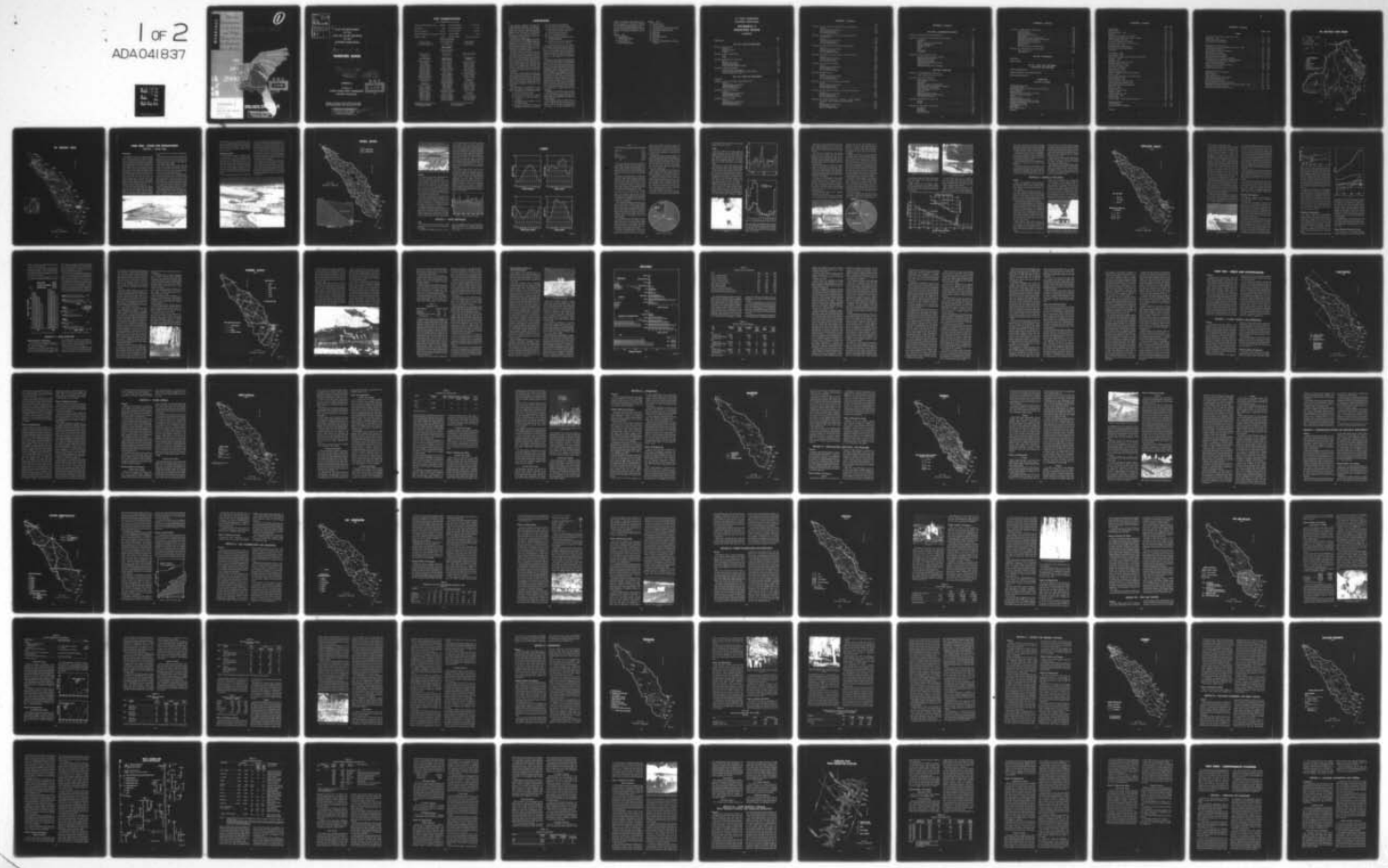
AD-A041 837 UNITED STATES STUDY COMMISSION SOUTHEAST RIVER BASINS--ETC F/G 8/6
PLAN FOR DEVELOPMENT OF THE LAND AND WATER RESOURCES OF THE SOU--ETC(U)
1963

UNCLASSIFIED NL

1 OF 2
ADA041837

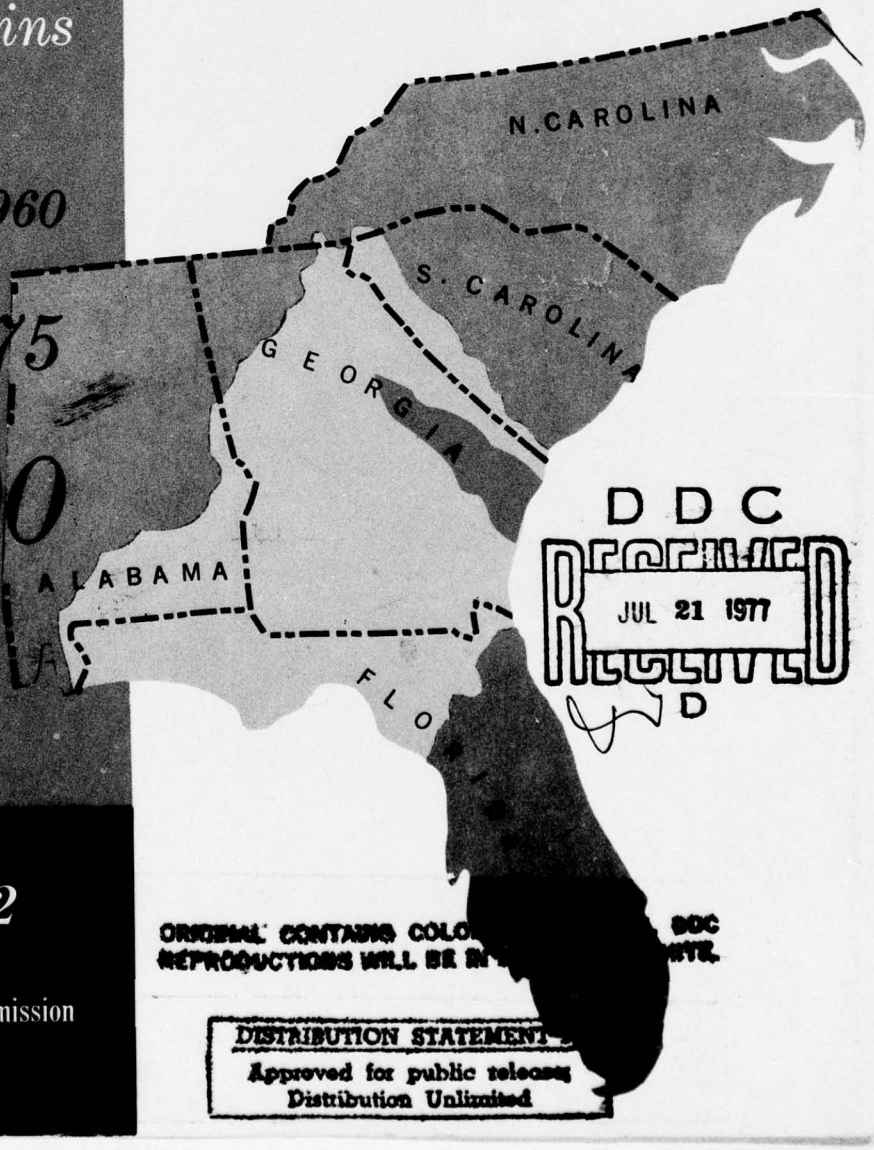


Plan for Development of the Land and Water Resources of the Southeast River Basins

1960

1975

2000



OGEECHEE BASIN

APPENDIX 2

To report of...

United States Study Commission

Southeast River Basins

1963

(6)

PLAN FOR DEVELOPMENT OF THE LAND AND WATER RESOURCES OF THE SOUTHEAST RIVER BASINS.

Appendix 2.

OGEECHEE BASIN.

(9) Final rept.

(11) 1963 (12) 147 p.

APPENDIX 2

TO REPORT OF

UNITED STATES STUDY COMMISSION

SOUTHEAST RIVER BASINS

ORIGINAL CONTAINS COLOR PLATES: ALL DDC REPRODUCTIONS WILL BE IN BLACK AND WHITE.

410288

Jane

THE COMMISSION

J. W. WOODRUFF, JR., *Chairman*

HOWARD A. MORRIS, Brig. Gen., Army . . Vice Chm.
TOM ADAMS . . . . . Florida
CECIL W. CHAPMAN . . . . . Agriculture
HOWARD W. CHAPMAN, Health, Education, and Welfare
WALTER A. GRESH . . . . . Interior
JAMES H. HAMMOND . . . . . South Carolina
RALPH C. HAMMOND . . . . . Alabama
WILLIAM E. HIATT . . . . . Commerce
LESTER S. MOODY . . . . . Georgia
ROBERT C. PRICE . . . Federal Power Commission

FORMER COMMISSIONERS

FRANK M. ALBRECHT
Maj. Gen., Army
Vice Chm.—Resigned, June 1960

THOMAS A. JOHNSON
Florida
Deceased, March 1961

JOHN A. SHORT
Agriculture
Resigned, June 1961

THE STAFF#

GEORGE E. TOMLINSON
Executive Director

FRED H. LARSON
Special Assistant

RICHARD F. BECKMAN
Administrative Assistant

HARRY W. ADAMS
Assistant Executive Director

PLAN DEVELOPMENT

CLARENCE M. CONWAY
Mark V. Hughes, Jr.
Paul H. Shore
Alva J. Armstrong
Kenneth C. Bird
Orville W. Chinn
Joseph T. Gay, Jr.# #
G. Robert Hallø
Richard L. Larkin
George R. Phippen
Richard E. Reinke
Emmett R. Rushin, Jr.*
Charles M. Sanders
George E. Townsend
Paul Willmore

CONSERVATION

JEROME F. ANDERSON
Lester W. Angell# #
William H. Appel
Joseph T. Gay, Jr.# #
Burle C. Laton
Horace P. Morgan
Richard F. Poston**
Albert H. Spector
Donald E. Whelan# #
Roy K. Wood
Lewis A. Young**

PERSONNEL AND CLERICAL SERVICES

MARY M. WALSH
Dorothy R. Belvin
Jean P. Byrd
Claire M. Howard
Carol L. Hughes
Kathryn W. Kennedy*
Evangeline L. King*
Sue B. Lee
Ruth L. Lightle*
Margie K. McBryar*
Earl J. McDonald
Mary E. Morris
Mitzy H. Portwood
W. Richard Ridling*
Beverly D. Rustin
Dorothy B. Rutledge*
Peggy H. Sheriff
Alma J. Simms*
Sara H. Smith
Dorothy C. Webb

ADMINISTRATIVE SERVICES

JOHN O. WEEDøø
ROGER J. PARKER
Ronald E. Anderson*
W. Kenneth Calhoun*
Thomas L. Hughes*
William M. Wilson*

ENGINEERING AND DRAFTING

LESTER W. ANGELL# #
Charles A. Spencer*
Johnny C. Rogers
Jimmy T. Stappas*
Vada M. Tierney
Edward J. Banke*
John W. Cameron*
E. Ruth Dodd*
George H. Mittendorf, Jr.*
Geneva S. Moore
Herbert A. Sckerl*
Judith C. Watkins

ECONOMICS

NED L. WILLIAMS
Owen D. Belcher
Robert W. Harrison**
Wallace H. Jones*
Edward L. Leland
Calvin C. Taylor
Harry C. Wolfe*

HYDROLOGY

WALTER T. WILSON
Donald E. Whelan# #
Roy W. Mitchell, Jr.*
Karl H. Rossoll

Assignments at completion of work.
Dual concurrent assignment.
* Served less than 18 months.
** On long-term loan from another agency.
ø Deceased April 1962.
øø Deceased January 1963.

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 Ogeechee basin. The plan for the Ogeechee 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 Ogeechee 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 a separate listing of improvements warranting early action, for the Ogeechee 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 included in the plan, but monetary analyses are made only on developments for the 1960-2000 period.

