georgia, and 12 miles west of Hazlehurst, Georgia.

Plan

The plan provides for a dam consisting of a concrete gravity-type bulkhead section across the main channel with a rolled-earth abutments and a concrete gravity spillway section. The normal pool elevation at 160 feet will provide a 54,000-acre pool. Land would be acquired for the reservoir to elevation 165 feet.

The project includes facilities for hydroelectric power development, about 3,000 acres for recreation and limited fishing, and three access areas for fishermen.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	4,950
Dam		
Top elevation	ft.	170
Maximum height	ft.	71
Length	ft.	14,620
Spillway		
Crest elevation	ft.	113
Effective length	ft.	761
Design discharge	c.f.s.	440,200
Reservoir		
Minimum design pool elevation	ft.	153
Normal full pool elevation	ft.	160
Maximum design pool elevation	ft.	165
Normal full pool area	acre	54,000
Minimum design pool area	acre	41,500
Normal full pool capacity	acre-ft.	1,050,000
Minimum design pool capacity	acre-ft.	715,000
Hydroelectric powerplant		
Installed capacity	kw.	50,000
Annual energy output	million kw.-hr.	128.7
Recreation	user-day	350,000
Fishing	user-day	207,500

Benefits

Annual Equivalent Primary Tangible ($1,000)

Power	1,500
Recreation	670
Fish and wildlife	230
Total	2,400

Impacts

Economic impacts from this point would stem largely from recreation, fish and wildlife, and power. Since a sizable portion of the project would be paid for by local interests, secondary benefits stemming from increased sales of gasoline, food, beverages, lodging, and recreation and fishing equipment are of particular interest locally. More recreational activities would result

COOPERS FERRY PROJECT

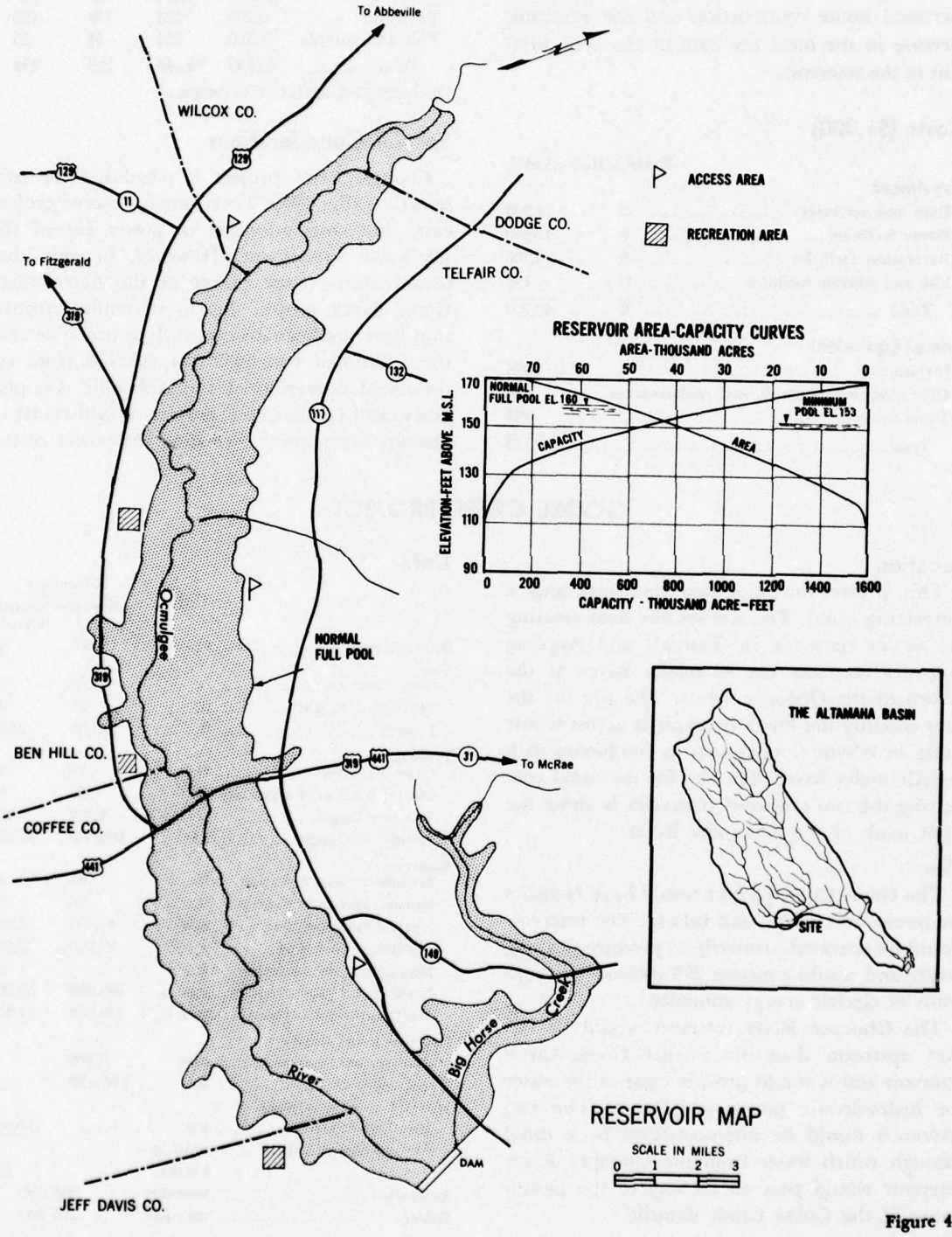


Figure 4.7

in increased business and employment in services and trades catering to these activities.

Considerable local impacts are also expected from such items as increased land values and increased home construction and the resulting increase in the local tax base in the area adjacent to the reservoir.

Costs ($1,000)

	Early action	Total
Investment		
Dam and reservoir	0	27,200
Power facilities	0	11,840
Recreation facilities	0	1,700
Fish and wildlife facilities	0	160
Total	0	40,900
Annual Equivalent		
Investment		1,474
Operation, maintenance, and replacements		296
Taxes foregone		383
Total		2,153

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Power	29,850	*1,606	145	145
Recreation	5,700	323	118	120
Fish and wildlife	5,350	224	33	33
Total	40,900	*2,153	296	298

*Includes $383,000 for taxes foregone.

Special Considerations

Coopers Ferry project is scheduled for construction after 1975. Total benefits exceed project costs, but costs allocated to power exceed the justifiable investment. However, benefits that would accrue from power at the downstream Goose Creek project due to streamflow regulation have not been evaluated. It is probable that the additional benefits to be derived from coordinated operation of the Abbeville, Coopers Ferry, and Goose Creek projects would result in benefits from power exceeding the power costs.

GOOSE CREEK PROJECT

Location

This project includes two reservoirs and a connecting canal. The site for the dam creating the upper reservoir in Tattnall and Appling Counties is across the Altamaha River at the mouth of the Ohoopee River. The site for the dam creating the lower reservoir is across Goose Creek in Wayne County near its confluence with the Altamaha River. The site for the canal connecting the two proposed reservoirs is along the right bank of the Altamaha River.

Plan

The Goose Creek project would have facilities for power, recreation, and fishing. The reservoir would be operated primarily to produce peaking power and would generate 275 million kilowatt-hours of electric energy annually.

The Ohoopee River reservoir would be farther upstream than the smaller Goose Creek reservoir and it would provide most of the water for hydroelectric power generation. The two reservoirs would be interconnected by a canal through which water from the Ohoopee River reservoir would pass on its way to the powerhouse at the Goose Creek damsite.

Data

	Unit	Reservoir	
		Ohoopee	Goose Creek
Drainage area	sq. mile	13,220	60
Dam			
Top elevation	ft.	100	100
Maximum height	ft.	65	85
Length	ft.	24,030	2,950
Spillway			
Crest elevation	ft.	70	70
Design flood pool elevation	ft.	95	95
Effective length	ft.	1,432	200
Design discharge	c.f.s.	680,000	95,000
Reservoir			
Minimum pool elevation	ft.	81	81
Normal full pool elevation	ft.	90	90
Normal full pool area	acre	46,000	4,000
Minimum pool area	acre	27,000	2,900
Maximum pool elevation	ft.	---	95
Normal full pool capacity	acre-ft.	665,000	86,000
Minimum pool capacity	acre-ft.	335,000	51,000
Recreation and fishery development, four areas	acre	3,000	---
Canal, minimum size	ft.	110 x 20	---
Hydroelectric powerplant			
Installed capacity	kw.	---	180,000
Annual energy output	million kw.-hr.	---	275
Recreation	user-day	350,000	
Fishing	user-day	205,200	

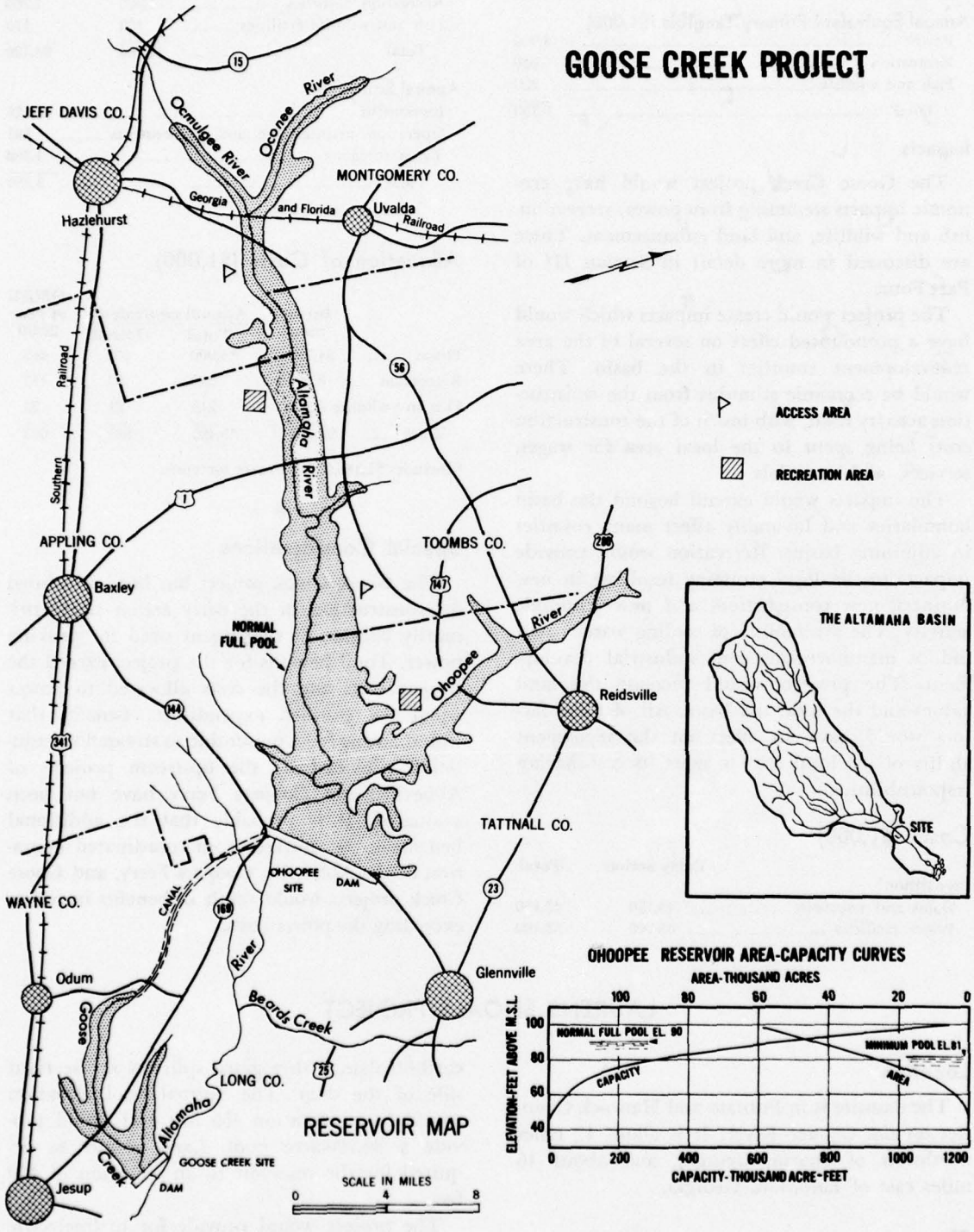

GOOSE CREEK PROJECT
JEFF DAVIS CO.
Ocmulgee River
Oconee River
MONTGOMERY CO.
Georgia and Florida Railroad
Uvalda
Hazlehurst
Railroad
Southern
Altamaha River
ACCESS AREA
RECREATION AREA
APPLING CO.
Baxley
TOOMBS CO.
NORMAL FULL POOL
Ohoopee River
Reidsville
THE ALTAMAHA BASIN
SITE
TATTNALL CO.
OHOOPEE DAM SITE
WAYNE CO.
CANAL
Odum
Glennville
Beards Creek
Goose Creek
LONG CO.
Altamaha River
GOOSE CREEK SITE DAM
Jesup
RESERVOIR MAP
SCALE IN MILES
0 4 8
OHOOPEE RESERVOIR AREA-CAPACITY CURVES
AREA-THOUSAND ACRES
100 80 60 40 20 0
NORMAL FULL POOL EL. 90
MINIMUM POOL EL. 81
CAPACITY
AREA
ELEVATION-FEET ABOVE M.S.L.
100 80 60 40
0 200 400 600 800 1000 1200
CAPACITY-THOUSAND ACRE-FEET

Figure 4.8

Benefits

Annual Equivalent Primary Tangible ($1,000)

Power	4,900
Recreation	630
Fish and wildlife	220
Total	5,750

Impacts

The Goose Creek project would have economic impacts stemming from power, recreation, fish and wildlife, and land enhancement. These are discussed in more detail in Section III of Part Four.

The project would create impacts which would have a pronounced effect on several of the area redevelopment counties in the basin. There would be economic stimulus from the construction activity itself, with much of the construction costs being spent in the local area for wages, services, and materials.

The impacts would extend beyond the basin boundaries and favorably affect many counties in adjoining basins. Recreation would provide impacts to the local economy resulting in new business, new construction, and new economic activity. The availability of cooling water could induce manufacturing and industrial development. The projects would increase the land values and the local tax bases. All of these factors would have an effect on the repayment ability of the local area to meet its cost-sharing responsibilities.

Costs ($1,000)

	Early action	Total
Investment		
Dams and reservoirs	43,150	43,150
Power facilities	53,100	53,100
Recreation facilities	1,400	1,700
Fish and wildlife facilities	130	170
Total	97,780	98,120
Annual Equivalent		
Investment		3,528
Operation, maintenance, and replacements		581
Taxes foregone		1,386
Total		5,495

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Power	84,750	*4,900	463	463
Recreation	8,000	380	97	117
Fish and wildlife	5,370	215	21	23
Total	98,120	*5,495	581	603

*Includes $1,386,000 for taxes foregone.

Special Considerations

The Goose Creek project has been scheduled for construction in the early action phase primarily because of the urgent need for peaking power. Total benefits for the project exceed the project costs and the costs allocated to power equal the justified expenditure. Benefits that would accrue from power due to streamflow regulation provided by the upstream projects of Abbeville and Coopers Ferry have not been evaluated. It is probable that the additional benefits to be derived from coordinated operation of the Abbeville, Coopers Ferry, and Goose Creek projects would result in benefits in power exceeding the power costs.

LAURENS SHOALS PROJECT

Location

The damsite is in Putnam and Hancock Counties on the Oconee River. It is about 12 miles northwest of Sparta, Georgia, and about 16 miles east of Eatonton, Georgia.

Plan

The project would include a concrete and earthfill dam with a gated spillway at the right side of the dam. The normal pool elevation would be at elevation 455 feet and would provide a 38,700-acre pool. Land would be acquired for the reservoir to an elevation of 460 feet.

The project would provide for hydroelectric power for peaking purposes, recreation, and fish and wildlife use. The hydroelectric powerplant

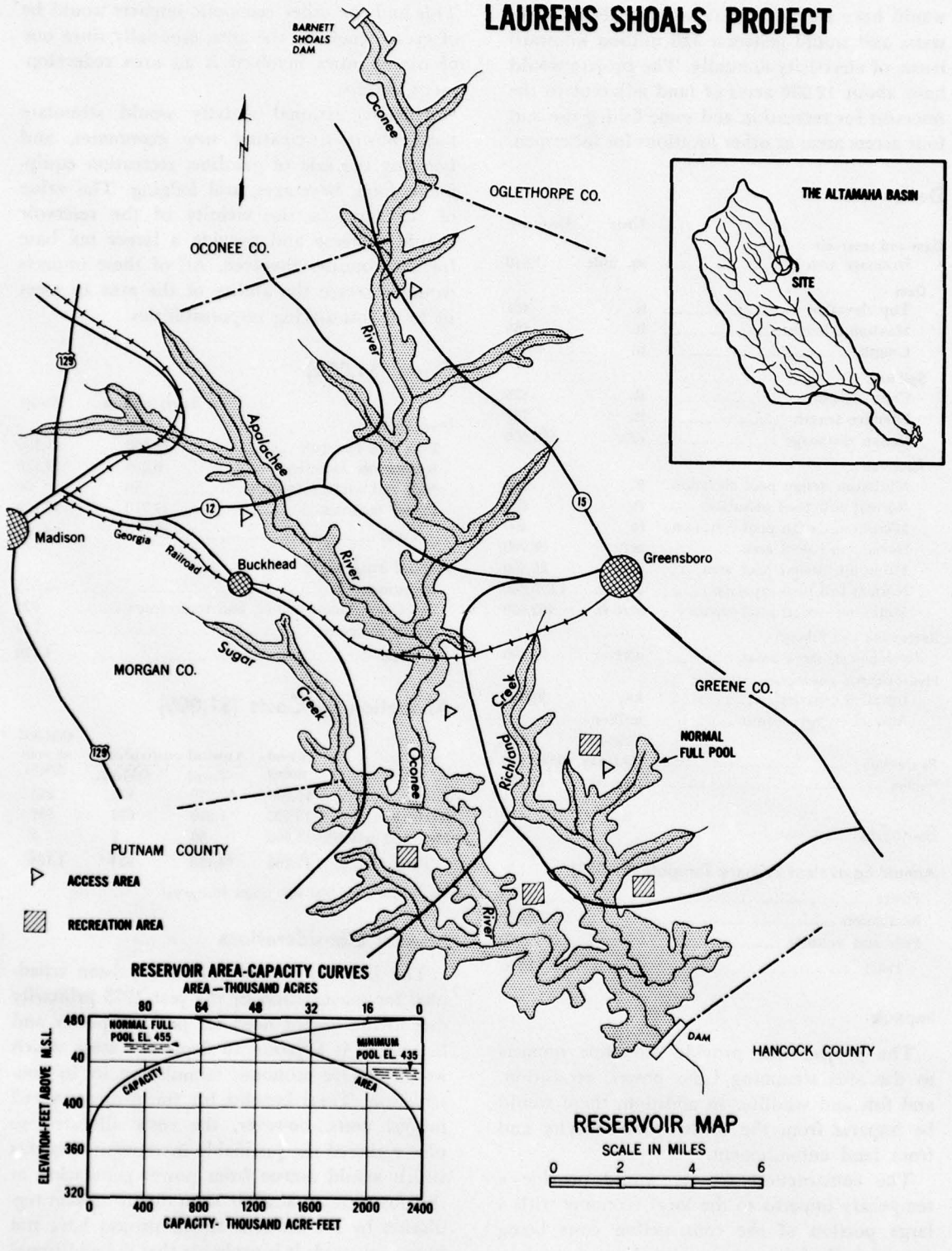

LAURENS SHOALS PROJECT
BARNETT SHOALS DAM
Oconee
N
OGLETHORPE CO.
OCONEE CO.
THE ALTAMAHA BASIN
SITE
River
129
Apalachee
12
15
Madison
Georgia
Railroad
Buckhead
River
Greensboro
Sugar
Creek
MORGAN CO.
GREENE CO.
Richland Creek
NORMAL FULL POOL
Oconee
129
PUTNAM COUNTY
ACCESS AREA
RECREATION AREA
River
DAM
HANCOCK COUNTY
RESERVOIR AREA-CAPACITY CURVES
AREA—THOUSAND ACRES
80
64
48
32
16
0
480
40
400
360
320
NORMAL FULL POOL EL. 455
MINIMUM POOL EL. 435
CAPACITY
AREA
ELEVATION-FEET ABOVE M.S.L.
0
400
800
1200
1600
2000
2400
CAPACITY- THOUSAND ACRE-FEET
RESERVOIR MAP
SCALE IN MILES
0
2
4
6

Figure 4.9

would have an installed capacity of 95,000 kilowatts and would generate 120 million kilowatt-hours of electricity annually. The project would have about 12,000 acres of land adjacent to the reservoir for recreation and some fishing use and four access areas at other locations for fishermen.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	1,840
Dam		
Top elevation	ft.	465
Maximum height	ft.	165
Length	ft.	6,090
Spillway		
Crest elevation	ft.	425
Effective length	ft.	727
Design discharge	c.f.s.	478,000
Reservoir		
Minimum design pool elevation	ft.	435
Normal full pool elevation	ft.	455
Maximum design pool elevation	ft.	460
Normal full pool area	acre	38,700
Minimum design pool area	acre	20,400
Normal full pool capacity	*acre-ft.*	*1,070,000*
Minimum design pool capacity	acre-ft.	462,000
Recreation and fishery development, three areas	acre	12,000
Hydroelectric powerplant		
Installed capacity	kw.	95,000
Annual energy output	million kw.-hr.	120
Recreation	user-day	3,000,000
Fishing	user-day	72,700

Benefits

Annual Equivalent Primary Tangible ($1,000)

Power	2,520
Recreation	4,460
Fish and wildlife	60
Total	7,040

Impacts

The project will provide economic impacts to the area stemming from power, recreation, and fish and wildlife. In addition, there would be impacts from the construction activity and from land enhancement.

The construction activity would provide a temporary impetus to the local economy with a large portion of the construction costs being spent locally for wages, materials, and services. This and the other economic impacts would be of great benefit to the area, especially since one of the counties involved is an area redevelopment county.

This recreational activity would stimulate local business, creating new economies, and boosting the sale of gasoline, recreation equipment, food, beverages, and lodging. The value of the land in the vicinity of the reservoir should increase and provide a larger tax base for the counties involved. All of these impacts would increase the ability of the area to meet its local cost-sharing responsibilities.

Costs ($1,000)

	Early action	Total
Investment		
Dam and reservoir	41,300	41,300
Recreation facilities	6,850	13,130
Fish and wildlife facilities	50	60
Power facilities	17,770	17,770
Total	65,970	72,260
Annual Equivalent		
Investment		2,516
Operation, maintenance, and replacements		924
Taxes foregone		730
Total		4,170

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Power	51,200	*2,860	285	284
Recreation	19,500	1,250	633	833
Fish and wildlife	1,560	60	7	7
Total	72,260	*4,170	924	1,124

*Includes $730,000 for taxes foregone.

Special Considerations

The Laurens Shoals project has been scheduled for construction by the year 1975 primarily due to the urgent need for peaking power and because it is adjacent to depressed areas which would receive economic stimulation by its construction. Total benefits for the project exceed project costs, however, the costs allocated to power exceed the justifiable investment. Benefits which would accrue from power generation at the downstream Sinclair Dam due to stream regulation by the Laurens Shoals project have not been evaluated. It is probable that the additional

benefits to be derived from coordinated operation of the Laurens Shoals and Sinclair projects would result in benefits from power exceeding the costs. Additional benefits may, also, accrue from the Laurens Shoals project by furnishing cooling water into Lake Sinclair. Water for cooling purposes will be used from this lake in connection with the operation of the steam-electric plant now under construction adjacent to Lake Sinclair.

NEW BETHEL PROJECT

Location

The damsite is on Yellow River in Rockdale County about 1 mile east of the DeKalb County line. The reservoir site is in Rockdale, Gwinnett, and DeKalb Counties, and it extends upstream on Stone Mountain Creek almost to a new lake in Stone Mountain Park.

Plan

The project would include an earthfill dam with a gated concrete spillway. At the normal operating pool, the surface area of the reservoir is 1,540 acres. Development will include about 3,500 acres of land for recreation and limited fishing use and three access areas for fishermen.

The project is primarily for recreation. The reservoir would be selectively cleared and certain areas would be set aside for various types of recreation.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	191
Dam		
Top elevation	ft.	795
Maximum height	ft.	85
Length	ft.	1,100
Top width	ft.	20
Spillway		
Crest elevation	ft.	760
Effective length	ft.	168
Design discharge	c.f.s.	76,400
Reservoir		
Minimum design pool elevation	ft.	780
Normal full pool elevation	ft.	780
Maximum design pool elevation	ft.	785
Normal full pool area	acre	1,540
Minimum design pool area	acre	1,540
Normal full pool capacity	acre-ft.	32,800
Minimum design pool capacity	acre-ft.	32,800
Recreation	user-day	1,250,000
Fishing	user-day	2,900

Benefits

Annual Equivalent Primary Tangible ($1,000)

Recreation	1,892
Fish and wildlife	3
Total	1,895

Impacts

The economic impacts from this project would stem from recreation and fish and wildlife activities. Sales of gasoline, recreation equipment, food, beverages, and lodging in the area would be of great benefit to the local economy. Coupled with the nearby attraction of Stone Mountain and its potential drawing power, the reservoir will supplement the recreation facilities planned there. Being near metropolitan Atlanta as well, it should attract many recreationists. All of these aspects would increase the ability and willingness of local interests to meet their cost-sharing responsibility.