The plan for the development of the resources of the Southeast River Basins and the Ogeechee basin is the result of cooperative work of Federal, State, 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 and the several geographic areas are contained in Appendixes 9 through 13. The appendixes to the Commission Report are as follows:

Appendix	Title
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 2
OGEECHEE BASIN

CONTENTS

CONTENTS – Continued

CONTENTS – Continued

CONTENTS – Continued

ILLUSTRATIONS

(some titles are abridged)

* *Photograph*

CONTENTS – Continued

* *Photograph*

CONTENTS – Continued

THE SOUTHEAST RIVER BASINS

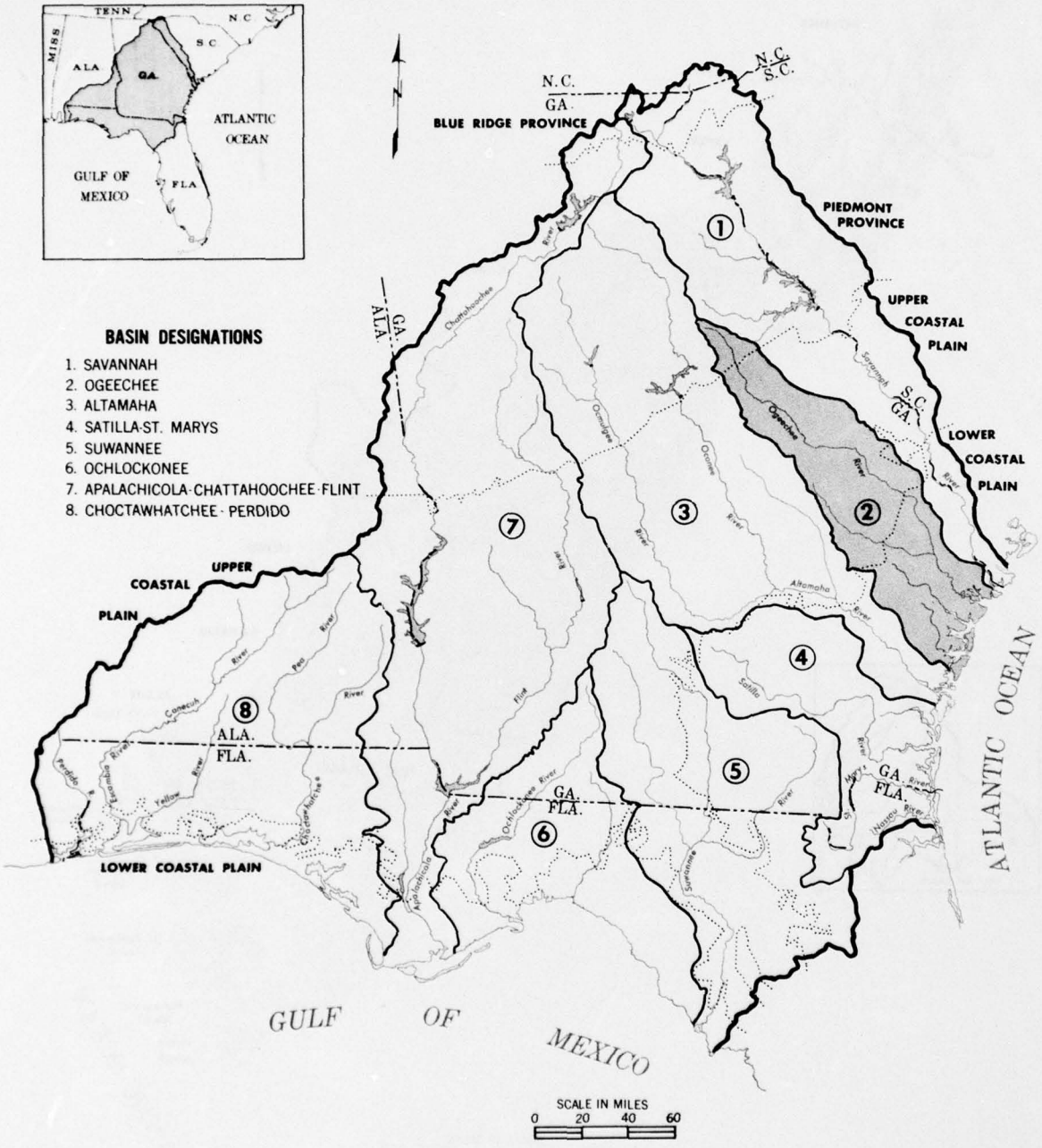


Figure 1.1

THE OGEECHEE BASIN

Figure 1.2

PART ONE – STAGE FOR DEVELOPMENT

SECTION 1 – BASIN AREA

Description

The Ogeechee basin lies in eastern Georgia and, as defined in the study, includes the drainage of the Ogeechee River and its tributaries and areas between the Savannah and Altamaha basins draining directly into the Atlantic Ocean. It is wedge shaped, 170 miles in length, and about 45 miles wide at its base along the Atlantic coast. The basin area totals 5,535 square miles. The land area totals 5,436 square miles, excluding 99 square miles in large water bodies. The land area includes small water bodies such as farm ponds, small reservoirs, and streams less than one-eighth mile in width, which cover about 43 square miles. There are 21 counties within or partly within the basin. The basin is divided into the Piedmont province and the Upper and Lower Coastal Plain areas.

A chain of islands bordering the Atlantic Ocean coastline so impressed the first Spanish explorers that they named them the Golden Isles, and of these, Wassaw Island, Ossabaw Island, St. Catherines Island, Blackbeard Island, and Sapelo Island are included in the Ogeechee basin.

Maximum elevations of about 650 feet above mean sea level occur near Union Point in the Piedmont province. This area, at the upper tip, comprises only about 5 percent of the basin area and is rather steeply rolling.

The Upper Coastal Plain extends some 90 miles to the southeast and includes about 57 percent of the basin area. This area is gently rolling to nearly level, with well-drained sandy soils and many small diversified farms.

The Lower Coastal Plain, comprising about 38 percent of the basin area, is nearly flat. Mixed pine and hardwood forests cover much of the land, giving way to swamp conditions in the lower lying areas. At the extreme seaward end of the Lower Coastal Plain, land and water form an irregular and intricate pattern in which estuaries, sloughs, lagoons, mud flats, brackish swamps, and fringing islands all play a part.

The Ogeechee River, about 245 miles long, flows the length of the basin and empties into Ossab[illegible] Sound 15 miles south of Savannah. Its

Figure 1.3 *Land Resources in the Basin Are Used Mainly for Farming and Forestry.*

principal tributary, the Canoochee River, originates in the Upper Coastal Plain southwest of the Ogeechee River and, for most of its 85 miles, flows parallel to the Ogeechee. The Canoochee River joins the Ogeechee River about 35 miles above its mouth.

Geology and Soils

In the Piedmont province, the deeply weathered rock consists of ancient sediments which were injected by granites and related basic and ultrabasic rock. The sediments, which once were shales, limestones, and sandstones, are now changed to marbles, quartzites, and schists. Red soils with silt and silty clay textures predominate. The dense geologic formations do not transmit water freely except along fault zones where the rock has been broken by earth movements.

In the Coastal Plain are layers or strata of silts, sands, limestones, and clays, generally outcropping in wide bands roughly parallel to the area boundary lines. Because of the sandy nature of the parent material, most of the soils are also sandy. Rainfall readily infiltrates the more open strata, and the absorbed water then percolates to the ocean. The strata of clays or other less permeable materials above and below the open strata confine the water to these permeable beds and, when combined with the slope to the ocean, produce an artesian condition.

The Upper Coastal Plain is the most intensively cultivated area in Georgia and the basin, as the soil properties lend themselves to many types of crops and respond readily to fertilizer.

The Lower Coastal Plain contains widely scattered areas of low-lying wetlands. Areas of sandy land are intermingled with bays or depressions containing organic matter that stays wet much of the time.

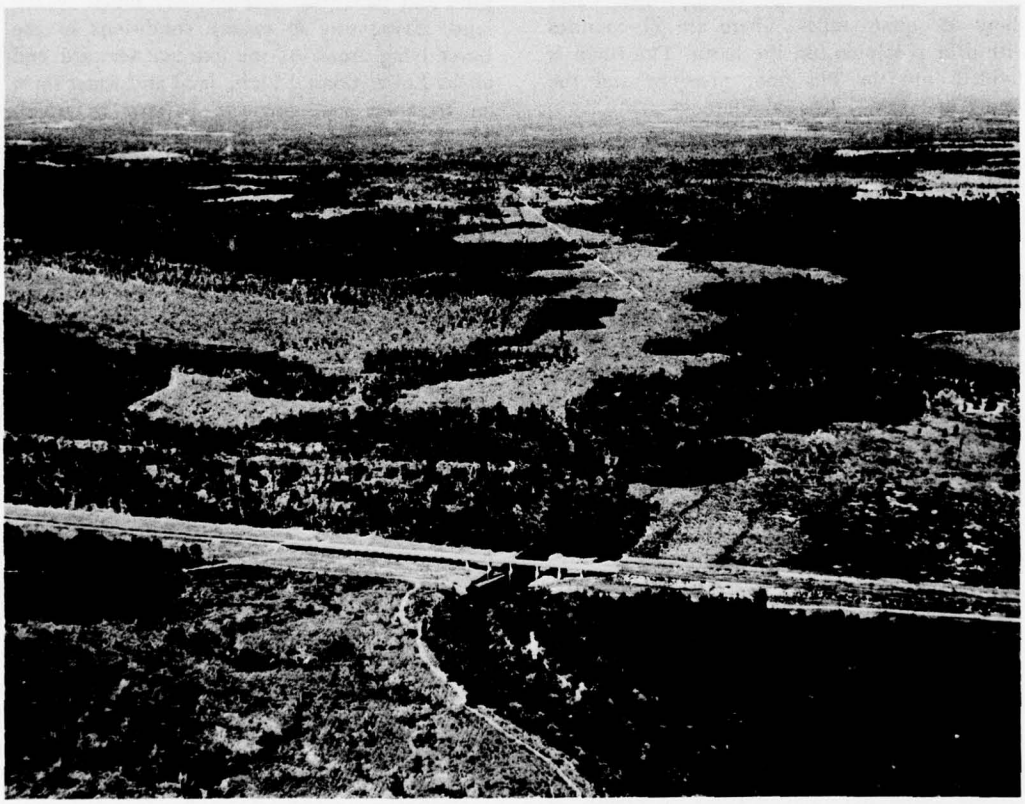


Figure 1.4 *Lower Coastal Plain.*


GENERAL GEOLOGY
CRYSTALLINE ROCK
SEDIMENTARY ROCK
A
Union Point
GREENE
TALIAFERRO
Warrenton
WARREN
HANCOCK
Sparta
GLASCOCK
JEFFERSON
Louisville
BURKE
WASHINGTON
Wadley
JENKINS
Millen
Ogeechee
EMANUEL
SCREVEN
Twin City
Ohoopee River
CANDLER
Statesboro
Metter
EFFINGHAM
TATTNALL
EVANS
Claxton
Pembroke
Savannah
BRYAN
CHATHAM
LIBERTY
LONG
Hinesville
Wassaw Island
Ossabaw Island
St. Catherines Island
McINTOSH
Blackbeard Island
Sapelo Island
ATLANTIC OCEAN
SCALE IN MILES
0 10 20 30
ELEVATION 650 ±
MEAN SEA LEVEL
Fresh-water Bearing Rock
Salt-water Intrusion
SECTION A-A (NOT TO SCALE)

Figure 1.5

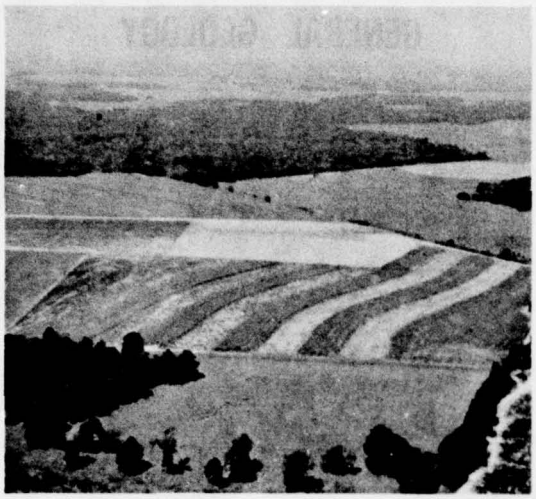


Figure 1.6 *Rolling Hills Typify the Upper Coastal Plain.*

Climate

The basin has long, warm summers and short, mild winters. Snowfall is extremely rare.

The average annual temperature is 66° Fahrenheit. During a typical day in January, the temperature ranges from 40° to 62°, and in July from 70° to 93°. During the year, the temperature drops below 32° in the Piedmont area of the basin about 50 times and in the coastal area about 10 times. The frost-free growing season of the basin ranges from 220 days in the Piedmont area to 280 days along the coast.

Humidity is represented by a smoothed average of observations of relative humidity taken at stations in or near the basin at 1:00 p.m. The relative humidity has a December peak of 59 percent. It then declines to 49 percent in April. In August, the peak rises to about 58 percent, then declines to 52 percent in October.

The mild climate has important agricultural implications as it permits three to five hay cuttings each year and a second crop of legumes or grain sorghum after the first harvest of small grain in early summer. Livestock require little, if any, winter housing and are able to graze 9 to 12 months of the year. Other agricultural benefits of the climate include diversification of crops and rapid production of timber. Industry and commerce also benefit from the mild climate of the basin. Differences in temperature between the Southeast and other regions are much greater in winter than summer. The winter heating requirements are much less than in northern areas. The frost-free soil makes construction and maintenance relatively economical, and the mild climate permits building and other outdoor activities throughout the year. Normal highway and waterway use is not curtailed during winter.

The average yearly rainfall over the basin ranges from 45 inches in the upper basin to 52 inches along the coast. Rainfall during the four wettest months, June through September, averages about 5 inches per month. Rainfall during the two driest months, October and November, averages 2.5 inches per month. A maximum 24-hour rainfall of 12.75 inches at Brooklet, Georgia, was recorded in September 1929 as the result of a hurricane. A minimum annual rainfall of 22.75 inches was recorded in 1931 at Midville on the Ogeechee River between Louisville and Millen.

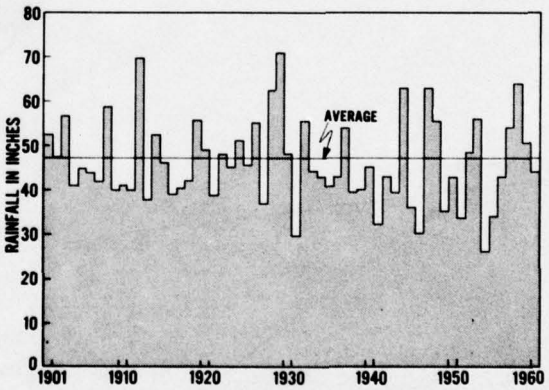


Figure 1.7 *Annual Rainfall near Statesboro.*

SECTION II – BASIN RESOURCES

Land

The land resources of the basin are used principally for crop and livestock production and forestry.

In 1959, about 645,000 acres were in cropland, some 193,000 acres were in pastureland, about 2,242,000 acres in woodland, and some 399,000 acres were in other uses including small water bodies.