Costs ($1,000)

	Early action	Total
Investment		
Dam and reservoir	0	2,800
Recreation facilities	0	5,485
Fish and wildlife facilities	0	15
Total	0	8,300
Annual Equivalent		
Investment		300
Operation, maintenance, and replacements		348
Total		648

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Recreation	8,250	645	347	356
Fish and wildlife	50	3	1	1
Total	8,300	648	348	357

NEW BETHEL PROJECT

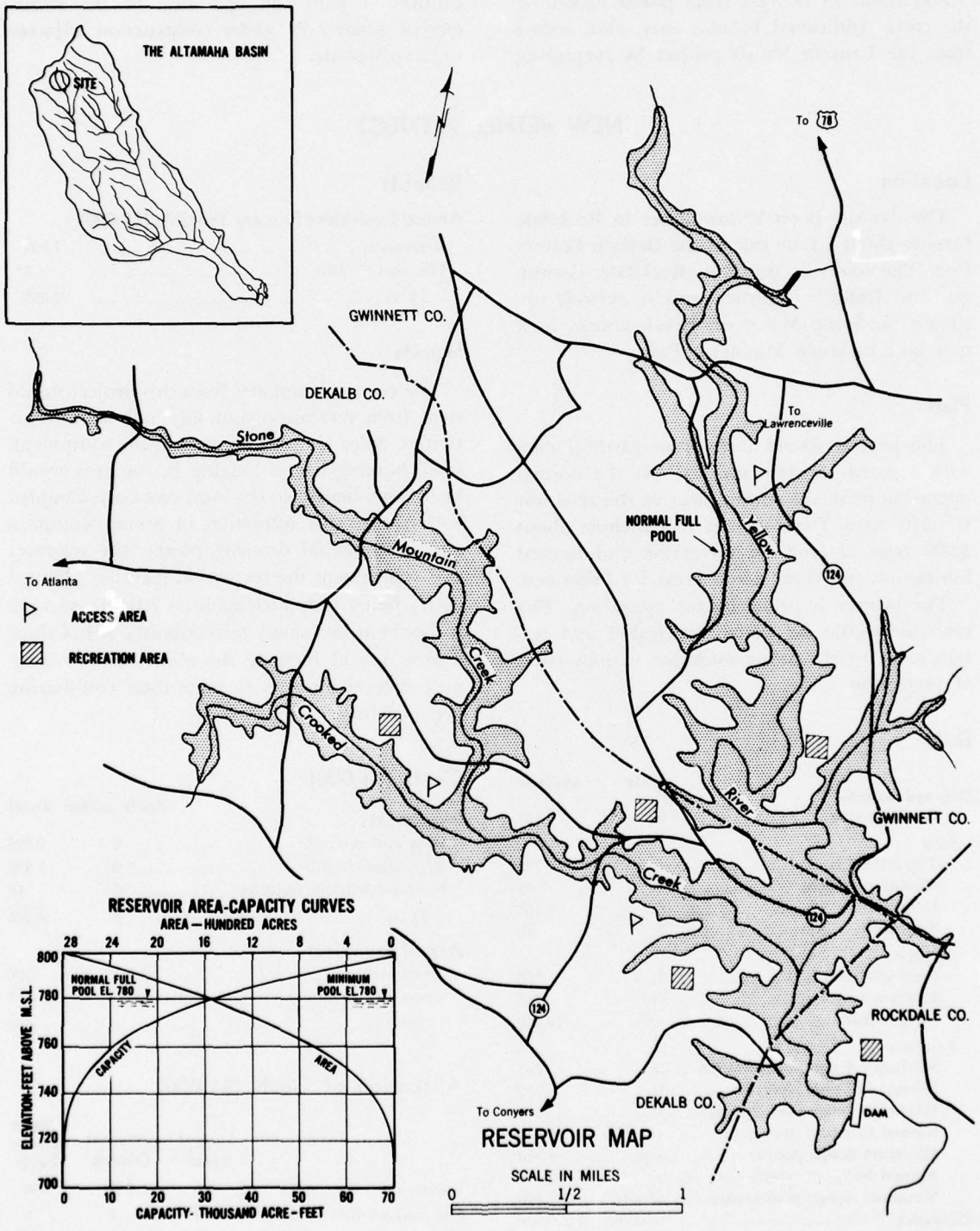


Figure 4.10

PEACHSTONE PROJECT

Location

The Peachstone damsite is on South River about 8 miles northeast of McDonough, the county seat of Henry County, and 19 miles above the mouth of the river. The reservoir site is in Henry and Newton Counties.

Plan

The project would include about 8,000 acres of land for recreation and limited fishing use and 2 access areas for fishermen. Facilities would be provided for recreation, fish and wildlife, and hydroelectric power development primarily for peaking purposes.

The dam would be an earthfilled type with a gate-controlled side-channel spillway. The powerplant will be on the right bank of the river at the toe of the dam. The normal pool elevation will be at 670 feet and will provide a 6,500-acre pool. Land should be acquired for the reservoir to elevation 670 feet mean sea level, and flood easements to elevation 675.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	372
Dam		
Top elevation	ft.	685
Maximum height	ft.	123
Length	ft.	7,625
Spillway		
Crest elevation	ft.	640
Effective length	ft.	200
Design discharge	c.f.s.	167,000
Reservoir		
Maximum design pool elevation	ft.	675
Normal full pool elevation	ft.	670
Minimum design pool elevation	ft.	650
Maximum design pool area	acre	7,500
Normal full pool area	acre	6,500
Minimum design pool area	acre	3,900
Maximum design pool capacity	acre-ft.	230,000
Normal full pool capacity	acre-ft.	197,000
Minimum design pool capacity	acre-ft.	90,000
Hydroelectric powerplant		
Installed capacity	kw.	13,000
Annual energy output	million kw.-hr.	21
Recreation	user-day	2,000,000
Fishing	user-day	13,000

Benefits

Annual Equivalent Primary Tangible ($1,000)

Power	360
Recreation	1,974
Fish and wildlife	16
Total	2,350

Impacts

This project, located near the Atlanta metropolitan area, would have impacts attributable to recreation, fish and wildlife, and the power generation. The land enhancement and construction impacts should be comparable to those of Lake Sidney Lanier but on a less scale because of the much smaller reservoir, or to some other bodies of water near a large metropolitan center.

These benefits should have an effect on the local economy. The result would be an increased tax base and increase in business, particularly in services and trades. These increased economic activities would aid the locality in paying its share of the project costs.

Costs ($1,000)

	Early action	Total
Investment		
Dam and reservoir	11,790	11,790
Recreation facilities	4,575	7,625
Fish and wildlife facilities	15	15
Power facilities	2,770	2,770
Total	19,150	22,200
Annual Equivalent		
Investment		760
Operation, maintenance, and replacements		485
Taxes foregone		100
Total		1,345

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Power	4,850	*346	73	73
Recreation	17,000	985	411	619
Fish and wildlife	350	14	1	1
Total	22,200	*1,345	485	693

*Includes $100,000 for taxes foregone.

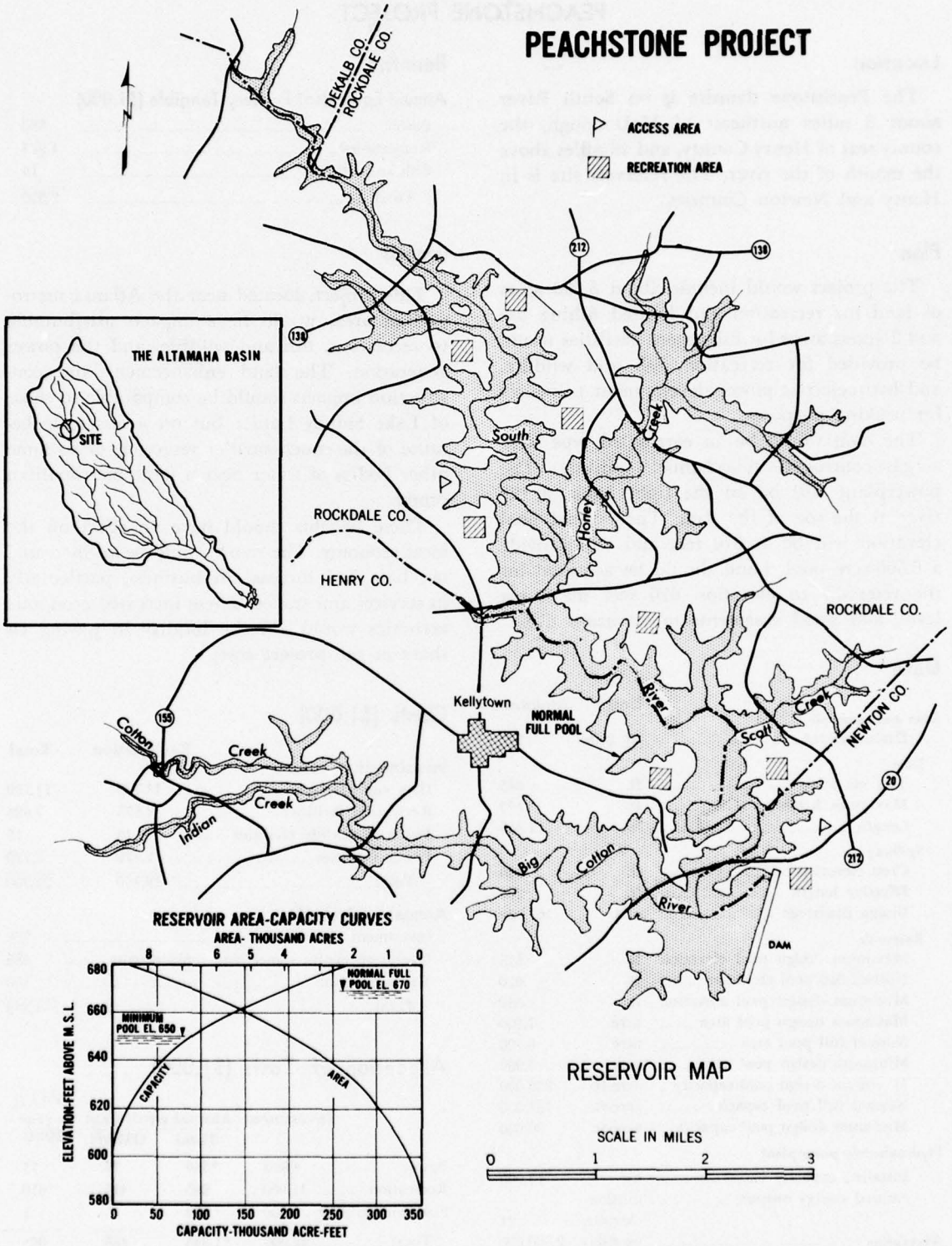

PEACHSTONE PROJECT
ACCESS AREA
RECREATION AREA
DEKALB CO.
ROCKDALE CO.
THE ALTAMAHA BASIN
SITE
ROCKDALE CO.
HENRY CO.
South
Honey
Creek
ROCKDALE CO.
Kellytown
NORMAL FULL POOL
River
Scott
Creek
NEWTON CO.
Cotton
Creek
Indian
Creek
Big
Cotton
River
DAM
RESERVOIR AREA-CAPACITY CURVES
AREA- THOUSAND ACRES
8 6 5 4 2 1 0
NORMAL FULL POOL EL. 670
MINIMUM POOL EL. 650
CAPACITY
AREA
ELEVATION-FEET ABOVE M.S.L.
680 660 640 620 600 580
0 50 100 150 200 250 300 350
CAPACITY-THOUSAND ACRE-FEET
RESERVOIR MAP
SCALE IN MILES
0 1 2 3

Figure 4.11

TOWNSEND PROJECT

Location

The Townsend project is in Long, Liberty, and McIntosh Counties near Townsend and about 25 miles north and slightly west of Brunswick.

Plan

The project would provide drainage and flood control for 161,000 acres of land, much of which is well adapted to general farming, pasture or high-value truck crops. The plan includes levees for flood prevention connecting the sand ridges parallel to the river on the southwest side of the area and a series of canals draining generally southeast to remove excess water from the area to be improved.

Data

Acres in project	161,000
Number of main canals	9
Miles of canals (including laterals)	128
Miles of levees	15
Average height of levees (feet)	8

Benefits

Annual Equivalent Primary Tangible ($1,000)

Drainage	142
Flood control	458
Total	600

Impacts

This project is in an area now largely in trees, brush, and cypress swamps. It would increase the production and cash income and provide more employment in an area now lacking in employment opportunities. The tax base would also be substantially increased which would increase the revenue for the counties.

Costs ($1,000)

	Early action	Total
Investment		
Canals and appurtenant structures	0	4,965
Levees	0	825
Total	0	5,790
Annual Equivalent		
Investment		208
Operation, maintenance, and replacements		142
Total		350

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		OM&R	Total	
Flood control	4,610	280	114	114
Drainage	1,180	70	28	28
Total	5,790	350	142	142

BUFFALO CREEK-OCONEE RIVER FISH AND WILDLIFE PROJECT

Location

This project consists of two units which are located in Hancock, Washington, Baldwin, and Wilkinson Counties. The Oconee River unit is about 10 miles southeast of Milledgeville and the Buffalo Creek unit is about 13 miles east of that city.

Plan

The plan proposes creation of a big game restoration area that would be intensively stocked with deer and wild turkeys to provide a source of replenishment and an adjacent equally desirable habitat open to public hunting. Hunting benefits attributable to the project would be realized within the two units as well as on a minimum 100,000-acre peripheral area.

Waterfowl developments are also proposed. Very desirable waterfowl habitats are located in both units with the primary limitations being a lack of waterfowl and sufficient water during migration periods. With the plan in effect, a waterfowl project would be carried out to inundate bottom land hardwood flats to determine if waterfowl would congregate in sufficient numbers to utilize the natural food supplies and provide public hunting opportunity.

Desirable hardwood flats on Buffalo Creek would be inundated by construction of a dam across the stream near the downstream terminus of the unit and construction of cross levees that

TOWNSEND DRAINAGE AND FLOOD CONTROL PROJECT

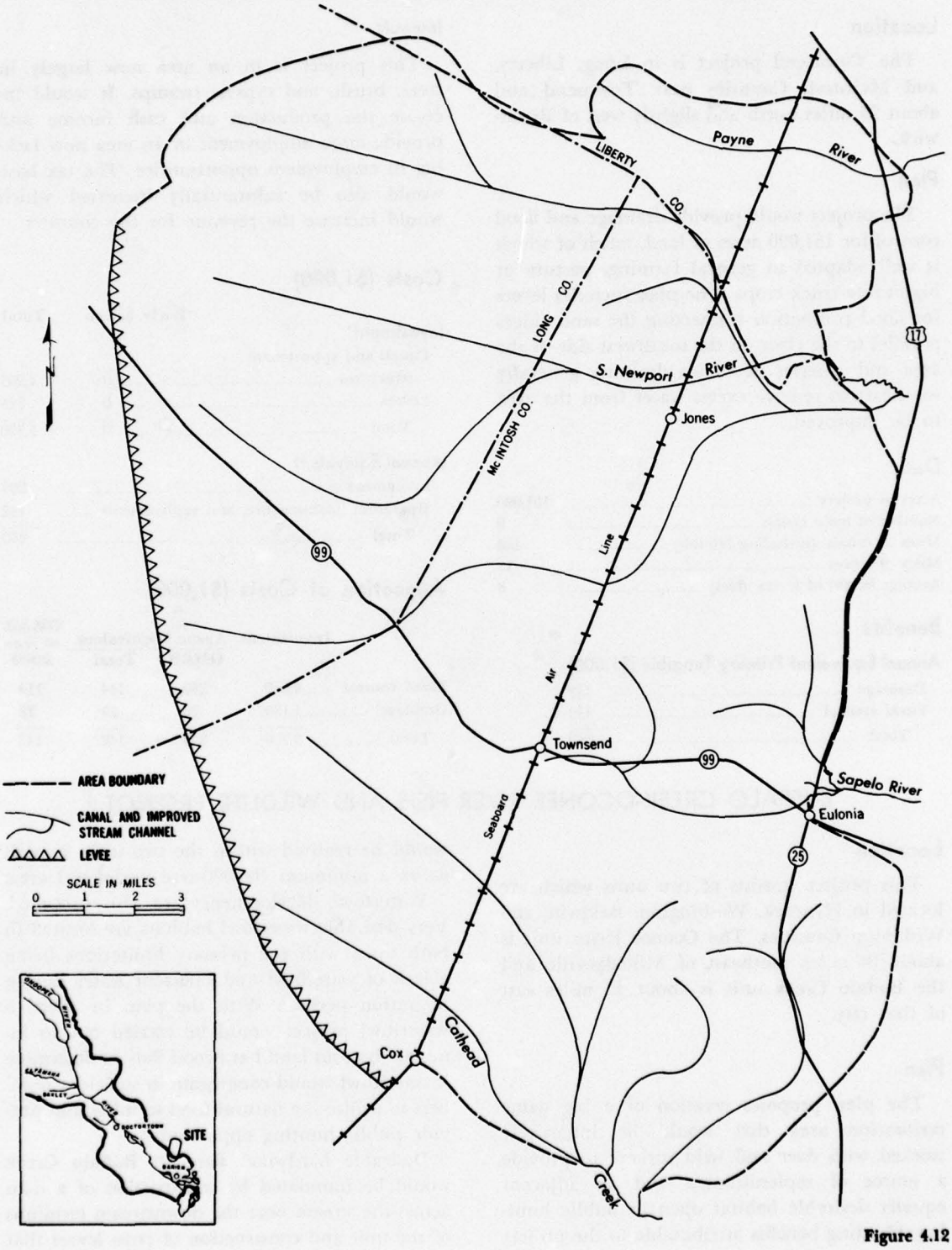


Figure 4.12

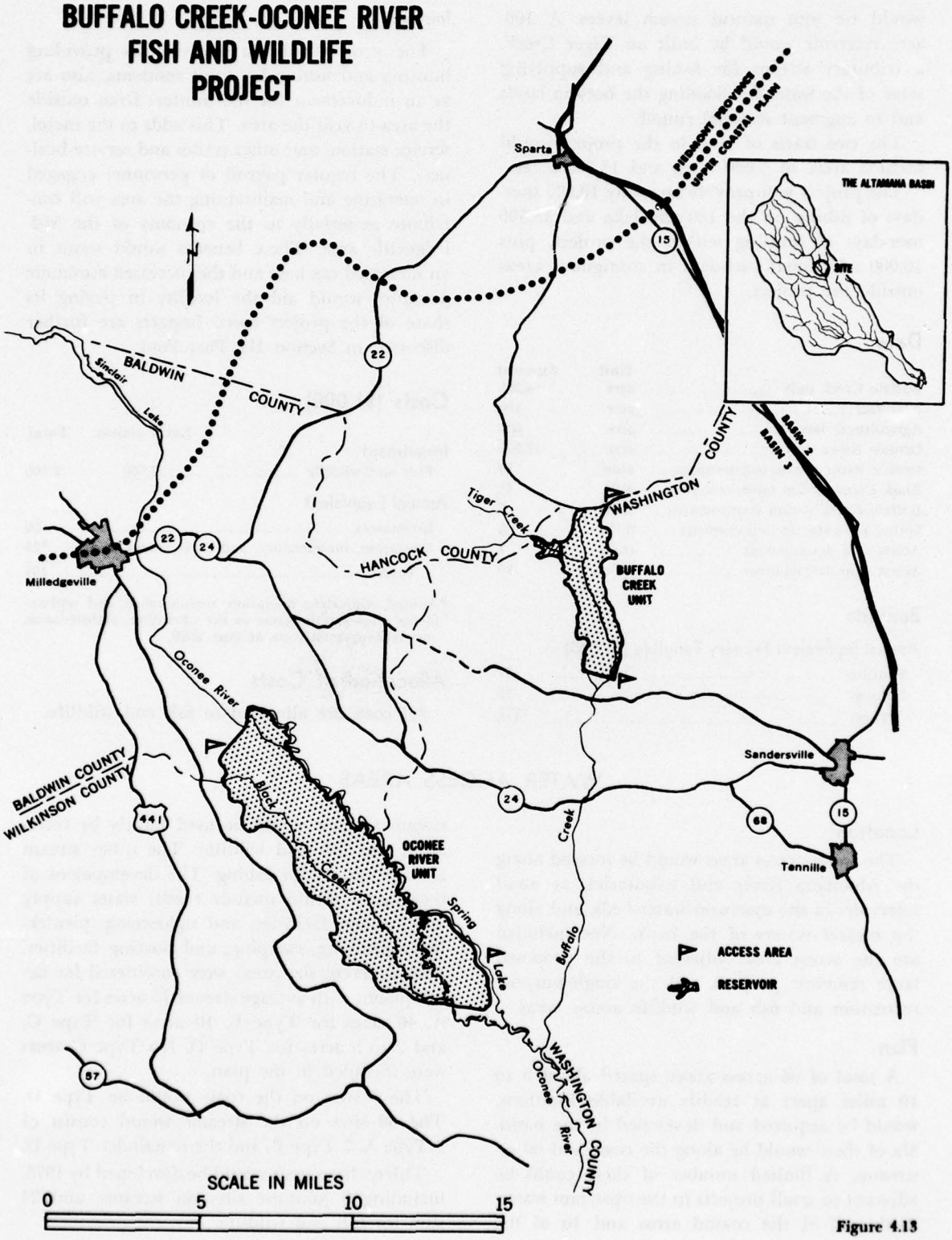

BUFFALO CREEK-OCONEE RIVER
FISH AND WILDLIFE
PROJECT
PIEDMONT PROVINCE
UPPER COASTAL PLAIN
THE ALTAMAHA BASIN
SITE
Sparta
15
22
BALDWIN COUNTY
Sinclair Lake
WASHINGTON COUNTY
BASIN 2
BASIN 3
Tiger Creek
HANCOCK COUNTY
Milledgeville
24
BUFFALO CREEK UNIT
Oconee River
Sandersville
BALDWIN COUNTY
WILKINSON COUNTY
441
Black Creek
OCONEE RIVER UNIT
Spring Lake
Buffalo Creek
Tennille
68
ACCESS AREA
RESERVOIR
57
WASHINGTON COUNTY
Oconee River
SCALE IN MILES
0
5
10
15

Figure 4.13

would tie into natural stream levees. A 100-acre reservoir would be built on Tiger Creek, a tributary stream for fishing and supplying some of the water for flooding the bottom lands and to augment seasonal runoff.

The two tracts of land in the project would include areas of 5,000 acres and 17,500 acres.

The project will provide annually 10,800 user-days of fishing on the 100-acre lake and 18,500 user-days of hunting within the project, plus 10,000 additional user-days in contiguous areas outside the project.

Data

	Unit	Amount
Buffalo Creek unit	acre	4,300
Reservoir	acre	100
Agricultural land	acre	600
Oconee River unit	acre	17,500
Oconee River stream improvement	mile	16
Black Creek stream improvement	mile	12
Buffalo Creek stream improvement	mile	6
Spring Lake stream improvement	mile	5
Access area development	each	4
Access road development	mile	10

Benefits

Annual Equivalent Primary Tangible ($1,000)

Hunting	97
Fishing	15
Total	112

Impacts

The project will, in addition to providing hunting and fishing for local residents, also act as an inducement for the hunters from outside the area to visit the area. This adds to the motel, service station, and other trades and service business. The regular payroll of personnel engaged in operating and maintaining the area will contribute materially to the economy of the Milledgeville area. These benefits would result in an increased tax base and the increased economic activities would aid the locality in paying its share of the project costs. Impacts are further discussed in Section III, Part Four.

Costs ($1,000)

	Early action	Total
Investment		
Fish and wildlife	2,500	2,500
Annual Equivalent		
Investment		80
Operation, maintenance, and replacements		*24
Total		104

*Annual equivalent operation, maintenance, and replacements costs are the same as the operation, maintenance, and replacements costs at year 2000.

Allocation of Costs

All costs are allocated to fish and wildlife.

WATER ACCESS AREAS

Location

The water-access areas would be located along the Altamaha River and tributaries, at small reservoirs in the upstream watersheds, and along the coastal waters of the basin. Not included are the access areas adjacent to the proposed large reservoir projects and the single-purpose recreation and fish and wildlife access areas.

Plan

A total of 66 access areas, spaced about 5 to 10 miles apart at readily available locations, would be acquired and developed in the basin. Six of these would be along the coast and 60 on streams. A limited number of these could be adjacent to small projects in the upstream watersheds. All of the coastal areas and 10 of the stream accesses would be used jointly by recreation and fish and wildlife. The other stream areas would be for fishing. The development of these areas would include roads; water supply and sanitary facilities; and sightseeing, picnicking, swimming, camping, and boating facilities. Four different size areas were considered for development with average sizes of 75 acres for Type A, 40 acres for Type B, 10 acres for Type C, and 2 to 5 acres for Type D. No Type C areas were included in the plan.

The 6 sites on the coast would be Type D. The 60 sites on the streams would consist of 3 Type A, 7 Type B, and the remainder Type D.

Thirty-three areas would be developed by 1975, including 9 joint-use sites on streams, and 24 sites for fish and wildlife.

Data

Type	Annual user-days in 1975			Annual user-days in 2000		
	No.	Recreation	Fish and wildlife	No.	Recreation	Fish and wildlife
A	2	200,000	4,000	3	300,000	6,000
B	7	420,000	14,000	7	420,000	14,000
C	0	0	0	0	0	0
D	24	0	48,000	56	0	112,000
Total	33	620,000	66,000	66	720,000	132,000

Benefits

Annual Equivalent Primary Tangible ($1,000)

Recreation	1,200
Fish and wildlife	70
Total	1,270

Impacts

The access areas provide a wide distribution of low-cost facilities to make the streams, lakes, and coastal areas available to people all over the basin. The use of private land along water bodies is becoming more and more restricted. This restriction limits the use of water bodies and makes fishing and other water-based activities more and more difficult for the public. A main objective of the access areas is to keep the fishing areas available to the public and, at the same time, protect the rights of private property holders.

It is recognized that the reaches of the rivers below the reservoir projects would be improved for fishing and other recreational uses when the upstream storage is provided for low streamflow augmentation. However, due to uncertainty as to location of access areas below the reservoirs, no access area benefits have been assigned to the water-storage projects.