CLIMATE

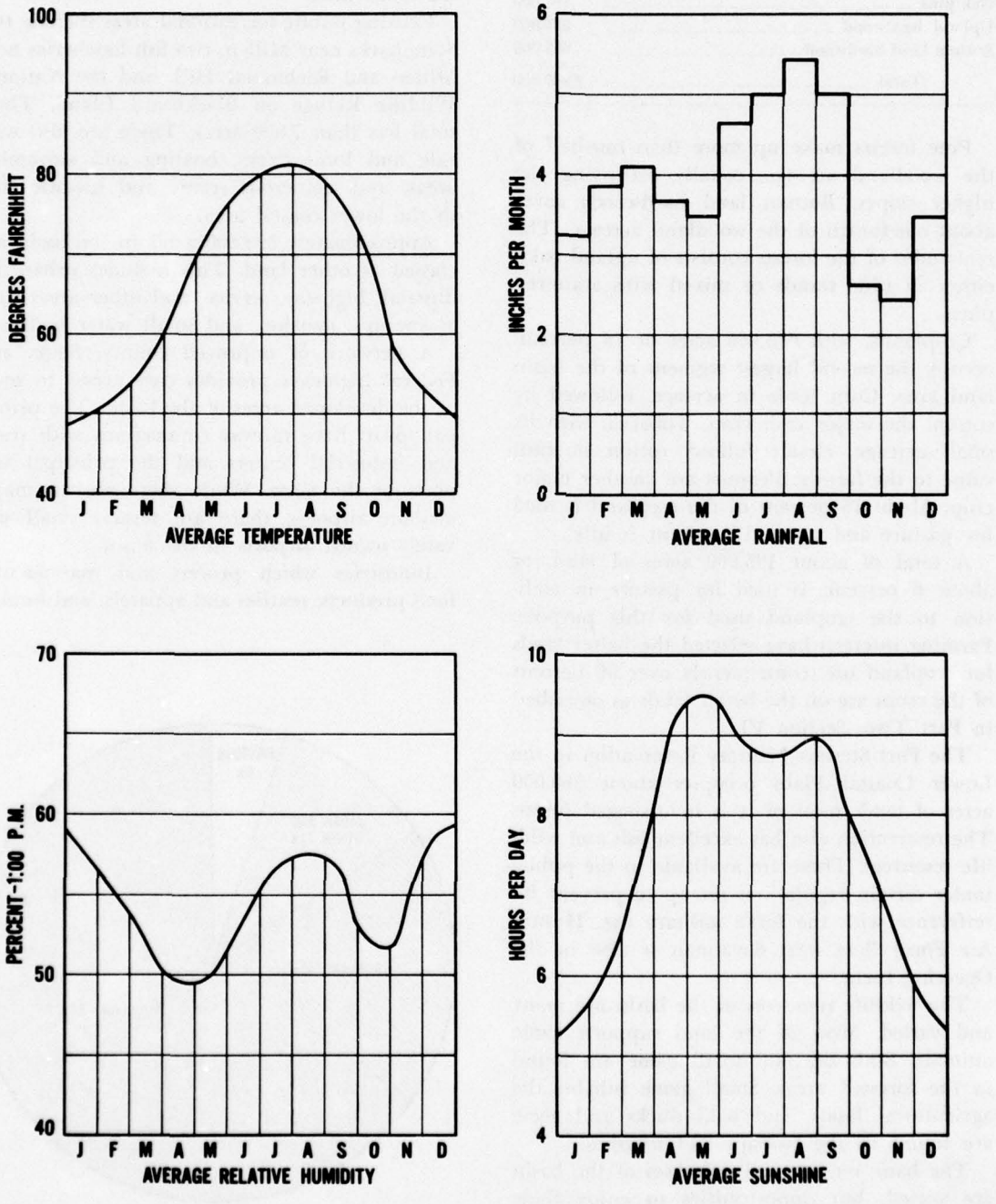


Figure 1.8

TABLE 1.1

Commercial Forest Acreage by Major Forest Types

Forest types	Acres
Pine	1,171,000
Oak pine	191,000
Upland hardwood	236,000
Bottom land hardwood	605,000
Total	2,203,000

Pine forests make up more than one-half of the woodland acreage, usually occupying the higher slopes. Bottom land hardwoods cover about one-fourth of the woodland acreage. The remainder of the forests consists of upland oaks, either in pine stands or mixed with scattered pines.

Croplands, with 645,000 acres or 18 percent, occupy the second largest segment of the basin land area. Corn leads in acreage, followed by cotton, the major cash crop. Tobacco, with its small acreage, closely follows cotton in cash value to the farmer. Peanuts are another major crop. About 15 percent of the cropland is used for pasture and about 15 percent is idle.

A total of about 193,000 acres of land, or about 6 percent, is used for pasture in addition to the cropland used for this purpose. Farming interests have selected the better lands for cropland use, consequently over 96 percent of the crops are on the better lands as described in Part Two, Section VI.

The Fort Stewart Military Reservation in the Lower Coastal Plain occupies about 280,000 acres of land; most of it is in managed forest. The reservation also has excellent fish and wildlife resources. These are available to the public under certain regulations set up to prevent interference with the fort's military use. Hunter Air Force Base near Savannah is also in the Ogeechee basin.

The wildlife resources of the basin are many and varied. Most of the land supports game animals. Both big and small game are found in the forested areas. Small game inhabit the agricultural lands, and wild ducks and geese are found in the swamps and marshes.

The basic recreational resources of the basin are varied, but opportunities to enjoy these resources are limited by the lack of facilities, physical access, public ownership of lands, and good distribution by type and in relation to population. Most use of forest lands for recreational activities is confined to State parks and roadside areas which constitute a small part of the forest area.

Existing public recreational areas include two State parks near Millen, two fish hatcheries near Millen and Richmond Hill, and the National Wildlife Refuge on Blackbeard Island. These total less than 7,000 acres. There are also wayside and local parks, boating and swimming areas, and numerous scenic and historic sites in the lower coastal area.

Approximately 399,000 acres in the basin are classed as other land. This includes urban, industrial, highway, service, and other areas such as swamps, marshes, and small water bodies.

A network of improved county, State, and Federal highways provides easy access to most of the developed areas of the basin. The principal towns have railway connections with trade and industrial centers and the principal seaports of the State. While there are no major civilian airports, there are several small privately owned airports in the basin.

Industries which process and manufacture food products, textiles and apparels, and lumber

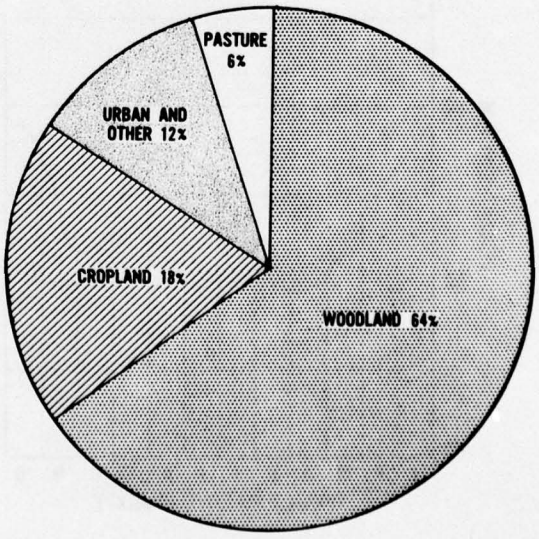


Figure 1.9 *Land Use in 1959.*

and wood products are located in the basin and occupy minor areas of land.

Water

The basin usually has an ample supply of surface and ground water of good quality. The Piedmont province, with its dense underlying rock, contributes about 50 percent more surface runoff per square mile than the Coastal Plain areas. Permeable limestone is the major source of water for deep wells in the Coastal Plain.

Except for the areas which drain directly into the Atlantic Ocean, the Ogeechee River and its tributaries drain nearly the entire basin.

There are no large storage reservoirs, hydroelectric plants, or major stream diversions in the basin. The many small lakes, reservoirs, and ponds have little effect on streamflow. The withdrawal, use, and discharge of ground water into streams is greater than withdrawal of water from streams, but the total amount is negligible with respect to total streamflow.

The runoff from the basin averages about 11 inches annually, or 3 million acre-feet. Eleven inches is slightly more than the United States average and less than that of the Southeast as a whole. The yearly difference between rainfall and runoff results from evaporation, transpiration, and seepage. The highest measured annual flow was in 1948 and represented about 27 inches average depth over the drainage area. The lowest, in 1954, represented about 5 inches average depth over the area.

Figure 1.10 *Upper Reach of Ogeechee River near Louisville.*

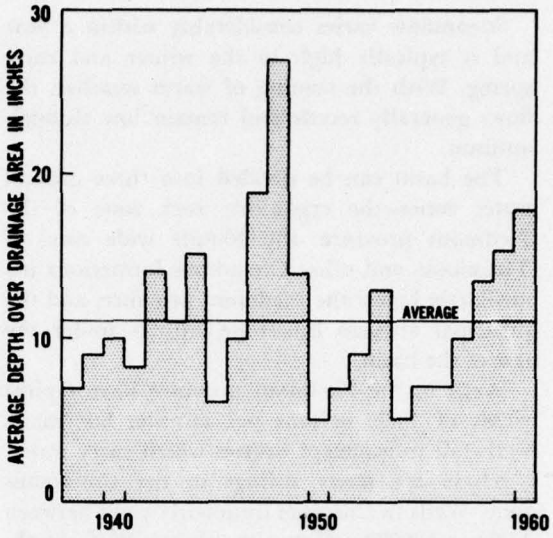


Figure 1.11 *Annual Runoff, Ogeechee River near Mouth.*

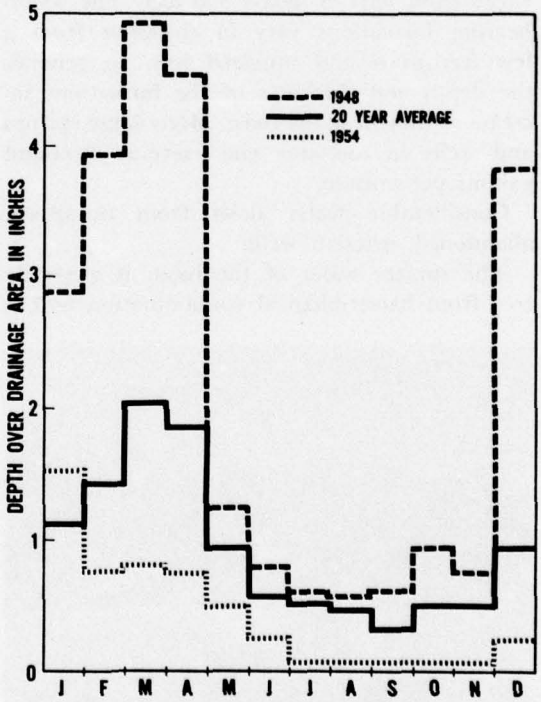


Figure 1.12 *Monthly Runoff, Ogeechee River near Mouth.*

Streamflow varies considerably within a year and is typically high in the winter and early spring. With the coming of warm weather, the flows generally recede and remain low through autumn.

The basin can be divided 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 Piedmont province, and the principal artesian limestone aquifer under the rest of the basin.

Wells in the Piedmont province have typical yields of 15-25 gallons per minute, but many wells fail to intercept fissures which carry water.

There are many springs in the Cretaceous zone. Wells in this zone frequently yield between 1,000 and 2,000 gallons per minute. Well depths to 600 feet are common.

The depth to the principal artesian aquifer varies from zero to nearly 500 feet. The water-bearing formations vary in thickness from a few feet to several hundred feet. In general, the depth and thickness of the formations increase as they near the coast. Many large springs and wells in the area yield several thousand gallons per minute.

Considerable water flows from uncapped, abandoned, artesian wells.

The surface water of the basin is generally free from bacteriological contamination and is extremely soft. In the lower reaches of the streams, it is dark in color. The hardness of surface water that was analyzed did not exceed 25 parts per million. The observed hardness of ground water ranges from 39 to 132 parts per million.

Sediment concentrations of 10 to 100 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, and about 90 percent of the load is carried 10 percent of the time. Turbidity at five Piedmont stations near the Ogeechee basin has declined to about 10 percent of that recorded in the 1930's. Since that time, there has been a great reduction in cultivated row crop acreages, adoption of soil conservation practices, construction of many farm ponds and small impoundments, and land-use changes.

Tidal effects extend upstream to just above the junction of the Canoochee and Ogeechee Rivers. The salt-water wedge extends nearly as far, depending on the flow of the stream. The only serious salinity problem appears to be the intrusion of salty ground water into the aquifer near Savannah. Salt-water intrusion occurs where there is excessive pumping of ground water near the coast.