The access sites will provide convenient points to reach the streams, lakes, and Atlantic coast for fishing, flood forecasting, water sampling, and other purposes outside the recreational fields.

In addition to the primary benefits evaluated, local secondary benefits would result from sales and services of equipment and supplies to the users.

Costs ($1,000)

	Early action	Total
Investment		
Recreation	2,800	3,200
Fish and wildlife	600	940
Total	3,400	4,140
Annual Equivalent		
Investment		150
Operation, maintenance, and replacements		225
Total		375

Allocation of Costs ($1,000)

	Investment	Annual equivalent	
		Total	OM&R*
Recreation	3,200	310	194
Fish and wildlife	940	65	31
Total	4,140	375	225

* Annual equivalent operation, maintenance, and replacements costs are the same as the operation, maintenance, and replacements costs at year 2000.

UPSTREAM WATERSHED PROJECTS

Location

The upstream watershed programs would be basinwide.

Plan

It is estimated that multiple-purpose flood prevention and drainage projects would be developed between 1960 and 2000 on tributary streams in the Altamaha basin draining some 1.1 million acres. The structural works of improvements would protect and provide for the improvement of agricultural lands and other areas. In addition, many of the desired land-use changes would be made possible by more effectively utilizing, protecting, and developing the land and water resources of the basin.

Changes in the criteria for project selection, evaluation, installation, and cost sharing due to legislative changes which cannot be predicted, or increased local interest, or other factors such as changes in the amount of watershed technical assistance could substantially change the estimate and result in a different rate of watershed project installations. The possibility of changes in the watershed program is recognized. Appropriate recognition of actual developments and resulting modifications can be accomplished as a part of keeping the Study Commission plan up to date.

Upstream watershed projects will provide watershed protection, flood prevention, and water resources development for other purposes in the upstream areas. The structural works of improvement included will result in reducing the average annual floodwater and sediment damages occurring under existing conditions on a substantial area of flood plains in the small-stream watersheds. Protection provided for these flood plain areas will enable landowners to use more intensively some highly productive areas which are now in low value production and use because of the existing flood hazards.

Many opportunities exist in the proposed reservoirs in the upstream watersheds for recreation facilities, for fish and wildlife developments, for storing water for other beneficial uses, and for reducing floodwater and sediment damages. To the extent the reservoirs are made available to and managed for public use, they will provide substantial portions of the projected needs for recreation and fish and wildlife as well as other purposes. In developing detailed plans for each of the upstream watersheds, the needs for all purposes should be considered and facilities included wherever needed and feasible. Adjustments in other proposals in the plan could and should be made for that portion of the projected needs that can be met by the upstream reservoirs.

Benefits from reduction of floodwater and sediment damage to agricultural lands and fixed improvements and increase in the productivity would accrue to the affected areas when works of improvements are installed.

Benefits

Annual Equivalent Primary Tangible ($1,000)

Flood prevention	1,173
Drainage	12
Total	1,185

Impacts

The upstream projects will allow more intensive use of the flood plains thereby increasing gross cash returns part of which go to pay additional wages and salaries. The reservoirs and other treatment measures to prevent erosion and transportation of sediment will reduce sediment storage requirements in downstream structures.

Costs ($1,000)

	Early action	Total
Investment		
Flood prevention	9,720	15,700
Drainage	100	140
Total	9,820	15,840
Annual Equivalent		
Investment		573
Operation, maintenance, and replacements		182
Total		755

Allocation of Costs ($1,000)

	Investment	Annual equivalent	
		Total	OM&R*
Flood prevention	15,700	749	180
Drainage	140	6	2
Total	15,840	755	182

*Annual operation, maintenance, and replacements costs are the same as the operation, maintenance, and replacements costs at year 2000.

WATER SUPPLIES

Location

The water supply program would be basinwide.

Plan

In addition to domestic water supplies provided by water storage projects, the programs for

domestic, municipal, and industrial uses of water include the development or improvement of water supplies, treatment facilities, and distribution systems. Water made available under these programs would serve domestic, municipal, and industrial needs for about 331 million gallons per day by 2000.

Data

Domestic Supplies

Domestic water systems are expected to decline from 76,000 in 1960 to 31,000 by the year 2000. Water use for the same years is expected to decrease from 17.0 to 13.9 million gallons per day. This reduction in the number of systems is expected because of the decline in rural population and the expansion of areas served by municipal water systems. The increased use per system is expected to result from greater per capita demand. There will be some investment in domestic supplies after 1975, although for the purpose of statistical reporting, all such costs are shown as being made by that date.

The plan would satisfy the following needs:

New drilled wells	5,200
Wells to be covered and sealed	30,000
Pressure systems	18,000
New pumps and motors	31,000

Municipal Supplies

Municipal water systems of 103 communities served an estimated 392,000 persons living in 117 communities and institutions in 1960. An additional 308,000 people living within the basin are served by water supplies outside the basin. About 12,000 people living outside the basin are served by water supplies within the basin. By 2000, it is estimated that 91 systems will have to be expanded to serve an estimated 720,600 persons. Municipal water demands by 2000 are estimated at 144 million gallons per day. The above figures do not include the population within the basin served by water supplies from outside the basin. Requirements include:

	Number of municipalities
Total number of municipal systems	91
Sources or treatment including disinfection equipment	91
Elevated storage	67
Expansion of distribution systems	91

Industrial Supplies

Increased industrial growth is expected to require about 162.4 million gallons of water per day by the year 2000, plus what would be supplied by municipal water supply systems. Requirements include new wells, surface water intakes, treatment plants, and storage facilities.

Benefits

Tangible benefits are assumed to be equal to the costs of the cheapest alternatives and are not expressed in monetary terms.

Costs ($1,000)

	Early action	Total
Investment		
Augment domestic supplies	19,640	19,640
Augment municipal supplies	12,960	35,450
Expand industrial facilities	2,770	9,060
Total	35,370	64,150

Annual Equivalent

Investment	
Domestic	589
Municipal	794
Industrial*	196
Total	1,579
Operation, maintenance, and replacements	
Domestic	210
Municipal	2,437
Industrial*	829
Total	3,476
Total	
Domestic	799
Municipal	3,231
Industrial*	1,025
Total	5,055

Operation, Maintenance, and Replacements at Year 2000

Domestic	406
Municipal	4,567
Industrial*	1,416
Total	6,389

*Does not include industrial water supplies furnished by municipal systems.

Allocation of Costs

All costs are allocated to water supplies.

NAVIGATION PROJECT

(Altamaha Sound to Doctortown)

Location

The project consists of a slackwater channel from Altamaha Sound upstream to mile 59 near Doctortown.

Plan

The plan consists of two low-head navigation dams and locks located at mile 28.7 (No. 1) and mile 39.6 (No. 2) which will provide a slackwater navigation channel for commercial barge traffic upstream to Doctortown.

Data

	Unit	Amount
Lock and dam No. 1, lift	ft.	10
Lock and dam No. 2, lift	ft.	20
Minimum channel width	ft.	90
Minimum channel depth	ft.	9
Lock size	ft.	60x360
Depth over upper sill	ft.	18
Depth over lower sill	ft.	14
Freeboard, above upper pool	ft.	5
Elevation		
Pool No. 1	ft.	10
Pool No. 2	ft.	30

Benefits

Annual Equivalent Primary Tangible ($1,000)

Navigation	1,240

Impacts

Impacts are discussed in Section III of Part Four.

Costs ($1,000)

	Early action	Total
Investment		
Locks and dams	0	16,400
Channel improvement and markers	0	1,180
Lands and easements	0	550
Total	0	18,130
Annual Equivalent		
Investment		630
Operation, maintenance, and replacements		*222
Total		852

*Annual equivalent operation, maintenance, and replacements costs are the same as the operation, maintenance, and replacements costs at the year 2000 because all facilities are assumed to be added at one time.

Allocation of Costs

All costs are allocated to navigation.

HYDROELECTRIC POWER AND INDUSTRIAL DEVELOPMENT

Location

The basin area is entirely within the State of Georgia.

Plan

About 67,200 kilowatts of the hydroelectric potential are now available, generating an average of 267 million kilowatt-hours annually. Most of this capacity is used for peaking purposes. The projects proposed will add about 388,000 kilowatts capacity and produce an average of about 670 million kilowatt-hours annually. This added capacity and energy can be absorbed readily in the projected electrical load. By the year 2000, the basin electric-energy requirements are projected to be over 23 billion kilowatt-hours with a demand of about 4.3 million kilowatts.

The Georgia Power Company has started construction on the first unit of a steam-electric powerplant on Lake Sinclair, a source of cooling water. As the electric load increases, the high voltage grid system will be expanded and the present 115,000-volt lines will be increased to 230,000 volts where possible. Additional substations and subtransmission lines will be constructed to deliver energy to the ultimate customer as the need arises.

Part Three of Appendix 9, Economics, includes projections of increased population, income level, employment, and goals for food and fiber production. The attainment of the production goals will be made through increased management efficiencies, utilization of fertilizers, and technological improvements. Industries associated with agricultural production will have an expanding market. As agricultural production

NAVIGATION PROJECT

(ALTAMAHA SOUND TO DOCTORTOWN)

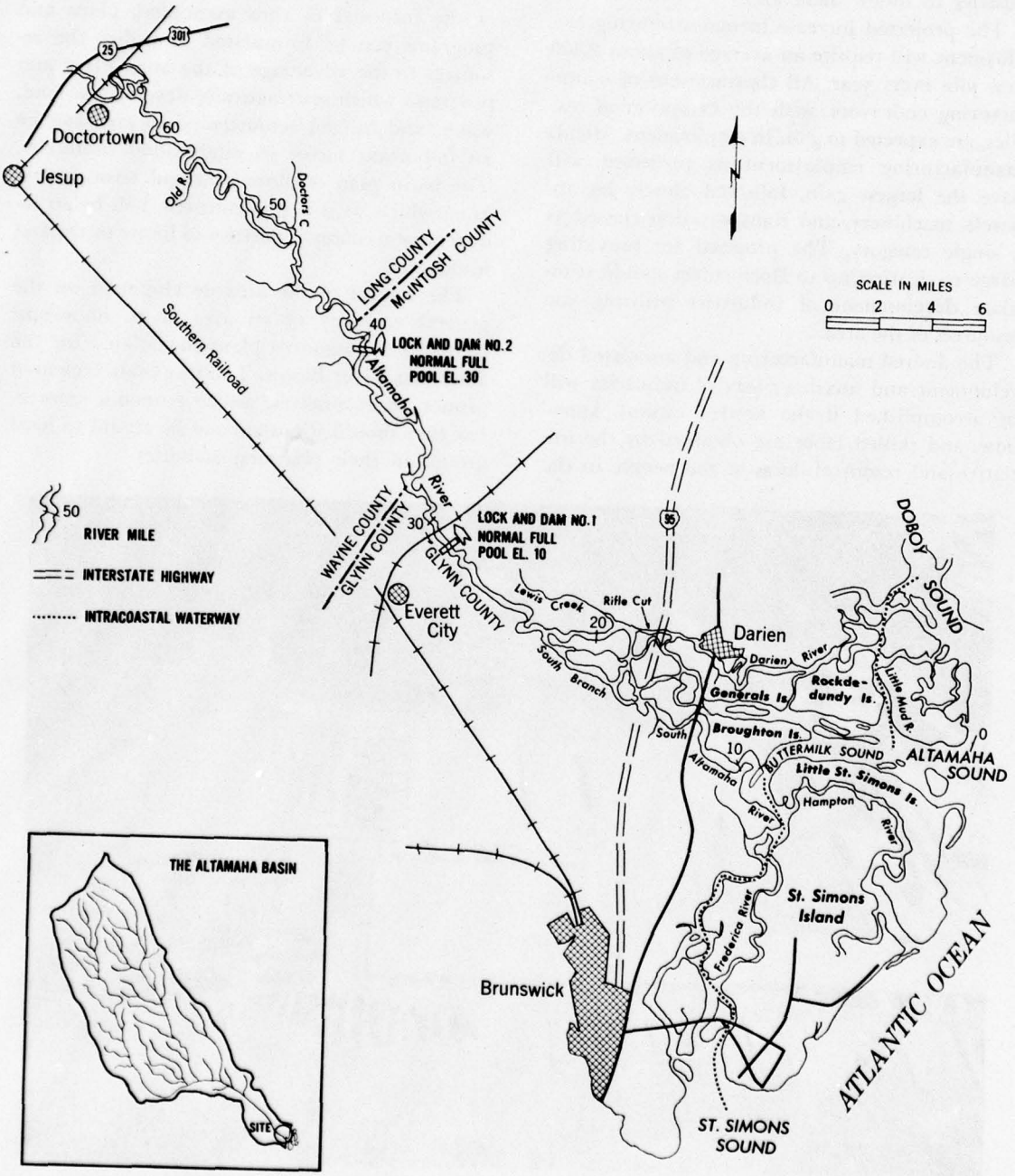


Figure 4.14

increases, industries processing the products will have a source of raw material and will have a market in the urban areas of the region. Basic industries will locate in the urban centers which will induce other manufacturing or satellite industries to locate there also.

The projected increase in manufacturing employment will require an average of about 2,700 new jobs every year. All classifications of manufacturing endeavors, with the exception of textiles, are expected to gain in employment. Metals manufacturing employment as projected will have the largest gain, followed closely by apparels, machinery, and transportation classed as a single category. The proposal for providing barge navigation up to Doctortown should stimulate development of industries utilizing the resources of the area.

The desired manufacturing and associated development and auxiliary service industries will be accomplished if the needed capital, know-how, and skilled labor are obtained by the initiative and resourcefulness of the people in the area. City or city-county development committees can determine the resource potentials of the area. Such a determination requires research into natural resource potentials, labor potentials, market potentials, educational facilities, and all other phases of area activity. From an analysis of the information thus assembled, plans and programs can be formulated to utilize the resources to the advantage of the area. Plans and programs which systematically develop the land, water, and human resources of an area can be an important factor in establishing industries. The basin plan outlines in broad terms a program which, as it is implemented, will be an inducement to many industries to locate or expand in the area.

The impact of the area development on the general economy of an area is an important factor in the resource plans formulated for the Southeast River Basins. The proposals presented cannot, in themselves, assure economic growth, but they should stimulate and be an aid to local groups in their planning activities.

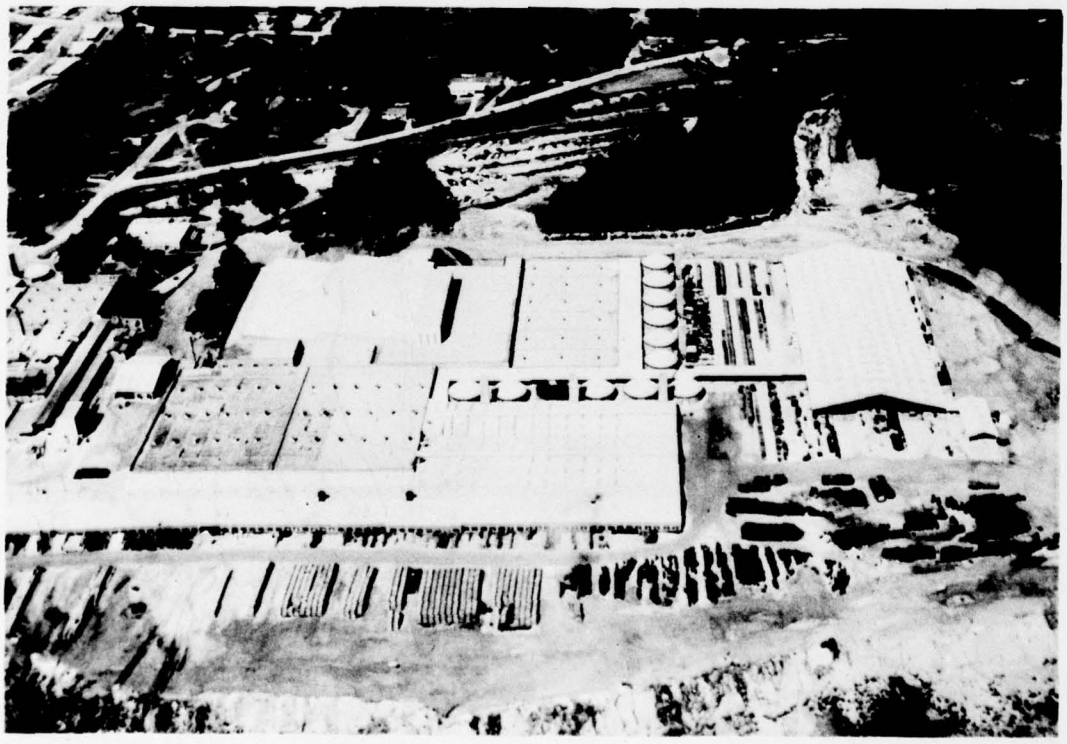


Figure 4.15 *Clay Products Manufacturing Plant, Milledgeville, Georgia. The Altamaha Basin Has Excellent Resources for Rapid Expansion of Clay Manufacturing.*

RECLAMATION, IRRIGATION, AND DRAINAGE

Location

The reclamation, irrigation, and drainage programs would be carried out on irrigable areas of the basin used for cropland, and on wetland areas of the basin used for cropland and pastureland. Drainage of woodland is discussed under Forest Conservation and Utilization.

Plan

The reclamation, irrigation, and drainage programs summarized in this Section are in addition to the projects and programs presented elsewhere in this Appendix. Drainage in upstream areas is included in the upstream watershed projects and the Townsend project.

The features of the irrigation program include individual sprinkler systems on an individual farm basis to irrigate an estimated 44,200 additional acres of cropland. Irrigation of home gardens, nurseries, lawns, and nonagricultural areas would be in addition to the cropland acres. About 70 percent of the water supply requirements will be provided by farm ponds and the remaining 30 percent from individual wells and streams. Crops to be irrigated include tobacco, cotton, truck crops, corn, and speciality crops. The irrigated acres would require a high level of conservation treatment for protection and efficient use.

Irrigation included in the plan was established on the basis that incremental returns to the farmer, based on long-term projected prices would at least equal the incremental operation, maintenance, and replacements costs without consideration of secondary effects or intangibles. This general guide was considered acceptable for reconnaissance studies although it was realized that followup individual irrigation development would be subject to standard and more detailed evaluations.

The features of the drainage program include onfarm open ditch drainage systems on an estimated 8,700 additional acres of cropland and pastureland. Crops to be grown on drained land include tobacco, corn, cotton, peanuts, truck and other speciality crops, and pasture.

Individual farmers are expected to install the irrigation and drainage systems with technical and financial assistance provided by private concerns and State and Federal programs.

Benefits

Annual Returns to Farmers ($1,000)

	Total
Irrigation	3,614
Drainage	123
Total	3,737

Impacts

Irrigation would provide insurance against drought conditions and assist in prompt germination and continuous plant growth of new seedlings. The survival of transplanted material, and the maturing of crops, would help in establishing vegetative cover on eroded areas, and would provide for better use of land in accordance with its capability. Drainage also would provide for improved land preparation, seeding, cultivation, management, and harvesting.

Costs (exclusive of technical assistance) ($1,000)

	Total
Investment	
Early action	
Irrigation	2,377
Drainage	53
Total	2,430
Total	
Irrigation	6,113
Drainage	131
Total	6,244
Annual Equivalent	
Irrigation	
Investment	221
Operation, maintenance, and replacements	*1,399
Total	1,620
Drainage	
Investment	5
Operation, maintenance, and replacements	*9
Total	14
Summary	
Irrigation and drainage	
Investment	226
Operation, maintenance, and replacements	*1,408
Total	1,634

*Annual equivalent operation, maintenance, and replacements costs are assumed to be equal to the operation, maintenance, and replacements costs at year 2000.

Allocation of Costs

All costs are allocated to irrigation and drainage as shown.

SOIL CONSERVATION AND UTILIZATION

Location

Soil conservation and utilization would have basinwide implementations.

Plan

Soil conservation measures and practices on cropland, pastureland, and rangeland are discussed in Section II, Part Four, Plan by Purpose.

It is estimated that of the 1,569,600 acres needing treatment, 1,216,000 would be treated by the application of permanent and annual types of practices. An estimated 474,000 acres will be converted to use other than its present use.

Benefits

Annual Returns to Farmers $5,320,000

Impacts

The soil conservation measures would be an important factor in assuring that adequate soil and water resources are available for future use. The land conversions will bring about secondary benefits due to the processing of crops and products resulting from more intensive land use.

Costs (exclusive of technical assistance) ($1,000)

	Early action	Total
Investment	16,150	42,490
Annual Equivalent		
Investment		1,536
Operation, maintenance, and replacements		*2,434
Total		3,970

*Annual equivalent operation, maintenance, and replacements costs are the same as the annual operation, maintenance, and replacements costs at the year 2000.

Allocation of Costs

All costs are allocated to soil conservation and utilization.

FOREST CONSERVATION AND UTILIZATION

Location

The forestry program will affect about 70 percent of the basin land area. There are some 6,347,000 acres of forest land, including lands under public administration, that will benefit to some degree from forestry proposals for the basin.

Plan

Major items in the forestry plan are: (1) Technical assistance for managing and harvesting timber and for applying other recommended measures; (2) commercial and noncommercial thinnings to help bring forest stands to better operable conditions; (3) tree planting and site preparation for natural regeneration and seeding; (4) detecting and controlling insect and disease infestations; (5) woodland drainage to help eliminate standing surface water in the forests with drainage ditches gated to maintain desired water levels; (6) forest-fire protection by providing needed additional facilities, such as tractors and fire towers, and by increasing the number of personnel assigned to detection and suppression activities; (7) fencing overgrazed woodland areas to control grazing and prevent damage to tree seedlings by cattle; (8) road building for management and protection purposes, using drainage ditch fill where feasible; (9) intensified education and information programs; and (10) accelerated forest research.

Data

Item	Unit	Amount
Fire protection (new)	acre	206,000
Fencing for woodland grazing control	mile	1,500
Erosion control, tree planting	acre	160,000
Woodland drainage and water control	acre	135,000
Shelterbelts	acre	5,000
Timber-stand improvement (commercial and noncommercial)	acre	5,470,000
Other tree planting and site preparation for natural regeneration	acre	3,830,000
Annual Production at Year 2000		
Timber cut (million)	cu. ft.	386
Gum-naval stores (thousand)	bbl.	470

Benefits

Annual Equivalent Primary Tangible $8,440,000

Impacts

The increased timber and gum-naval store production will help bolster the economy in many counties that are now in a depressed economic condition.

The forestry program will help reduce erosion in the hills of the Piedmont province and Fall Line area.

Costs ($1,000)

	Early action	Total
Investment		
Forest fire protection	100	110
Fencing for woodland grazing control	450	450
Erosion control, tree planting	1,600	4,000
Roads and/or drainage works of improvement	1,400	3,640
Shelterbelts	80	80
Timber-stand improvement (commercial and non-commercial)	5,370	19,120
Other tree planting and site preparation for natural regeneration	26,000	62,900
Total	35,000	90,300
Annual Equivalent		
Installation		2,030
Operation, maintenance, and replacements		905
Total		2,935
Annual Operation, Maintenance, and Replacements at Year 2000		1,215

Allocation of Costs

All costs are allocated to forest conservation and utilization.

FISH AND WILDLIFE

Location

The wildlife and sport fisheries programs would be instituted on lands and waters throughout the basin and the commercial fisheries program on the adjacent coastal waters. These programs are exclusive of features for fish and wildlife in multiple-purpose projects.

Plan

The features of the wildlife program would satisfy 629,000 user-days annually by the year 2000. They include: (1) Habitat improvement on State-owned lands now administered for wildlife purposes; (2) further development of habitat within the national forests, the Piedmont National Wildlife Refuge, and the Altamaha State Wildlife Management Area; (3) establishment and development of five additional wildlife management areas in the Piedmont and Coastal Plain areas by the State Game and Fish Commission in cooperation with private landowners for public hunting purposes; (4) development of about 2,000 acres of dove fields for public hunting purposes in accordance with practices approved by the conservation agencies; (5) acquisition and development of the wetlands in the lower Buffalo Creek—Oconee River bottom as a national wildlife refuge with particular emphasis on migratory waterfowl; (6) extensive management of wildlife habitat throughout the basin by interested landowners in cooperation with State and Federal conservation agencies; and (7) the expansion of current activities in research, planning, education and information, and management and enforcement.

The features of the sport fisheries program would satisfy 1,525,000 user-days annually by 2000. They include: (1) Improvement of the South, Ocmulgee, Oconee, and Altamaha Rivers for sport fishing; (2) renovation and more intensive management of the existing and prospective large and small impoundments; (3) development of a minimum of about 20,000 acres of new large impoundments in the Piedmont and Coastal Plain areas in conjunction with other functions; (4) development of the streams and impounded waters within the proposed Buffalo Creek National Wildlife Refuge for sport fishing in conjunction with the proposed waterfowl program; (5) development of public access areas to streams and selected large impoundments; (6) expansion of services and facilities for coastal fishermen, including the installation of

additional fishing piers and artificial reefs; (7) expansion of existing hatcheries to meet the needs for stocking and renovation of large and small impoundments; and (8) expansion of current activities in research, planning, education and information, and management and enforcement.

The features of the commercial fisheries program include: (1) Expansion of existing operations; (2) rehabilitation of oyster-producing reefs; (3) cultivation of shrimp, pompano, and other high quality food fish under controlled conditions; (4) acceleration and expansion of existing facilities and going programs with a view toward more efficient harvest, better methods of handling and processing the catch, new sources of supply, sound regulations, and enforcement; (5) increasing the demand for domestic products; and (6) abatement of pollution.