The water temperature in the larger streams of the basin varies from 50° Fahrenheit in winter to 80° in summer. The smaller streams have

Figure 1.13 *Considerable Water Flows from Uncapped Artesian Wells.*

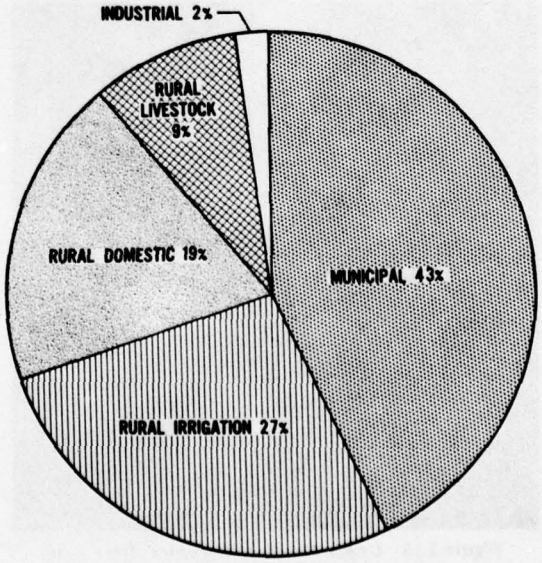


Figure 1.14 *Water Withdrawal-1960.*

Figure 1.15 *Farm Ponds Have Many Uses.*

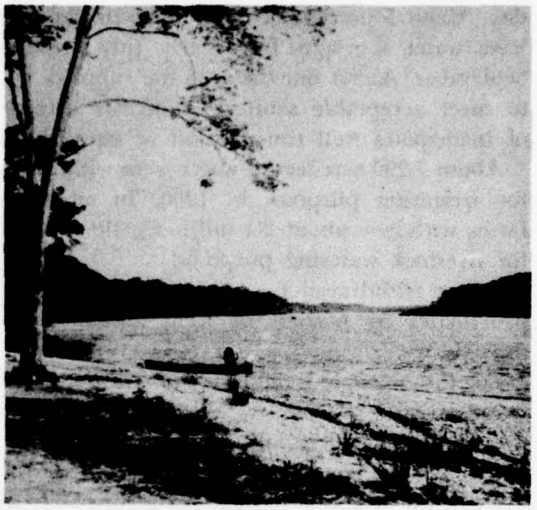


Figure 1.16 *Lower Ogeechee River Provides Many Miles of Good Stream Fishing.*

an even greater range and a more rapid fluctuation. The ground water temperature ranges from 65° to 70°.

While conditions vary from place to place, generally, the ground water is slightly alkaline. As with surface water, the ground water quality is better than that of most other regions in the United States.

The 8.84 billion gallons of water withdrawn from wells, ponds, and streams in the basin each year represent less than 1 percent of the average sustained supply available from both surface and ground water sources.

Rural residents served by domestic water supplies use about 50 gallons per person per day, or a total of about 4.7 million gallons per

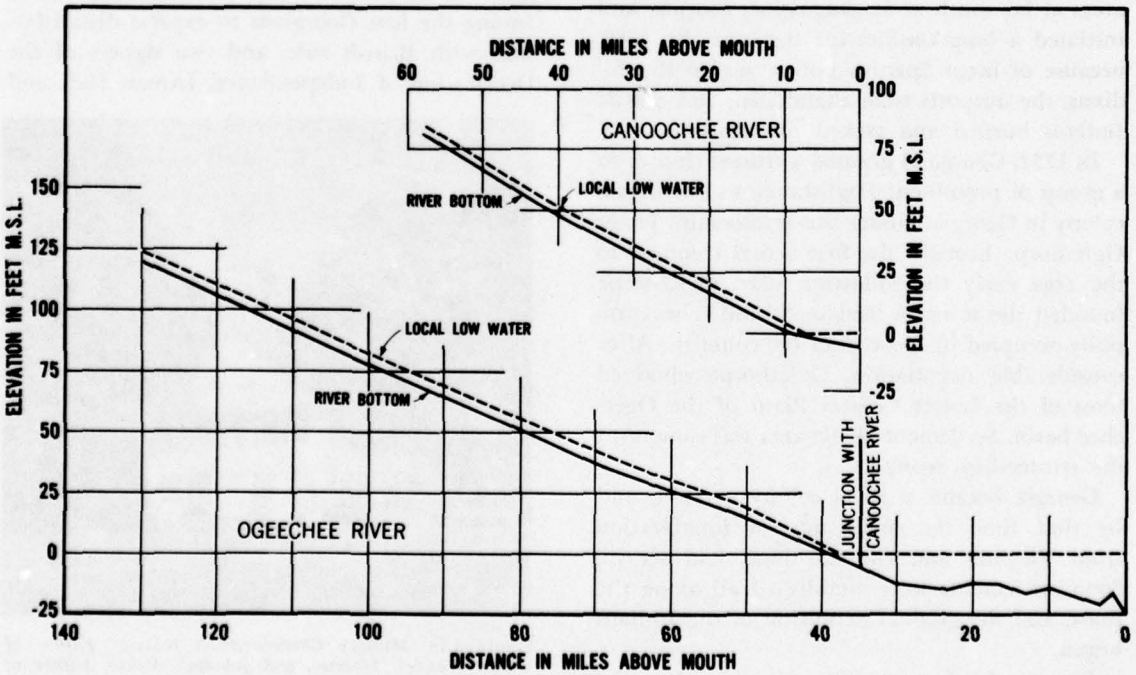


Figure 1.17 *Stream Profiles.*

day. About 7 percent of these domestic supplies have water shortages from early July through September. About one-third of the supplies fail to meet acceptable sanitary standards because of inadequate well construction or equipment.

About 7,200 acre-feet of water were withdrawn for irrigation purposes in 1960. In addition, farms withdrew about 2.1 million gallons a day for livestock watering purposes.

Water withdrawal for all rural purposes approximates 55 percent of total annual withdrawals.

For those people living in communities served by municipal systems, water use in the basin averages about 90 gallons per person each day, while for the Southeast River Basins area the average use is about 105 gallons per person. In 1960, municipal water withdrawals in the basin, including water for Federal installations, total 10.5 million gallons each day. About 1 percent of this total is used for industrial purposes. In addition, the basin industries withdraw through their own systems approximately 0.5 million gallons of water a day.

The river and its tributaries have considerable natural beauty and are used for both boating and fishing, particularly in the lower reaches where there are fishing camps.

The Ogeechee River will accommodate barge traffic for about 23 miles above its mouth. The Atlantic Intracoastal Waterway, with an authorized depth of 12 feet, extends along the coast of the basin and provides a protected route for commercial and pleasure craft.

SECTION III – PEOPLE IN THE BASIN

History

Prior to the appearance of the white man, the basin was inhabited by the Creek Indians. The Spanish, arriving in the mid-1500's, established missions and dominated the region for over a century.

In 1663, England extended land grants to areas as far south as St. Augustine, Florida, and initiated a long conflict for the area. By 1680, because of inept Spanish policy toward the Indians, the outposts were abandoned, and hostile Indians burned and sacked the missions.

In 1732, George II granted a trustee charter to a group of prominent Englishmen to establish a colony in Georgia. Under this trusteeship, James Oglethorpe brought the first actual colonists to the area early the following year. Oglethorpe founded the town of Savannah, and it was initially occupied by more than 100 colonists. After considerable negotiation, Oglethorpe obtained most of the Lower Coastal Plain of the Ogeechee basin. Settlement of the area was slow until the trusteeship expired.

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 expulsion of the Indians began.

Among the first people to arrive after the collapse of the trusteeship was a large group of New England Puritans. They founded the town of Midway in the Ogeechee basin, 40 miles southwest of Savannah, and the port of Sunbury on the Medway River. These industrious people, with their numerous slaves, prospered so well that by 1761 Sunbury was Georgia's second port of entry. These colonists were among the first Georgians to express dissatisfaction with British rule, and two signers of the Declaration of Independence, Lyman Hall and

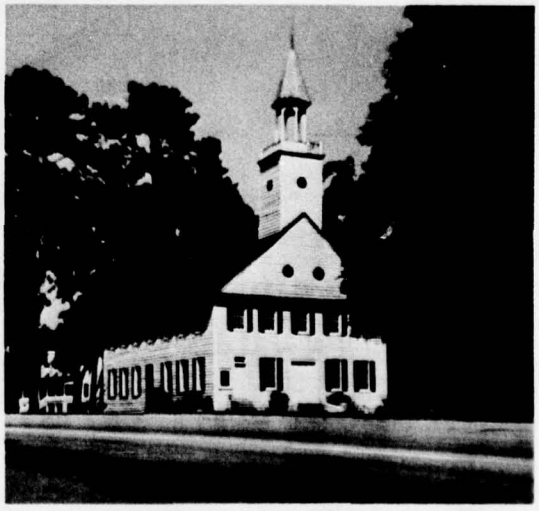


Figure 1.18 *Midway Church—Abiel Holmes, Father of Oliver Wendell Holmes, and Jebidiah Morse, Father of Samuel F. B. Morse, Were Among the Early Pastors.*

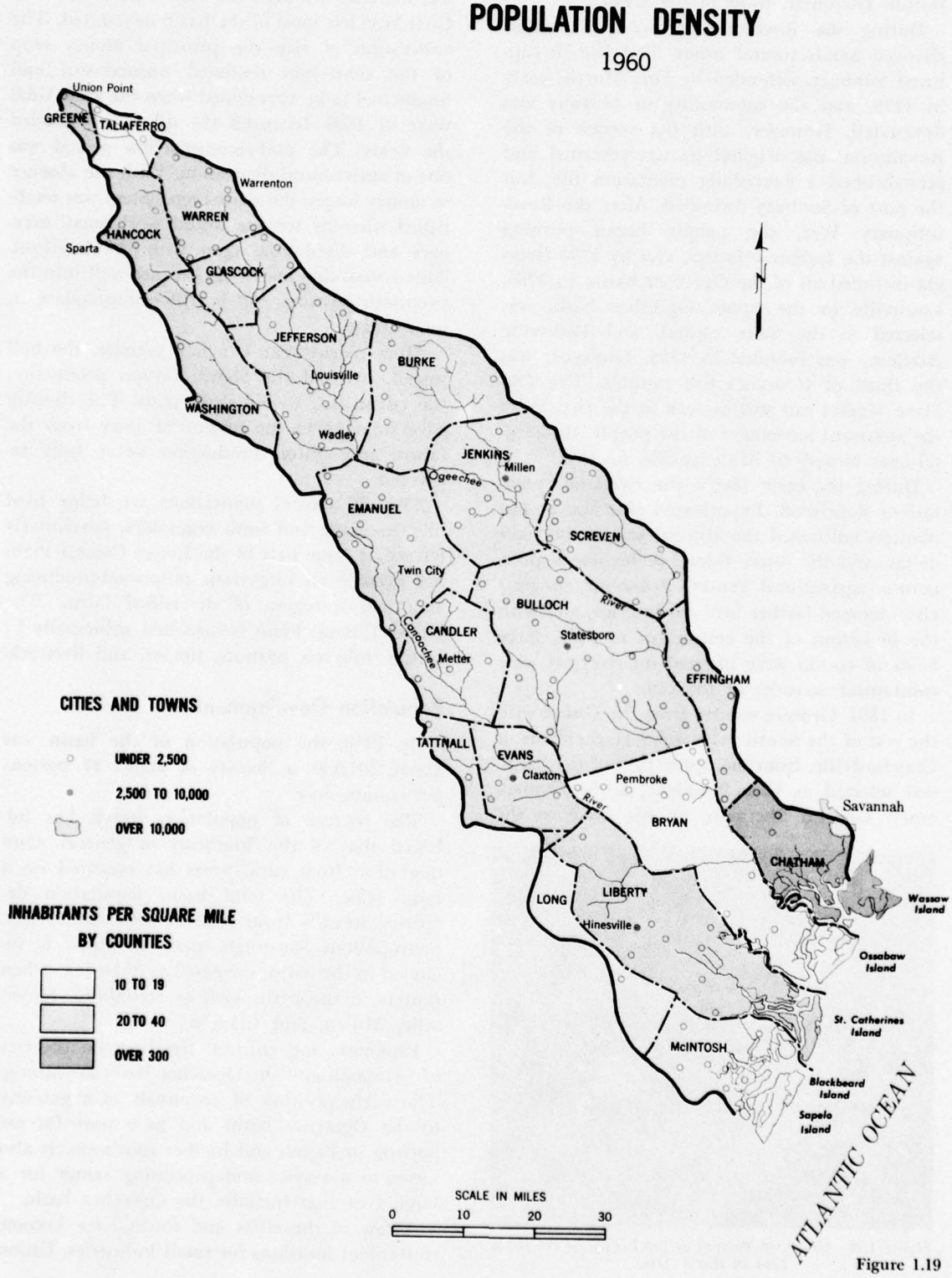

POPULATION DENSITY
1960
Union Point
GREENE
TALIAFERRO
Warrenton
WARREN
HANCOCK
Sparta
GLASCOCK
JEFFERSON
Louisville
BURKE
WASHINGTON
Wadley
JENKINS
Millen
Ogeechee
EMANUEL
SCREVEN
Twin City
BULLOCH
River
Statesboro
CANDLER
Canoochee
Metter
EFFINGHAM
TATTNALL
EVANS
Claxton
Pembroke
River
Savannah
BRYAN
CHATHAM
LONG
LIBERTY
Hinesville
Wassaw Island
Ossabaw Island
St. Catherines Island
McINTOSH
Blackbeard Island
Sapelo Island
ATLANTIC OCEAN
CITIES AND TOWNS
UNDER 2,500
2,500 TO 10,000
OVER 10,000
INHABITANTS PER SQUARE MILE
BY COUNTIES
10 TO 19
20 TO 40
OVER 300
SCALE IN MILES
0
10
20
30

Figure 1.19

Button Gwinnett, lived in the area.

During the Revolutionary War, Savannah changed hands several times. The British captured Sunbury, defended by Fort Morris, early in 1779, and the community of Midway was devastated. However, with the success of the Revolution, the original owners returned and reestablished a flourishing plantation life; but the port of Sunbury dwindled. After the Revolutionary War, the people began pushing against the Indian frontiers, and by 1790 Georgia included all of the Ogeechee basin. In 1795, Louisville in the upper Ogeechee basin was selected as the State capital, and Louisville Academy was founded in 1796. Louisville was the third of Georgia's five capitals. The Old Slave Market can still be seen in the city. With the westward movement of the people, the capital was moved to Milledgeville in 1804.

During the early 1800's, the riverfront plantations flourished. Experienced rice and cotton planters cultivated the alluvial soil of the river deltas, and the lower Ogeechee became a prosperous agricultural center. Economic progress also bloomed farther into the interior, and with the invention of the cotton gin in 1793, large fields of cotton were planted up river, as were substantial acreages of tobacco.

In 1861, Georgia seceded from the Union with the rest of the South. Alexander H. Stephens of Crawfordville, from the upper part of the basin, was selected as Vice President of the Confederacy. General Sherman, on his drive to the sea, marched through the Ogeechee basin. The Civil War left most of the basin devastated. The cultivation of rice—the principal money crop of the coast—was rendered unsuccessful and finally had to be 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 whereby tenants would work small acreages and divide the crop with the landlord. This system dominated agriculture well into the twentieth century, and is still commonplace in some areas.

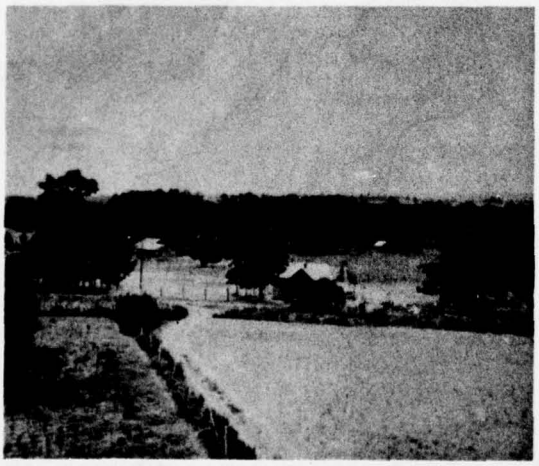


Figure 1.20 *Nearly 65 Percent of the People in the Basin Live in Rural Areas.*

After World War I, a new menace, the boll weevil, plagued the South. Cotton production was cut in half within three years. This disaster gave impetus to the migration away from the farms, and cotton production never fully recovered.

The old coastal plantations are being used to raise cattle and fresh vegetables, particularly lettuce. A large part of the Lower Coastal Plain has become an important pulpwood-producing area and a region of diversified farms. The Upper Coastal Plain is sustained principally by cotton, tobacco, peanuts, timber, and livestock.

Population Development

By 1960, the population of the basin was about 201,500, a density of about 37 persons per square mile.

The pattern of population trends has followed that of the Southeast in general. Outmigration from rural areas has occurred on a large scale. The total basin population decreased steadily from 1930 to 1950. Conversely, metropolitan Savannah, part of which is included in the basin, increased as did a few urban centers in the basin such as Statesboro, Hinesville, Millen, and Claxton.

Economic and cultural ties between the city of Savannah and the Ogeechee basin are strong. The early position of Savannah as a gateway to the Ogeechee basin and as a port for exporting its cotton and lumber continues. It also serves as a service and processing center for a large area that includes the Ogeechee basin.

A few of the cities and towns have become convenient locations for small industries. Union

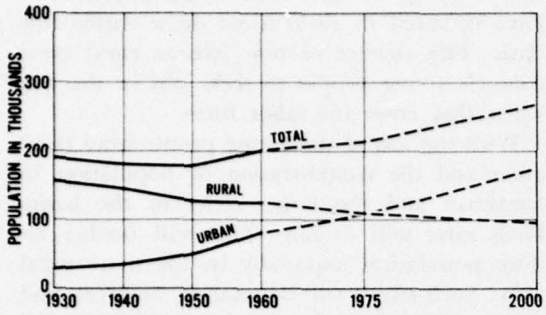


Figure 1.21 *Ogeechee Basin Population and Projection.*

Point serves as a textile and agricultural center, and Sparta and Warrenton fulfill similar functions. Statesboro is located in the center of the largest contiguous agricultural area in the basin. It also has many tourist facilities. Louisville, the old State Capital, and Claxton have similar agricultural services and tourist facilities, plus some manufacturing. Other centers in the basin are Millen, Metter, Pembroke, Twin City, and Wadley. Hinesville, in the Lower Coastal Plain, is a residential and commercial adjunct to Fort Stewart.

A continuation of population trends appears reasonably certain. Savannah is becoming a major metropolitan area and will undoubtedly expand further into the Ogeechee basin. Savannah's population is expected to increase to 250,000 by 1975 and to 390,000 by 2000. The larger urban centers will continue to receive people from rural areas and will provide more and more services for those who remain to work on the farms and in the forests. These cities will provide more opportunity for industry and thus continue to grow.

Population Characteristics

The major conditions and circumstances which characterize the people of the basin are changing. In line with national trends, there is a movement of people to the cities and larger towns. Although some move to nearby towns or Savannah, many leave the basin. While the percentage of Negroes is expected to dwindle gradually as a result of out-migration, the ratio of Negroes in the basin is not expected to approach the national average in the foreseeable future.

Certain characteristics of the basin population

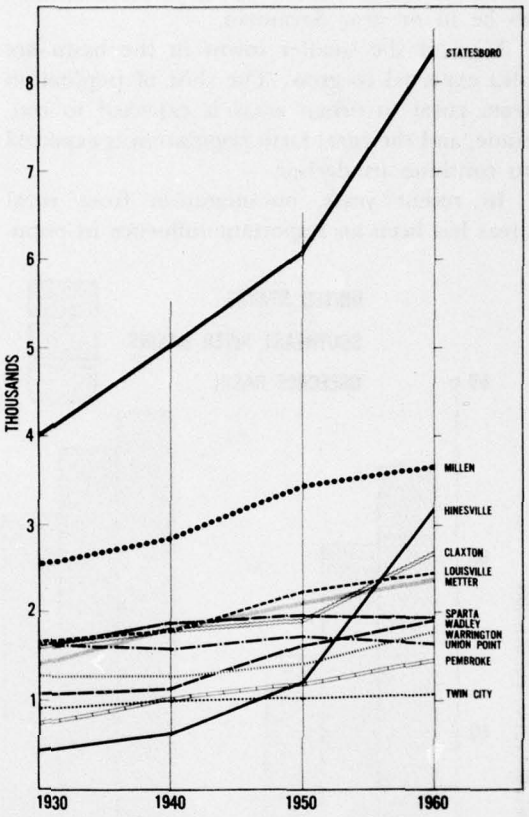


Figure 1.22 *Population of Cities and Towns (except Savannah).*

in relation to the State and Nation are shown in Figure 1.24. In addition to these comparisons, the number of years devoted to education is about one year less than the Georgia average and about two and one-half years less than the national average. The percentage of people engaged in agriculture is above the national average and considerably above that for the Southeast. Conversely, the percentage employed in manufacturing is below that for the Nation or the Southeast.

The educational level and related skills will undoubtedly improve, although the amount of such improvement depends upon local awareness of needs and the financial ability to meet those needs.

Factors Affecting Population Change

The population of the Ogeechee basin is expected to increase about one-third from 1960

to 2000. A large part of this growth is expected to be in or near Savannah.

Most of the smaller towns in the basin are also expected to grow. The shift of population from rural to urban areas is expected to continue, and the rural farm population is expected to continue its decline.

In recent years, out-migration from rural areas has been an important influence in population change of the basin. Population declines have occurred in rural areas on a nationwide basis. The absence of new jobs in rural areas compels young people to seek jobs in the city when they enter the labor force.

With the loss of the young people from rural areas and the concentration of population in Savannah and the larger cities in the basin, birth rates will decline. This will further reduce population, especially in the more rural areas. Such effects will be gradual, however, and a high birth rate will be characteristic of the region for the next several decades. This, in conjunction with increasing urban population, is expected to offset out-migration and to produce a continuing increase in total population.

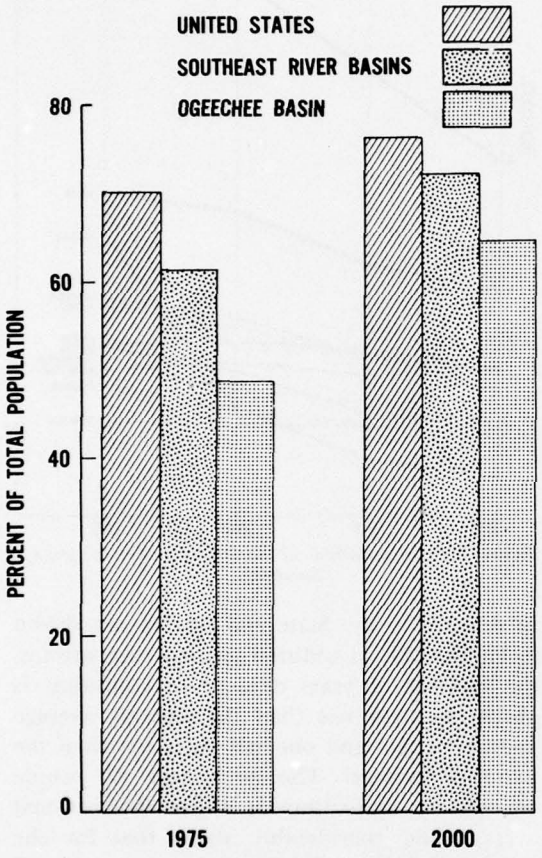


Figure 1.23 *Urban Population Projections.*

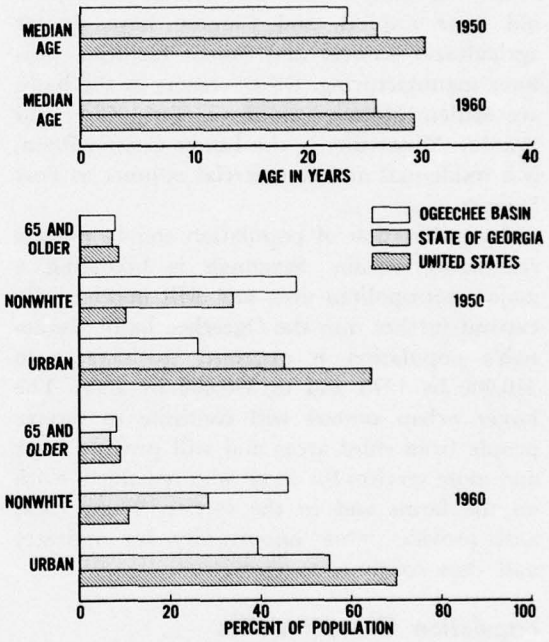


Figure 1.24 *Comparative Population Characteristics.*

SECTION IV – BASIN ECONOMY

Existing Economic Development

The economy of the Ogeechee basin has a rural basis; agriculture, forestry, and their related activities predominate.

Although the Savannah metropolitan area extends into the Ogeechee basin, no other large cities are within the basin. Statesboro, with about 8,000 people in 1960, is the largest city entirely within the basin. All other cities and towns are relatively small, although some have manufacturing and service activities.

The per capita income of the Ogeechee basin is low due to the way in which the agricultural economy is organized and to the lack of indus-

trial opportunity. Although the basin comprises about 6 percent of the Southeast River Basins area and about 4 percent of the population, total personal income is estimated to be less than 3.5 percent of the total for the Southeast River Basins area in 1960. The per capita income for the basin is estimated to be $1,300. This is only four-fifths of the average per capita income for the Southeast River Basins area and less than three-fifths of the national average.

The rapid changes which have occurred in the national, regional, and State economic structures have also affected the basin. The national economic structure has moved toward an industrial economy, while changes in the agricultural economy have occurred in land use and farm tenancy. There are fewer but larger farms. Rural areas in the Ogeechee basin have, however, had difficulty in keeping up with economic growth and industrial expansion.

To a large extent, these changes have somewhat compounded the plight of the basin economy. Although out-migration has included a large segment of the marginal agricultural labor, it has also included a large proportion of the better trained and educated young people. As these young people complete their secondary education and training, they are compelled to seek employment and additional training outside the area. The sustained loss of population, in general, and of trained and educated young people, in particular, has not been conducive to industrial growth. At the same time, manufacturing employment opportunities have not been sufficient for the labor that has become marginal or surplus in agriculture and forestry. About 55,000 persons were employed in the basin in 1960. Although there was substantial commuting to employment outside the basin, there was significant unemployment and underemployment in the basin.

More than one-half, or almost 2 million acres, of the basin is in farms, and over 14,000 people are employed in agriculture. Products sold from basin cropland exceeded $27 million in 1959. Sale of livestock and livestock products totaled more than $17 million. In addition, the value of forest products sold from farms in the basin was well over a million dollars. The total cash farm income from these enterprises was over $46 million.

The Ogeechee basin is a major wood-producing area. Forest products include sawtimber, poles and posts, pulpwood, and naval stores. Commercial sawtimber enterprises employ wood cutters and sawmill workers, and the pulpwood industries employ wood cutters and truckers. The production of naval stores requires a large number of workers.

Almost 56 million cubic feet of forestry products, with an estimated gross sale value of $5.6 million, were harvested from all forest lands of the basin in 1960.

The naval-stores industry is an additional contributor to the basin economy. Approximately 20 million pounds of pine gum were produced in 1960 with an estimated gross sale value of almost $2 million.

Manufacturing constitutes another important part of the basin economy. Manufacturing includes the apparel, food products, textile, and metal industries. Most of the industries in the basin are located in or near cities.

Traditional industries in the basin are related to farm and forest products and to the abundant labor supply created by declining agricultural employment. Industries utilizing forest resources include logging, naval stores, sawmilling, and woodworking. These industries individually usually employ less than 50 people.