Data

	Extent of action	
	Unit	Amount
Wildlife		
Improvement of existing facilities		
National forests	acre	100,000
National wildlife refuges	acre	32,000
Military areas	acre	10,000
State wildlife management area	acre	20,000
Development of new facilities		
Wildlife management areas		
Bells Ferry	acre	90,000
Cedar Creek	acre	90,000
Big Indian Creek	acre	20,000
Dry Creek	acre	20,000
Rum Creek	acre	20,000
Dove fields	acre	2,000
Extensive habitat improvements	basinwide	—
Supporting programs	basinwide	—
Salt-Water Sport Fisheries		
Improvement of existing facilities		
Development of new facilities		
Piers	pier	1
Artificial reefs	reef	8
Supporting programs	coastwide	—
Fresh-Water Sport Fisheries		
Improvement of existing waters		
Streams	acre	22,000
Large impoundments	acre	28,000
Small impoundments	acre	20,000
Fish cultural stations	number	2
Supporting programs		
Fresh water	basinwide	—
Salt water	coastwide	—
Commercial Fisheries		
Expansion of operations	basinwide	—
Seafood culture by 2000		
Oysters (60,000 lb. meat per year)	acre	138
Shirmp (170,000 lb. per year)	acre	212
Supporting programs	basinwide	—

Benefits

Annual Equivalent Primary Tangible ($1,000)

Wildlife	1,611
Sport fisheries	1,602
Commercial fisheries	230
Total	3,443

Impacts

The economic impacts for fish and wildlife and commercial fisheries are discussed in Section III of Part Four.

Costs ($1,000)

	Early action	Total
Investment		
Wildlife	336	390
Sport fisheries	590	720
Commercial fisheries	65	270
Total	991	1,380
Annual Equivalent		
Investment		56
Operation, maintenance, and replacements		2,012
Total		2,068

Summary of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Wildlife	390	663	652	989
Sport fisheries	720	1,186	1,166	1,996
Commercial fisheries	270	219	194	352
Total	1,380	2,068	2,012	3,337

Allocation of Costs

All costs are allocated to fish and wildlife.

RECREATION

Location

The recreation program would be basinwide. In addition to the program described here, features for recreation are included in multiple-purpose projects.

Plan

There are 14 areas in the basin which are already developed as public recreation areas. They range from small parks close to urban areas developed for high-density use to large areas and lakes with many uses. The development of 40 new areas for recreation would increase public outdoor recreation opportunity, especially in those areas close to centers of population and able to accommodate the high demand for opportunity estimated by the year 2000.

The Stone Mountain Memorial, Indian Springs State Park, and Lake Spivey are all located within about 1 hour driving time of the metropolitan Atlanta area. They would be developed to handle high-density use, primarily sightseeing and swimming. With the projected growth of Atlanta, facilities would be expanded to accommodate 2,430,000 user-days in 1975 and 5,750,000 user-days in the year 2000. Improved access roads, parking, water and sanitary provision, along with facilities for picnicking, sightseeing, and swimming, would be expanded.

Yam Grande State Park and Reidsville State Park in the southeast part of the basin primarily serve the people in those areas. A sizable expansion program is limited by the physical resources of existing areas and their location. However, facilities would be expanded to accommodate 80,000 user-days in 1975 and 250,000 user-days in the year 2000.

Six new areas would be developed for high-density or mass use. High Falls, midway between Atlanta and Macon, Georgia, and the development of areas in Bibb, DeKalb, Henry, Walton, and Newton Counties would provide for 1.6 million user-days in 1975 and for 4.8 million user-days in 2000. Facilities would be developed to enhance swimming, picnicking, sightseeing, and boating activities. Five thousand acres would be acquired; access roads, water supply and sanitary provision, and parking would complete the development for the heavy uses estimated by the year 2000.

Three existing general outdoor recreation areas and 29 new areas would be developed which, with expansion of present facilities and the construction of facilities at the new areas, could accommodate a large number of recreation-seeking people. Some could be developed on small watershed projects where the physical layout lends itself to these projects.

Hard Labor Creek State Park, Little Ocmulgee State Park, and Fort Yargo State Park have existing facilities for a broad range of outdoor recreation activity. Facilities would be expanded to accommodate 1,547,000 user-days in 1975 and 1.9 million user-days annually by the year 2000. Camping, cultural pursuits, swimming, and boating would be the major activities participated in by the recreationists.

Twenty-nine new areas would be developed for general outdoor recreation. Six county-type parks would be established in Peach, Houston, Twiggs, Wilkinson, Laurens, and Washington Counties to accommodate about 220,000 user-days each by the year 2000. Approximately 500 acres would be acquired for each area and facilities would be developed for a wide range of recreation activity. Twenty-three smaller areas would be developed, three on existing lakes at Porterdale, Barrett, and High Shoals in the northern part of the basin. Together, these 29 areas would have facilities to accommodate 1.9 million user-days annually in 1975 and 3,620,000 user-days by the year 2000.

There are five areas involving large land and water acreages which lend themselves to activities that require a great amount of space for the recreationist. These areas are (1) Lake Sinclair; (2) Jackson Lake; (3) Oconee National Forest, including the Rock Eagle area in the northeast corner of Oconee National Forest near Eatonton, Georgia; (4) Piedmont National Wildlife Refuge.; and (5) Wolf Island National Wildlife Refuge. These areas for which expansion of facilities appears warranted are discussed and summarized below. Costs and benefits are

illustrative of what is considered reasonable for development for public outdoor facilities of all types over the entire area.

Jackson Lake and Lake Sinclair are owned and operated by the Georgia Power Company. Additional facilities are needed for boating, camping, picnicking, swimming, and related activities. Some areas would be expanded for high-density use and general outdoor recreation at determined locations. It is estimated that development of facilities at these lakes would provide for 3,750,000 user-days in 1975 and for 7 million user-days annually by the year 2000.

Oconee National Forest, including over 96,000 acres in two general areas, would have expanded facilities and new recreation areas for 1.1 million user-days in 1975 and 1.8 million user-days by the year 2000. Facilities would enhance a wide variety of recreation activities, but would be mainly centered around camping, swimming, hiking, picnicking, and cultural pursuits.

Piedmont and Wolf Island National Wildlife Refuges have been established primarily for the preservation and enhancement of fish and wildlife. Facilities would be developed to accommodate 5,000 user-days in 1975 and 10,000 user-days in the year 2000. Activity would mainly be sightseeing and cultural pursuits for recreation-seeking people who desire such outlets.

There are two existing historic and cultural areas in the basin, the Ocmulgee National Monument and Hitchiti Experimental Station, which are located near Macon, Georgia. Additional facilities are proposed for these areas. Four undeveloped sites identified as having unusual significance for their historic and archeological background are proposed for development: Fort King George outside of Darien, Browns Mountain south of Macon, the Shinholser archeological site on Indian Island on the Oconee River, and the Shoulderbone archeological site outside of Sparta. Subsequent studies may identify similar areas which could be developed. These sites are illustrative, and costs and benefits are given to show the magnitude of the areas involved. Facilities would be both expanded and developed to provide for 579,000 user-days in 1975 and 1,250,000 user-days annually by the year 2000. Interpretive services should be provided where they would enhance the area. Activities would center around sightseeing, cultural pursuits, and picnicking. Land acquisition would be required and service facilities for parking, sanitation, water supply, and access roads. Detailed design planning would be worked out as the needs increase for the development of such areas.

Data

The proposed level of development at existing and new single-purpose recreation areas included in the plan would provide an opportunity for the following use of facilities:

	User-days annually (1,000)		
	1960 Base	By 1975	By 2000
Existing Developments			
Fort Yargo State Park	85	97	200
Stone Mountain	500	1,255	3,000
Hard Labor Creek State Park	700	1,250	1,500
Oconee National Forest	100	1,100	1,800
Lake Spivey	350	475	1,250
Jackson Lake	100	1,750	3,000
Indian Springs State Park	750	750	1,500
Lake Sinclair	750	2,000	4,000
Piedmont National Wildlife Refuge and Wolf Island Wildlife Refuge	1	5	10
Hitchiti Experimental Station	53	53	100
Ocmulgee National Monument	100	450	1,000
Yam Grande State Park	25	50	100
Little Ocmulgee State Park	150	200	200
Reidsville State Park	30	30	150
Subtotal	3,694	9,465	17,810
New Developments			
Five county high density sites	—	1,200	3,800
High Falls high density site	—	400	1,000
Porterdale, Barrett, and Highlands, general outdoor sites	—	100	300
Six county general outdoor sites	—	800	1,320
Twenty local general outdoor sites	—	1,000	2,000
Fort King George, Browns Mountain, Shinholser, and Shoulderbone historical and cultural sites	—	75	150
Subtotal	—	3,575	8,570
Total	3,694	13,040	26,380

Benefits

Annual Equivalent Primary Tangible $20,650,000

Impacts

Economic impacts for recreation are discussed in Section II of Part Four.

Costs ($1,000)

	Early action	Total
Investment	35,360	73,960
Annual Equivalent		
Investment		2,187
Operation, maintenance, and replacements		3,408
Total		5,595
Operation, Maintenance, and Replacements at Year 2000		5,172

Allocation of Costs

All costs are allocated to recreation.

POLLUTION ABATEMENT

Location

The pollution abatement program would be basinwide.

Plan

The program for pollution abatement consists of new and extended sewerage systems and new or enlarged municipal and industrial waste treatment facilities. Included in the pollution abatement plan is a proposal for a system of sewers to intercept the treated effluent, in the Atlanta metropolitan area, that is now entering the South River, and carry it down to a point below Highway No. 155 where it will be given additional treatment before being released into the stream.

Data

Pollution Abatement to Year 2000

	Number of places
New and extended sewerage systems	83
Primary treatment facilities	10
Secondary treatment facilities	42
Stabilization ponds	31

Benefits

Annual Equivalent Primary Tangible

Benefits are not evaluated in monetary terms. Each proposal was checked to make sure that there was no more economical alternative.

Impacts

Economic impacts for pollution abatement are discussed in Section III, Part Four.

Costs ($1,000)

	Early action	Total
Investment		
Pollution abatement, municipal	77,070	149,200
Pollution abatement, industrial	2,460	3,700
Total	79,530	152,900
Annual Equivalent		
Investment, municipal		3,611
Investment, industrial		95
Total		3,706
Operation, maintenance, and replacements, municipal		1,500
Operation, maintenance, and replacements, industrial		26
Total		1,526
Total Annual Equivalent		
Municipal		5,111
Industrial		121
Total		5,232
Operation, Maintenance, and Replacements at Year 2000		
Municipal		2,575
Industrial		69
Total		2,644

Allocation of Costs

All costs are allocated to pollution abatement.

PUBLIC HEALTH

Location

Public health programs are basinwide.

Plan

The public health program includes drainage, spraying, and other measures for vector control, the collection and disposal of solid wastes, and air pollution monitoring and radiological monitoring.

Data

Solid Waste Disposal

Number of incinerators needed	3
Number of sanitary landfills needed	97

Annual Operations

Vector control	basinwide
Air pollution and radiation monitoring	basinwide

Benefits

Annual Equivalent Primary Tangible

Annual benefits from the public health programs are not expressed in monetary terms. The programs were justified on the basis of intangibles.

Impacts

Economic impacts for public health are discussed in Section III of Part Four.

Costs ($1,000)

	Early action	Total
Investment		
Solid waste disposal	2,800	5,900

Annual Equivalent

	Total
Solid waste disposal	
Investment	140
Operation, maintenance, and replacements	2,072
Total	2,212
Vector control	
Investment	0
Operation, maintenance, and replacements	203
Total	203
Air pollution and radiological monitoring	
Investment	0
Operation, maintenance, and replacements	30
Total	30
Total	2,445

Operation, Maintenance, and Replacements at Year 2000

Solid waste disposal	4,095
Vector control	203
Air pollution and radiological monitoring	30
Total	4,328

Allocation of Costs

All costs are allocated to public health.

SECTION VI – OTHER PROJECTS CONSIDERED

This Section presents some of the alternative projects and programs considered in the plan formulation process but which are not included in the comprehensive plan. Appendix 12, Planning, includes more detail on the factors involved in decisions to include or not include project and program features in the basin plan.

Over 30 dam and reservoir sites in the basin were given consideration before final selections for inclusion in the plan were made. The principal reason that many are not included is that they are not needed to fulfill the needs for recreation, water supply, or fishing to the year 2000. None of the sites rejected could be economically justified for the production of hydroelectric power alone although a shortage of peaking power will still exist in the basin after the inclusion of the multiple-purpose projects which include power.

Local interests are very desirous of having a slack-water channel suitable for barge traffic and pleasure boats from Altamaha Sound upstream to Macon and Dublin. This proposed project is not economically justified at this time. However, a slack-water channel from Altamaha Sound to Doctortown is included in the plan.

Studies should be made in the future for the installation of weirs, wing-dams, or other means of making the river navigable for pleasure boating at all seasons. Studies should also be updated periodically to determine the future feasibility of commercial navigation.

Some of the more significant projects that were considered and eliminated during plan formulation are shown in the following tabulation.