Figure 1.25 *Naval Stores Contribute Materially to the Basin Economy.*

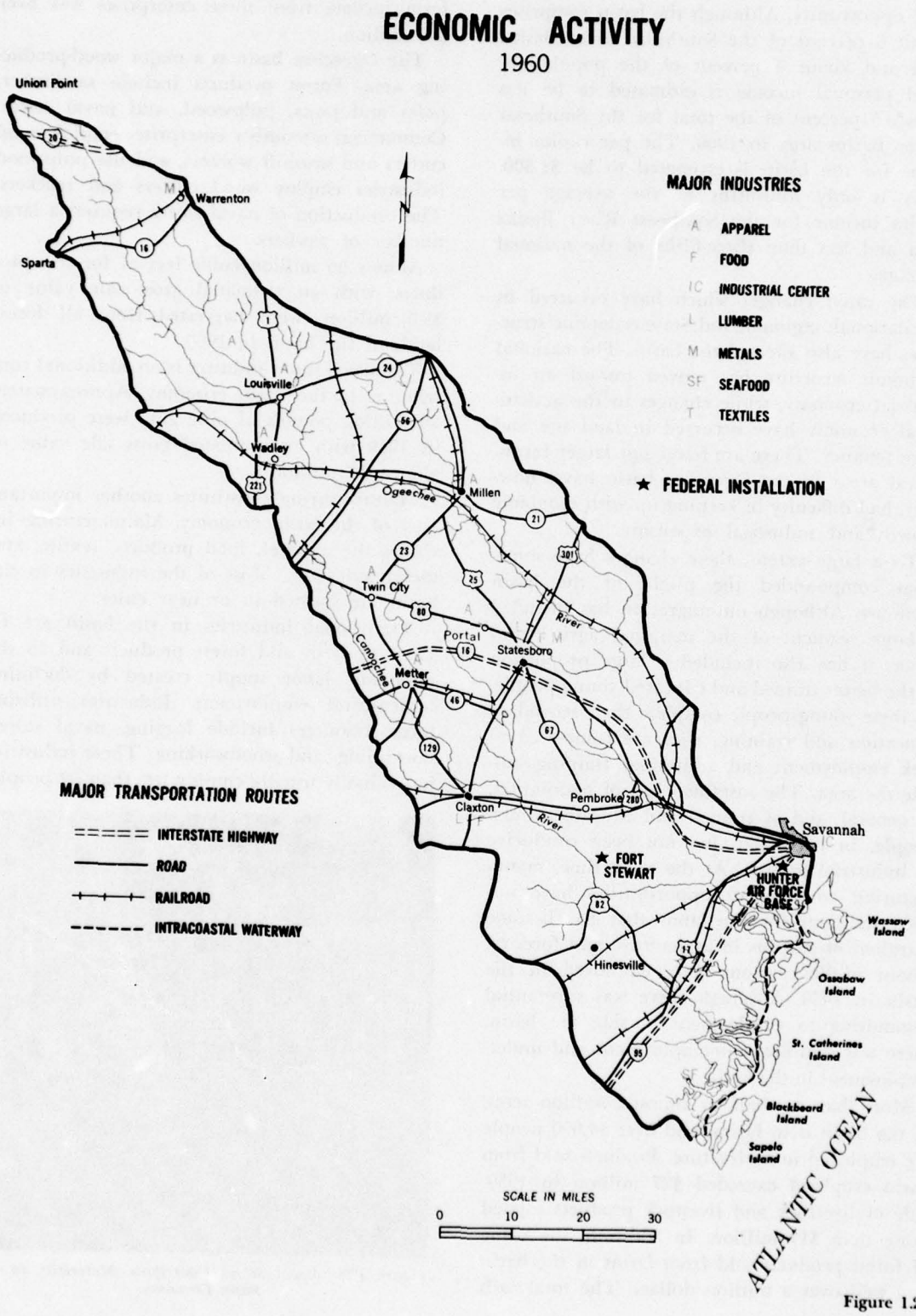

ECONOMIC ACTIVITY
1960
Union Point
Warrenton
Sparta
Louisville
Wadley
Millen
Ogeechee
Twin City
Portal
Statesboro
Metter
Claxton
Pembroke
Savannah
FORT STEWART
HUNTER AIR FORCE BASE
Hinesville
Wassaw Island
Ossabaw Island
St. Catherines Island
Blackbeard Island
Sapelo Island
ATLANTIC OCEAN
Canoochee River
Ogeechee River
MAJOR INDUSTRIES
A APPAREL
F FOOD
IC INDUSTRIAL CENTER
L LUMBER
M METALS
SF SEAFOOD
T TEXTILES
★ FEDERAL INSTALLATION
MAJOR TRANSPORTATION ROUTES
INTERSTATE HIGHWAY
ROAD
RAILROAD
INTRACOASTAL WATERWAY
SCALE IN MILES
0 10 20 30

Figure 1.26

The several textile and apparel industries in the basin employ about 2,500 people. Some of these plants employ over 100 workers each, and several employ from 300 to 500 workers. There are numerous smaller apparel plants. These industries supply regional and national markets. Most of the apparel plants have located in the basin since 1950.

Minerals commercially produced in the basin include rock, sand, gravel, clay, granite, quartzite, limestone, kaolin, fuller's earth, and peat. There is a rock-crushing plant near Warrenton which employs over 100 people and another smaller plant near Sparta. Kaolin, bauxite, and fuller's earth are found just downstream from the Piedmont province, in Washington, Jefferson, and Glascock Counties. Heavy mineral resources, thorium, titanium, and zirconium occur in a band 10 to 20 miles wide along the Atlantic coast. Peat occurs in a band approximately 50 to 60 miles wide along the coast.

Other important local industries include printing and metalworking, feed and seed processing, fertilizer mixing, ginning, canning, and freezing and processing food products such as meat, poultry, seafood, peanuts, and vegetables. These industries are usually small and employ less than 25 workers each.

New trends in the manufacture of metal products and parts to supply regional and national markets are occurring in the basin. Facilities for this type of industry are located at Warrenton in Warren County and at Statesboro in Bulloch County and employ over 500 workers.

Excluding Chatham County and Savannah, there are about 800 manufacturing and processing plants in the 20 counties, partly or wholly, in the basin. Some 400 of these handle forest products. About 100 are concerned with cotton products, including gins, spinners, weavers, and garment factories. About 50 firms process food or livestock feed. There are about six crushed-

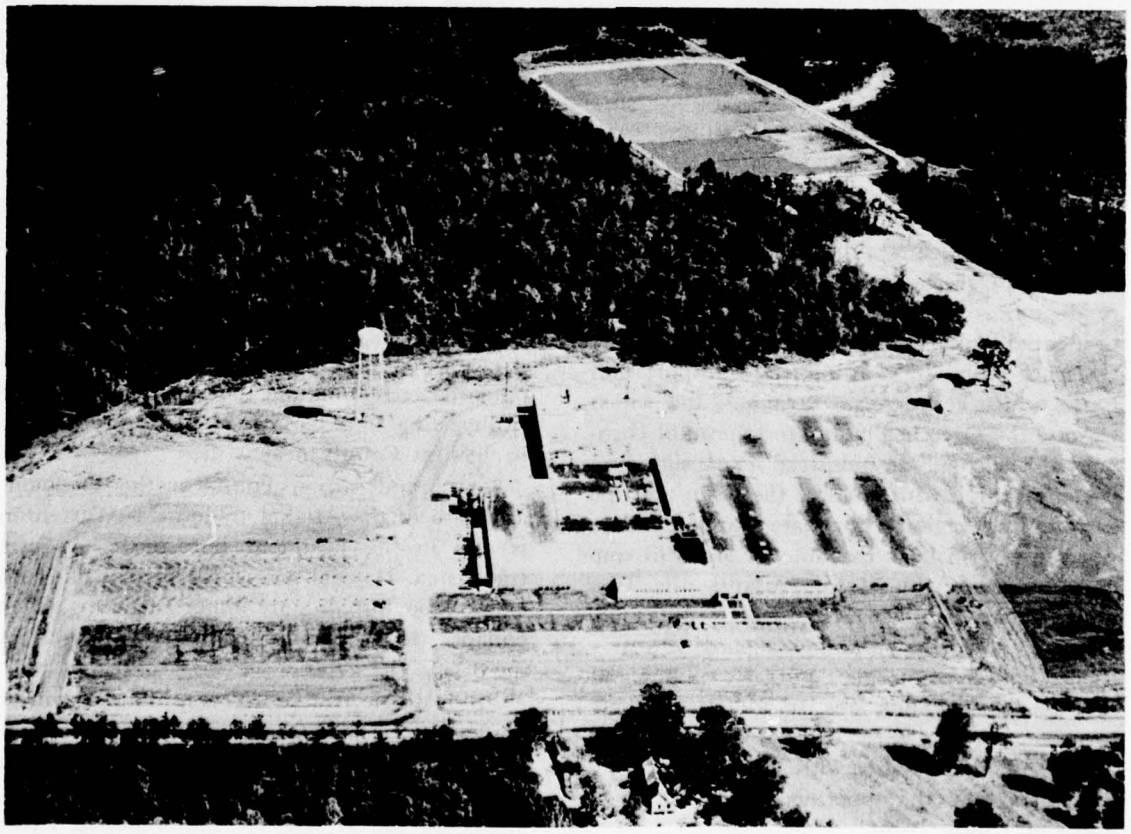


Figure 1.27 *New Industrial Plant near Statesboro. Manufacturing Accounted for 13 Percent of the Basin Employment in 1960.*

stone plants and three or four plants processing fuller's earth or kaolin. Some of these manufacturing and processing plants are in counties that extend into other basins.

About 7,500 people are now employed in manufacturing. The payroll is estimated at $25.3 million annually. About 14,100 people are employed in agriculture, and 33,400 are employed in other categories.

Nonagriculture and nonmanufacturing activities that are important in the basin economy include construction, trade, finance, real estate, services, transportation, and government. Generally, these activities pay higher wages than do many of the manufacturing industries.

Commercial fishing was once a major segment of the local economy. However, this industry nearly disappeared in the early 1930's. A recovery of the industry appears to be underway.

TABLE 1.2

Employment—1960

Major categories	Number	Percent
Agriculture	14,100	26
Manufacturing	7,500	14
Nonagriculture—nonmanufacturing	33,400	60
Total employment	55,000	100

In 1960, Savannah had a total population of 188,000, of which approximately 71,600 lived within the Ogeechee basin. Much of the existing residential area and a great deal of the recent residential expansion of the city are within the Ogeechee basin. In addition, the transportation routes which converge on Savannah and which traverse the Ogeechee basin are important channels of metropolitan-industrial expansion and communication with cities of the basin and the surrounding region. Interstate Route 16 traverses the basin from east to west and will connect Savannah with Macon, Atlanta, the Tennessee Valley, and the Middle West. Interstate Route 95 along the Atlantic seaboard will carry traffic between Florida and New England through the Savannah area. In addition to these two routes that cross the basin, Interstate Route 20 will connect Atlanta with Augusta and Columbia and cross the upper end of the basin just south of Union Point.

Savannah is the most important metropolitan influence with respect to the Ogeechee basin. Other than Savannah and the nearby metropolitan centers, small cities of the basin are important to its economy and act as economic and social links between the surrounding agricultural areas and the large metropolitan centers.

Statesboro, the county seat of Bulloch County, is in the Savannah trade area and is centered in the largest contiguous agricultural area of the basin. It is the most important tobacco auction center in Georgia. Statesboro has also become an important livestock center. Bulloch County is the leading hog-producing county in Georgia. Statesboro's industries are diversified, and most of them are related to the traditional economy of the region.

Hinesville, county seat of Liberty County, is also in the Savannah trade area and is located in the Lower Coastal Plain just south of Fort Stewart. Its economy fluctuates, being largely dependent upon military activities.

Other important cities of the basin in the Savannah trade area are Claxton, Pembroke, and Metter. These county seats all serve as local trade, service, and manufacturing centers.

Most of the cities of the basin in the Upper Coastal Plain lie within the trade area of Augusta. They include Millen, Louisville, and Wadley. Twin City, also in the Upper Coastal Plain, is in the Macon trade area. All of these except Wadley and Twin City are county seats. They are also important trade, service, and manufacturing centers. In addition, they are strategically located with respect to existing and potential recreation and tourist attractions. The two existing State parks in the basin are located in Jenkins County near Millen.

Sparta and Union Point, in the Piedmont area, are in the Atlanta trade area. Warrenton is also in the Piedmont but in the Augusta trade area. Natural gas which is available and ample labor supplies are important assets which enhance the economic potential of this part of the basin.

No hydroelectric power is produced within the basin, but adequate power is available from nearby areas. Existing power demands, both as to number of users and consumption per user, are below the average for the Southeast River Basins area and the Nation.

Future Economic Growth and Industrial Development

The economy of the Ogeechee basin is related 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 planning objectives for the basin is contained in the Economic Framework established for the Southeast River Basins. 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 too conservative, the projected level of economic growth may be reached later or earlier, but the goals would not be greatly altered. The framework includes projections of future national population growth, personal income changes, production requirements in terms of gross national product and specific commodities, labor force and employment, and other significant factors affecting the national economy under assumed conditions. Among other things, it is assumed for the purpose of projecting needs and opportunities that there will not be a major war, nor a prolonged depression during the period of analysis.

After the national projections were 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. Details are included in Appendix 9, Economics. Some of the more important production figures for the Ogeechee basin are in Table 1.3.

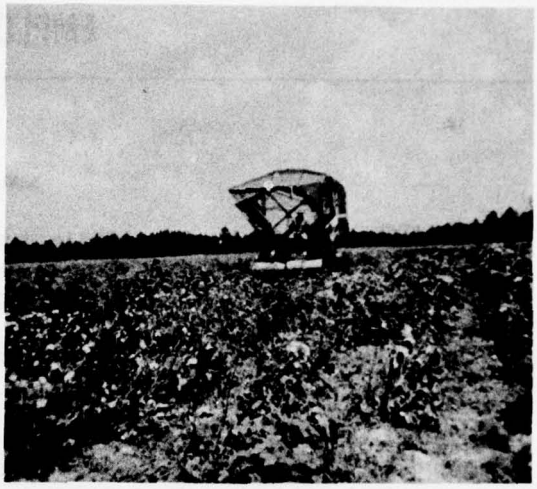


Figure 1.28 *Use of Mechanized Equipment Such as Cotton Pickers Is Increasing.*

The lack of economic growth in underdeveloped areas has been a problem for a long time and has been brought into sharper focus by the rapid transitions now underway throughout the national economy. Agricultural employment is expected to decline sharply, although farm productivity per worker should continue to increase. In 1960, 14,100 people were employed in agriculture. In 1975, employment in agriculture is not expected to exceed 10,700 persons; and by 2000, the figure should be about 7,900.

The immediate possibilities for expanding manufacturing appear somewhat limited. An analysis of the potentials in all major categories of basin manufacturing activities indicates that manufacturing employment should increase from 7,500 in 1960 to a little over 10,000 in 1975 and to about 15,600 in 2000.

The knowledge that employment in manufacturing activities helps create additional jobs for workers in trade and service occupations evokes much local and regional interest in industrial development. Many basin towns have an industrial-development corporation or committee of the local chamber of commerce. A few of these local groups are coordinated city-county organizations. Their work generally consists of stimulating local interest in industrial development, defining local assets and liabilities, raising local money for industrial building and loans, and visiting and negotiating with suitable industries.

EMPLOYMENT

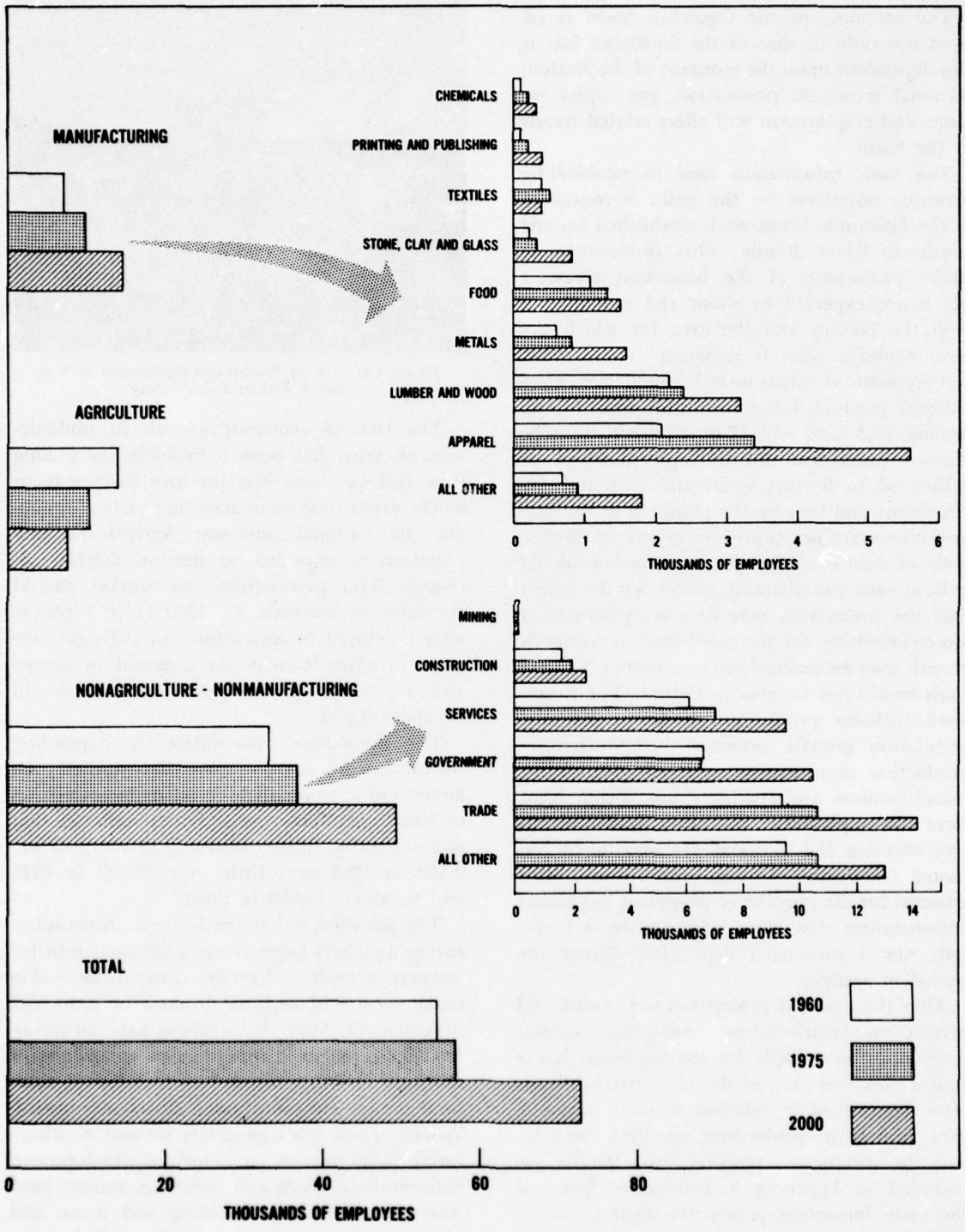


Figure 1.29

TABLE 1.3

Production Data and Projections

Item	1960	1975	2000
Cotton (million pounds)	33.3	46.8	63.8
Corn (million bushels)	5.4	7.3	11.3
Peanuts (million pounds)	23.9	47.6	74.6
Tobacco (million pounds)	12.8	23.2	30.6
Truck crops (thousand tons)	26.0	44.0	66.0
Meat (million pounds)	67.1	125.1	202.3
Milk (million pounds)	82.8	133.0	177.2
Timber cut (million cubic feet)	56.0	87.9	141.0
Gum naval stores (thousand barrels)	46.8	64.2	93.5
Commercial food fish (million pounds)	9.7	12.6	20.4

The Rural Development Program was established in 1955 as a Federal and State interagency effort to solve some of the economic problems of rural underdeveloped areas. This program, renamed the Rural Areas Development Program, is operating with renewed emphasis which involves cooperative efforts of many agencies, including those of the U. S. Department of Agriculture and State colleges and universities. The land-grant colleges of each of the five States of the Southeast River Basins area are active in this work. The University of Georgia has recently organized the Institute of Community and Area Development to coordinate work in this important field.

The Area Redevelopment Act of 1961 is directed toward achieving lasting improvement in areas with substantial and persistent unemployment and underemployment by creating new employment opportunities through the expansion of new and existing facilities and resources in the area.

Also, there is increased opportunity under the Federal Housing Act to rehabilitate blighted in-

TABLE 1.4

Economic Factors and Projections

Year and area	Population (1,000)	Increase over 1960 (percent)	Employment (1,000)	Increase over 1960 (percent)	Per capita income*	Increase over 1960 (percent)
1960						
United States	180,000	—	67,000	—	$2,222	—
Southeast River Basins	4,948	—	1,753	—	1,582	—
Ogeechee basin	202	—	55	—	1,300	—
1975						
United States	235,000	31	89,000	33	3,012	36
Southeast River Basins	6,408	30	2,343	34	2,202	39
Ogeechee basin	213	6	58	5	1,837	41
2000						
United States	380,000	111	148,000	121	4,733	113
Southeast River Basins	10,052	103	3,789	116	3,922	148
Ogeechee basin	268	33	73	33	3,239	149

*1960 dollar equivalent.

dustrial and commercial areas and to obtain technical assistance and planning aid in cities, small towns, and counties.

Assistance is also available through the Small Business Administration, U. S. Department of Commerce and under provisions of the Job Training Act of 1962.

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

Analysis of high-growth industries indicates that many industries have exceptional potential for expansion or location in Georgia. These include the manufacture of seamless hosiery; knit outerwear; metal products, including shelving, lockers, and metal castings; concrete products; measuring instruments and gages; boats and trailers; molded plastic products, including boats, toys, recreation and camping equipment; furniture and furniture accessories; food and dairy products, especially seafood; and wood furniture, toys, and specialty items.

Industrial expansion in Savannah, Augusta, and Macon would create opportunities for employment or development of satellite industries in the Ogeechee basin. Industries that might locate or expand from Savannah include petroleum refining and manufacturing of petrochemicals; ore reduction; heavy metalworking and rolling; cement manufacturing; paper products manufacturing; molded pulp and packaging; manufacturing wood-particle board, plywood and sandwich-type wall boards; and manufacturing and assembly of electronic equipment and machinery. Such industrial expansion could be greatly enhanced by regional planning which would give adequate and continuing consideration to problems of economic geography, patterns of urban development, and to factors influencing location of industrial satellites such as markets, transportation, raw materials, and labor supply. The area south of Savannah has potential for industrial development because of available land and access to navigable waters.

Educational levels and the adaptation of educational patterns to industrial needs and potentials of the future are important to economic development. Industrial change and the obsolescence of products and processes occur so rapidly that adaptation of workers to these changes is a factor of major importance in every region. Furthermore, industrial competition and effective entrepreneurship depend, to an ever-increasing degree, on ideas and development of new products and processes.

The long-range projection of manufacturing involves many interrelated factors. Of these, the location of raw materials, labor force, and markets predominate. The apparel industries, as the major manufacturing employer, are expected to grow and to continue to dominate manufacturing in the Ogeechee basin. The next important manufacturing industry, lumber and wood products, is expected to show moderate increases, but is expected to lose its relative importance with regard to employment. Employment in the manufacture of food products is expected to increase significantly. Employment in chemicals; stone, clay, and glass; and metals is expected to increase rapidly so that the share of the manufacturing employment in these industries should increase from approximately 12 precent in 1960 to almost 20 percent in the year 2000.

The food-products industries have been growing rapidly throughout the Southeast and have exceeded the national growth average. In the future, the Southeast and the Ogeechee basin should contribute a larger share of the Nation's needs for processed foods. A notable expansion has already been made in the meat-packing industries in Georgia when compared with the Nation. Technology in the food industries will very likely result in plant enlargement and increased output per employee. However, employment projections for these industries reflect an upward trend. In 1960, 1,100 employees were working in the food-products industries. It is estimated that this should increase by more than one-third by 2000.

In 1960, the textile industries accounted for about 5 percent of the employment in manufacturing in the Ogeechee basin. By 2000, they should account for less than 3 percent. National and regional statistics indicate a declining employment trend in the textile industries. In the past, the textile industries have required a large amount of low-skilled labor. With increasing

competition from synthetics and from foreign supplies, there has been a marked trend toward consolidation and automation in domestic plants. This trend is expected to continue. The percentage of the total manufacturing employment used in the textile industries should gradually decrease.

Examination of employment statistics for the apparel industries in the South Atlantic States and in Georgia shows that they have undergone substantial growth in recent years. Employment in the industries in Georgia increased 40 percent between 1947 and 1954. In 1960, the apparel industries in the Ogeechee basin employed 2,100 people. Projected to 1975, total employment in these industries should reach 3,400 persons; and projected to 2000, the employment should reach 5,600 persons. Substantial increases in employment for these industries are based on the growing popularity of the informal lines of apparels manufactured for expanding local and national markets.

Throughout the United States and the Southeast, employment in the lumber and wood industries has declined substantially. This decline in employment is a result of gradual modernization and mechanization of the industries and some decline in the overall output. In spite of this trend, the vast expanse of timber resources in the Ogeechee basin is expected to sustain these industries. Although the percentage of employees in manufacturing that are engaged in lumber and wood products industries is expected to decline from 29 percent in 1960 to about 25 percent in 1975 and to about 20 percent by the year 2000, the total employment in the industries should increase from 2,200 to 2,500 to 3,200 persons in these same years.

In terms of employment, the metal industries are the most important industries in the economy of the United States. In the Southeast and in the Southeast River Basins study area, metalworking is today the third largest manufacturing industry. However, only 8 percent of the employees in manufacturing in the Ogeechee basin are in these industries. With an ample labor force available and with nearby urban market areas continuing to grow, employment in these industries should increase to 800 by 1975 and to 1,600 by the year 2000.

Natural resources for stone, clay, and glass industries exist in the basin. These resources have barely been touched; and, as the area develops, such industries are expected to grow. In 1960, this industry segment employed about 200 workers. This should increase to 300 by 1975 and to 800 by 2000.

Few people are employed in the chemical industries in the Ogeechee basin. While the chemical industries of the area are not expected to employ as large a proportion of the total manufacturing labor force as does the Nation and the Southeast, there are ample reasons for projecting some employment growth in these industries.

Other miscellaneous manufacturing industries in the basin, which include pulp and paper and printing and publishing, are largely undeveloped at the present time. The possibilities for developing these industries are not to be disregarded. For instance, a pulp and paper mill could be located in the basin at some future date and have a definite influence on the basin economy.

Other than agriculture and manufacturing, important categories of employment in the basin include government, wholesale and retail trade, services, construction, and mining. Mining employs relatively few people, and no change has been projected for these industries.

The requirements of government are expected to increase at a slightly greater rate than the population in general. The greatest increase in this field will probably occur in education. At the same time, other segments of local, State, and Federal Governments are expected to increase. Wholesale and retail trade and services and, to some extent, construction, will be influenced by the expected increase in tourist travel and the use of the recreational resources of the basin. Employment in all these nonagricultural and nonmanufacturing activities are projected to increase from 33,400 in 1960 to 37,000 in 1975 and to 49,800 by the year 2000.