Name of project not included in plan	Key number on Figure 4.16	Approximate location	Description	Purpose*	Reason for not including in plan
India	3	On Apalachee River near Monroe, Ga.	Dam and reservoir	F&W, R, FC	Not economically justified
Tallassee	4	On Middle Oconee River in Jackson Co., Ga., near Athens	Dam and reservoir	WS, PA, R, F&W	Curry Creek site better alternative
High Shoals	6	On Apalachee River above Highway No. 106	Dam and reservoir	R, F&W, FC, P	Existing dam deemed adequate
Upper Athens	7	On Middle Oconee River near Athens	Dam and reservoir	F&W, R, WS	Not economically justified
Irwin Bridge	8	On Yellow River above Milstead	Dam and reservoir	R, F&W, WS	Not economically justified
Daniel Shoals	9	On South River	Dam and reservoir	R, P, F&W	Not economically justified
Almon	10	On Yellow River in Gwinnett Co., Ga., 3.5 miles W. of Covington, Ga.	Dam and reservoir	R, F&W	New Bethel site better alternative
Covington	11	On Alcovy River, 5.5 miles NE. of Covington, Ga.	Dam and reservoir	F&W, R	Not economically justified
Factory Shoals	13	On Alcovy River	Dam and reservoir	R, F&W	Not economically justified
E. Monticello	14	On Shoal Creek	Dam and reservoir	R, WS, F&W	Not needed
Snapping Shoals	15	On South River in Newton and Henry Counties, Ga.	Dam and reservoir	R, P, F&W	Proposed Peachstone site better alternative
McKay Creek	16	On South River 10 miles S. of Porterdale, Ga.	Dam and reservoir	R, F&W	Not needed by 2000
Lee Shoals	17	On Yellow River, 10.5 miles S. of Porterdale, Ga.	Dam and reservoir	R, F&W	Not economically justified
Lamar Ferry	19	On Ocmulgee River, 4.5 miles E. of Flovilla, Ga.	Dam and reservoir	R, F&W	Not needed
Sandy Creek	20	On Ocmulgee River	Dam and reservoir	R, F&W	Not economically justified
Dames Ferry	21	On Ocmulgee River, ¾ mile S. of Dames Ferry	Dam and reservoir	R, F&W	Not needed
Navigation	22 23 24 25 27 33 35	On Altamaha, Ocmulgee, and Oconee from Altamaha Sound upstream to Macon and Dublin and a tie into the Flint River near Vienna, Ga.	Project for 9-foot navigation channel, 5 multiple-purpose dams, 11 single-purpose locks and dams		Not economically justified
Dublin	26	Oconee River	Dam and reservoir	R, P, F&W	Not economically justified
Big Indian	28	On Big Indian Creek	Dam and reservoir	R, F&W	Not needed
Hawkinsville	29	On Ocmulgee River, 2 miles N. of Hawkinsville, Ga.	Dam and reservoir	P, R, F&W	Not economically justified
Rockledge	30	On Oconee River	Dam and reservoir	P, R, F&W	Not economically justified
Cypress Branch	31	On Oconee River	Dam and reservoir	P, R, F&W	Not economically justified

*R —Recreation
P —Hydroelectric power
F&W—Fish and wildlife
FC —Flood control
WS —Water supplies
PA —Pollution abatement

DAMS AND RESERVOIRS CONSIDERED



Figure 4.16

PART FIVE – CONCLUSIONS

DISCUSSION

The economy of the Altamaha basin ranges from a sparsely populated coastal area to the heavily populated industrialized Atlanta area. The population in the basin is expected to increase from one million to about one and three-fourths million by 2000 and the per capita income is expected to more than double.

The comprehensive plan for the Altamaha basin is formulated to meet needs to the year 2000 using the land and water resources in the most efficient manner. The people of the basin have been very interested in the plans being considered for development of the basin resources. They have expressed the desire for the development of large impoundments on the main streams for hydroelectric power; the need for commercial navigation to Macon, Georgia; the need for additional recreational and fish and wildlife facilities; and the need for land and forest conservation measures. All of these developments would contribute to the establishment of a favorable climate for further industrial expansion.

Improvements included in the plan for the development of the land and water resources potential of the basin have been formulated to meet the needs of the basin as related to the Southeast and the Nation. Implementation of the plan will meet those needs.

CONCLUSIONS

The Commission concludes:

(1) The lands of the Altamaha basin with presently known management and technology can produce food and fiber in excess of the share of the national needs to the year 2000 assigned to the basin.

(2) The program for domestic, municipal, and industrial water supplies will meet the basin needs to the year 2000. The availability of abundant good quality water will be an essential factor in the economic and industrial development in the area.

(3) The ground and surface waters of the basin are more than adequate to meet the foreseeable needs provided the quality is not impaired by pollution.

(4) Pollution in the basin from municipal and industrial wastes is a major problem. The problem is serious in the metropolitan Atlanta area and in the vicinity of Macon, Athens, Jesup, Dublin, and Milledgeville. Facilities proposed in the plan with known technology and treatment methods will alleviate the problem. Impoundment of free moving streams may affect pollution conditions at waste outfalls.

(5) Flooding in the basin is widespread both in the upstream areas and along the main streams. Owing to the lack of high flood-damageable developments in the overflow areas, flood damages are not extensive for the basin as a whole but are severe in local areas. Proper flood plain management and zoning, particularly in areas along the main streams, will control further development in the overflow areas and reduce damages in the future.

(6) Facilities proposed for slack-water navigation from Altamaha Sound to Doctortown will provide an opportunity for further industrial growth and economic development in the basin.

(7) Hydroelectric power facilities included in the Laurens Shoals, Peachstone, Goose Creek, Coopers Ferry, and Abbeville projects will provide some of the needed peaking capacity in the overall study area, but the power needs of the basin will continue to be supplied largely from thermal sources both within and outside the basin.

(8) Industrial development to fill the needed employment opportunities which is projected almost to double by 2000 is essential. Development of the proposed comprehensive plan will provide a favorable climate for this development.

(9) Annual and enduring soil conservation and utilization measures are necessary to conserve the basic land resource and to improve the

per capita income and standard of living of the farmer. The plan provides for treatment of an additional 1,216,000 acres of cropland, pastureland, and rangeland by 2000.

(10) Acceleration of the forestry programs proposed in the plan will meet projected timber production needs of two and one-half times the timber production in 1960.

(11) Present facilities in the basin for fishing and hunting are not adequate generally to meet the demands. The projects and programs included in the plan will meet the demands to 2000 with some possible adjustment in sportsman's choice as to types of hunting. The proposed impoundment projects will provide facilities to fill a part of the deficit demand for fishing.

(12) Outdoor recreation demands exceed the capacity of the presently developed facilities. The projects and programs proposed in the plan will provide for the needs to 2000.

(13) Salinity and sediment are not major problems in the Altamaha basin.

(14) The pollution abatement and public health program will contribute to the general health and welfare of the basin residents, tourists, and recreationists.

(15) Upstream watershed projects will provide drainage and flood prevention and control in tributary stream areas totaling 1.1 million acres.

(16) Basic data available for the Altamaha basin for resources planning are meager. Additional topographic and geologic mapping, hydrologic, water quality, and economic data, and analyses of existing information are necessary for implementation of the plan.

(17) The projects and programs described in Part Four provide a basic, comprehensive, and integrated plan of development of the land and water resources of the basin. Their development, with the adjustments and revisions growing out of more detailed studies, should assist greatly in obtaining maximum public benefits for the region and the Nation, consistent with the objectives and criteria of the study.

PART SIX – LOCAL, STATE, AND FEDERAL PARTICIPATION AND ASSISTANCE

Acknowledgements

The U. S. Study Commission, Southeast River Basins, gratefully acknowledges the assistance and cooperation of the following:

Alabama

Department of Agriculture; Auburn University; Department of Conservation; State Docks Department; Extension Service; Division of Forestry; Geological Survey; Department of Public Health; Highway Department; State Planning and Industrial Development Board; Department of Labor; Pilotage Commission; Public Service Commission; River Development Board; Soil Conservation Committee; Soil Conservation Districts; and Water Improvement Commission.

Florida

Department of Agriculture; Board of Conservation; Development Commission; Extension Service; Florida State University; University of Florida; Forest Service; Game and Fresh Water Fish Commission; State Board of Health; Industrial Commission; Inland Navigation District; Board of State Parks and Historical Monuments; Railroad and Public Utilities Commission; Road Department; Soil Conservation Board; Soil Conservation Districts; and Suwannee River Water Conservation Authority.

Georgia

Department of Agriculture; Bainbridge Port Authority; Brunswick Port Authority; Extension Service; Forestry Commission; Game and Fish Commission; University of Georgia; Georgia Institute of Technology; Georgia State College; Georgia Southern College; Department of Public Health; Highway Department; Department of Industry and Trade; Jekyll Island State Park Authority; Department of Labor; Department of Mines, Mining, and Geology; Department of State Parks; Georgia Ports Authority; Public Service Commission; Savannah District Authority; Soil and Water Conservation Committee; Soil and Water Conservation Districts; Tidewater Commission; Waterways Commission; Water Quality Council; and Water Resources Commission.

North Carolina

Extension Service; State Board of Conservation and Development; Highway Department; North Carolina State College; Western North Carolina Regional Planning Commission; Soil Conservation Committee; Department of Water Resources; Soil Conservation Districts; and Wildlife Resources Commission.

South Carolina

Department of Agriculture; Clemson College; Development Board; Extension Service; Forestry Commission; State Board of Health; Department of Labor; Congaree Navigational Study Committee; Parks Commission; Ports Authority; Public Service Authority; Public Service Commission; Soil Conservation Committee; Committee for Water Development; Soil Conservation Districts; Water Pollution Control Authority; and Wildlife Resources Department.

General

Altamaha Development Association; Middle Chattahoochee Development Association; Upper Chattahoochee Development Association; Choctawhatchee-Pea Development Association; Council of State Governments; Southern Regional Education Board; Southeastern Power Committee of Electric Membership Cooperatives of Nine Southeastern States; and Three Rivers Development Association.

Federal

U. S. Department of Agriculture—Agricultural Marketing Service, Agricultural Research Service, Agricultural Stabilization and Conservation Service, Economic Research Service, Farmers Home Administration, Forest Service, and Soil Conservation Service; U. S. Department of the Army—Beach Erosion Board, Board of Engineers for Rivers and Harbors, Corps of Engineers, and Military Posts; Atomic Energy Commission; Atlanta Federal Reserve Bank; U. S. Civil Service Commission; U. S. Department of Com-

merce—Area Redevelopment Administration, Business and Defense Services Administration, Bureau of the Census, Office of Business Economics, Bureau of Public Roads, Small Business Administration, and Weather Bureau; Federal Power Commission; General Services Administration; U. S. Department of Health, Education, and Welfare—Public Health Service; Housing and Home Finance Agency; U. S. Department of the Interior—Bureau of Commercial Fisheries, Geological Survey, Bureau of Mines, National Park Service, Bureau of Reclamation, Bureau of Outdoor Recreation, Southeastern Power Administration, and Bureau of Sport Fisheries and Wildlife; U. S. Department of Labor—Bureau of Labor Statistics; U. S. Department of the Navy—Sixth Marine Corps Reserve and Recruitment District; Executive Office of the President—Bureau of the Budget, and Public Works Planning; Outdoor Recreation Resources Review Commission; Advisory Commission on Intergovernmental Relations; Select Committee on National Water Resources, U. S. Senate, 86th Congress; Smithsonian Institution; U. S. Study Commission—Texas; and Tennessee Valley Authority.

In addition, the Commission gratefully acknowledges assistance received from numerous county and municipal governments, planning commissions, development commissions, chambers of commerce, corporations, trade associations, interested individuals, press, radio, television, and professional societies.

Public Hearings and Presentations

A series of public hearings were held early in the investigation to secure the views and desires of various interests, organizations, and individuals. These hearings were held at Tallahassee, Florida, on November 16, 1959; at Dothan, Alabama, on November 17, 1959; at Macon, Georgia, on November 18, 1959; and at Anderson, South Carolina, on November 19, 1959.

During the latter stage of the studies, a series of public presentations were held to acquaint the public with the proposed plan of the Commission for development of the land and water resources of the Southeast River Basins; to inform Federal, State, local, and private interests of their responsibility in implementing the developments proposed; and to solicit views and opinions on the proposals under active consideration. These presentations were held as follows:

Place	Date
Statesboro, Georgia	March 20, 1962
Waycross, Georgia	March 23, 1962
Tallahassee, Florida	May 15, 1962
White Springs, Florida	May 17, 1962
Valdosta, Georgia	May 18, 1962
Geneva, Alabama	June 19, 1962
Pensacola, Florida	June 20, 1962
Savannah, Georgia	July 16, 1962
Clemson, South Carolina	July 17, 1962
Atlanta, Georgia	August 13, 1962
Columbus, Georgia	August 14, 1962
Albany, Georgia	August 14, 1962
Baxley, Georgia	August 15, 1962
Macon, Georgia	August 16, 1962
Athens, Georgia	August 17, 1962

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2.14	U. S. Soil Conservation Service
2.15	U. S. Soil Conservation Service
2.16	U. S. Soil Conservation Service
2.23	U. S. Soil Conservation Service
2.24	U. S. Soil Conservation Service
2.27	Georgia Forestry Commission
2.28	U. S. Soil Conservation Service
2.36	Georgia Forestry Commission
All other	U. S. Study Commission staff