The amount of personal income per person is related to the size and productivity of the labor force. The Ogeechee basin is handicapped by unemployment, underemployment, and low-pay industries. It lags behind the United States and the Southeast in per capita income.

Total personal income in the Ogeechee basin is expected to increase from about $262 million in 1960 to about $391 million in 1975 and to $867 million in 2000. Per capita income is projected to increase about two and one-half times in the next 40 years and, as with the Southeast River Basins area, to move closer to the national average.

Approximately 1,852,000 acres of land in the Ogeechee basin, including nearly 18,000 acres of small water bodies, were in farms in 1959. The increase in population expected in the United States and the Southeast for 1975 and 2000 should create heavy demands for a greatly expanded food and fiber production. The Ogeechee basin will share in this increased production to the extent its valuable agricultural resources are developed and utilized. The Ogeechee basin should produce almost twice as much cotton by the year 2000 as was produced in 1959. The basin also should produce about 50 million more pounds of beef and veal, 81 million more pounds of pork, and more than double its 1959 poultry production. These and other increased future production requirements in the basin will have to be met with fewer farms and farm people and with a smaller total acreage of farmland than was used in the basin in 1959.

Sales of the agricultural products of the basin are projected to total $102 million by the year 2000 as compared to about $46 million in 1959. In order to utilize the potentials, some major adjustments in the agricultural industry will be required. Individual farms are expected to be about 25 percent larger in acreage, and the anticipated capital investment will be more than twice the 1959 investment per farm. The total output of crops should increase, but the total acreage of harvested cropland is expected to decrease slightly. Livestock and poultry production should greatly increase. There should be an addition of almost 139,000 acres of open pastureland over the 1949 base.

Farm woodland is expected to decrease from about 959,000 acres in 1959 to 665,000 acres by the year 2000. Nonfarm woodland should increase from 1,283,000 acres in 1959 to about 1,508,000 acres by the year 2000. The net effect would result in very little change in total woodland acreages between 1959 and the year 2000. However, improved standards of woodland management on existing forest lands by the year 2000 should produce more than twice the 1959 production.

Land for service areas for towns, cities, highways, airports, and recreation totalled about 371,000 acres in the basin in 1959. Certain rural-residential lands, farmstead and other farmlands, and vacant and waste lands are also included. By 2000, such uses are expected to require about 392,000 acres of land.

These adjustments in total land resources of the basin, in conjunction with the increased population, will require agriculture and forestry to operate at higher levels of efficiency. It will also necessitate adequate planning of resources development to insure the best resources utilization.

Social and Institutional Factors

Social and institutional factors have a bearing on the economic development of an area, and the rate of accomplishment of needed changes is indicative of future progress. Awareness of a lag can, and often does, serve as a spur to more effective organization and action. One outcome of this awareness is the formation of local and regional organizations for planning and development that take note of the changing patterns of population concentrations and economic opportunity. Metropolitan Savannah already has an effective Savannah-Chatham County Planning Commission.

Local and regional planning has begun on both State and city levels. Many of the municipalities in the basin are participating in planning and development programs in an effort to promote local opportunities in terms of the physical and economic potentials of the basin.

An important factor in the basin which requires immediate consideration and improvement is the generally low level of education and training. This is particularly evident among the nonwhites. The problem is becoming more acute because economic advancement involves more mechanization, automation, complex record-keeping, and high-speed output. The economic history of the United States demonstrates that economic growth and development proceed

more rapidly in areas where all segments of the population are adequately equipped to contribute to and participate in the total economy.

The leaders among the people in the Ogeechee basin are aware of the existing educational limitations and are making an effort to provide trade school opportunities and to raise the general education level. If opportunities for employment are developed in the basin to attract the youth now in school, as well as those that follow, and improvements in education and training are continued, the basin labor force would soon be more adequately prepared to meet the demands of modern industry.

Statesboro is the site of Georgia Southern College. Augusta, in the adjacent basin, is the site of a major southeastern medical center and the home of the Medical College of Georgia. A trade school is also being built at Augusta with the aid of matched Federal and State funds and a second school is expected to be added. In addition, an extensive State school-building and consolidation program has been going on all over the State for the past 10 years.

The vocational agricultural program and the various training and assistance programs related to conservation and agricultural production reach every area of the State and are especially important in the Ogeechee basin. Industrial-training programs for workers in new industries are jointly sponsored by the State Department of Education, the State Department of Labor, the local community, and the industry involved. More recently, local and regional industrial-workshops and tourist-promotion training programs have been introduced under the joint sponsorship of the localities concerned, the local and State chambers of commerce, and State agencies and institutions, including the Georgia Institute of Technology and the State Department of Commerce. Conferences and training programs for local officials and special interest groups are also held periodically at the University of Georgia Center for Continuing Education at Athens, and occasionally at other State institutions. Continuation and improvement of these programs, particularly those directly related to industrial development, is of primary importance to the social and economic welfare of the basin.

Hospital and other medical and health facilities within the basin have been improved considerably in recent years with the help of the Georgia Department of Public Health and with Federal aid. Area hospital centers are located at Savannah, Augusta, Statesboro, and Claxton. Community hospitals are located at Louisville, Metter, and Millen. In spite of these important facilities, much remains to be done. The 1960 State plan for construction of hospital and medical facilities points out that the existing facilities meet only 40 to 80 percent of the needs in the basin, depending on location.

A general public health program is organized on a district or a county basis. Welfare departments, aided by State and Federal funds under the Social Security Act, carry on a program of aid to dependent children, the aged, disabled, and the blind.

Housing conditions in the basin are being improved, in part, by means of the low-rent public housing program which operates through local housing authorities under the Federal Housing Act. An additional aid for local action under the Federal Housing Act is the Urban Renewal Program. So far, only Savannah has participated in this program. Federal Housing Authority approved loans have also led to improved standards of construction and inspection of new houses and subdivisions. This is carried out with the aid of the State Department of Public Health and is especially important in urbanizing areas.

Federal advances and matching funds are available for planning and construction of various other kinds of community facilities. Local and regional planning programs, as outlined above, could pinpoint the needs for such facilities and the available sources for financing.

The people of the area, to a considerable degree, are aware of its problems and are making efforts in the direction of planning and education. It is obvious from the income and educational levels that past efforts have not been adequate. Additional stresses on the economy would probably prevail in the future, and only through continuation and expansion of current efforts can these future problems be met successfully and the welfare of the people of the area improved.

PART TWO – NEEDS AND OPPORTUNITIES

General

Existing facilities and programs, needs and opportunities, and means of meeting the needs of the Ogeechee basin are discussed for each of the purposes considering that purpose only.

Discussion of the existing programs and facilities generally provide inventory data and briefly outline 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 Ogeechee 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.

In the discussion of means of meeting the needs, the rather broad outline of the types of measures that probably could be effectively used is based on the assumption that available resources could be used for each purpose without regard to competition from other purposes. This was done to demonstrate what is possible in meeting the needs of each purpose and to permit considering all purposes with equal care so that they may be combined into a comprehensive plan which would best fulfill the needs.

There are no known reports that attempt to portray fully the resources and economy of the Ogeechee basin. However, several reports on specific studies, mainly navigation, and some general information reports that are applicable to the area are available. Data in these reports were used as supplemental information wherever practicable. A summary of the more important studies is included in Appendix 12.

SECTION I – FLOOD CONTROL AND PREVENTION

General

At the present time, flood problems in the Ogeechee basin are only minor. Dover, with a population of 150, is the only town in the basin subject to flooding. Major highways in the basin are not subject to flooding, except U. S. Highway No. 17 at Kings Ferry just below the mouth of the Canoochee River. Sections of the Central of Georgia Railroad were extensively flooded in 1925 and 1929, but the tracks have since been raised and its bridges are now higher than the major floods of record. Most of the developed farmland is above the active flood plain. The time lapse between a storm and the passage of the flood peak downstream is measured in days, and flood forecasting and warning can be both accurate and effective, thereby reducing flood damages at downstream areas.

Three-fourths of the floods in the Ogeechee basin occur during winter and early spring. The highest known flood in the basin occurred in October 1929 when a heavy rainstorm was followed a week later by a hurricane. These events produced a total rainfall of 17 inches over the basin. In August 1940, another hurricane flood occurred which ranked fourth among the known floods of the basin.

The Ogeechee River has been above flood stage for an average of 5 days per year near Midville, 32 days per year near Dover, and 31 days per year near Eden. The Canoochee River has been above flood stage for 19 days per year near Claxton.

Existing Facilities and Programs

The United States Weather Bureau makes flood forecasts for three locations on the Ogeechee River—Midville, Dover, and Eden. Timing

FLOOD CONTROL
1960

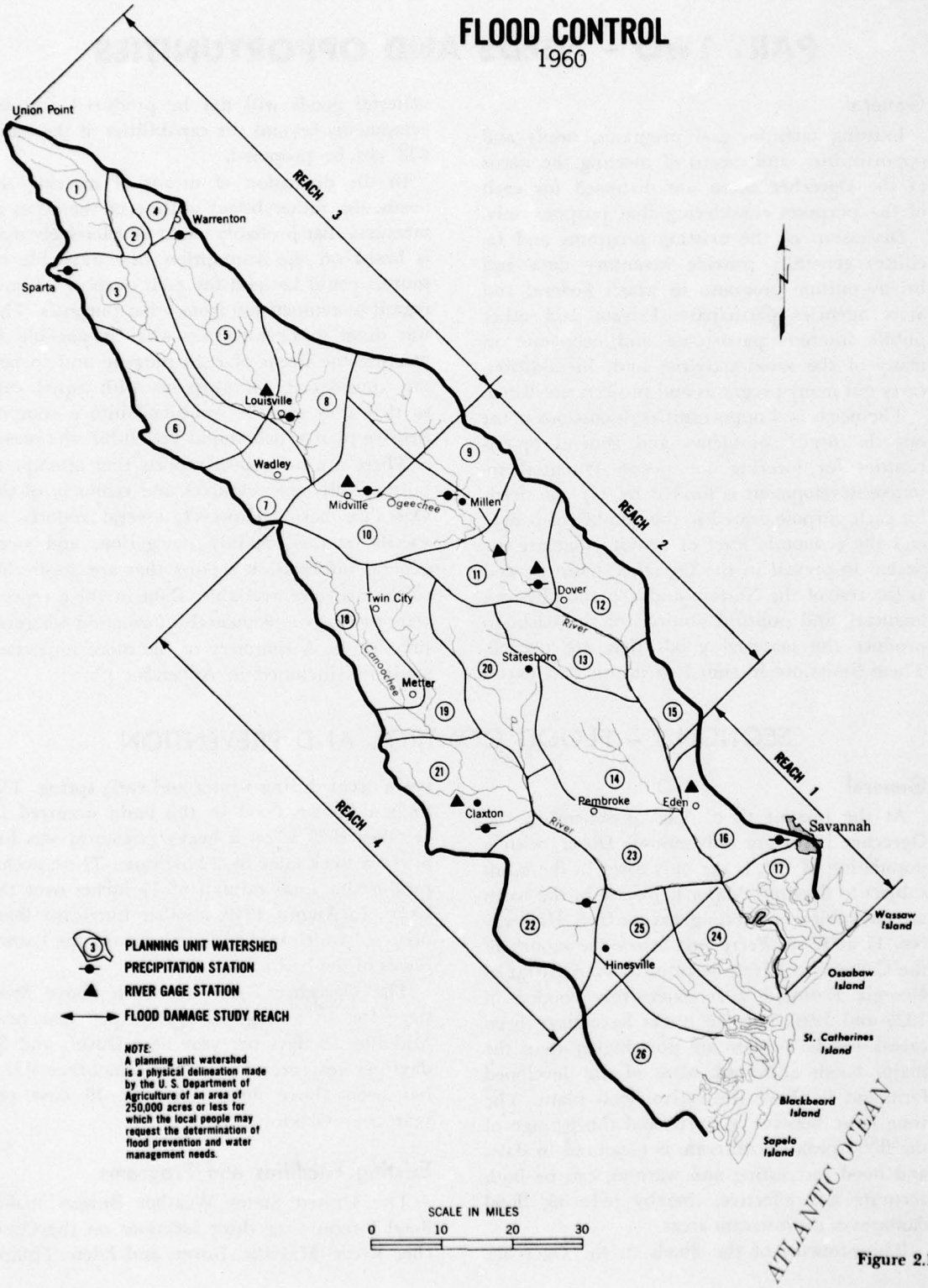


Figure 2.1

does not present a major problem in this forecast system. The peak flow for the Ogeechee River reaches Midville approximately 2 days after the rainfall occurs.

There are no major flood control or flood prevention projects in the basin, but some drainage projects provide flood protection for drained lands. As of January 1, 1960, the Soil Conservation Service had received two applications for assistance under provisions of Public Law 566, 83d Congress, the Watershed Protection and Flood Prevention Act. In addition, the regular conservation programs of the U. S. Department of Agriculture, the State of Georgia, and others, as carried out by the landowners and operators, contribute to the improvement of hydrologic conditions in the control of runoff and erosion in the basin.

Needs and Opportunities

Flood damages in upstream tributaries were evaluated for each of 26 small upstream planning-unit watersheds as shown in Figure 2.1. The most serious problems appear to be in four watersheds. These have average annual damages of $104,700, $23,100, $45,700, and $57,200, respectively, or a total of $230,700. Although half of the damages occur to major fixed improvements such as public roads and bridges, railroads, dwellings, barns, churches, and stores, flood damages to cropland and pastureland are also signficant. Flood damage and the potential benefit to existing crops and pasture, public roads and bridges, farm roads, and buildings appear to be negligible in the Coastal Plain.

To appraise flood damage on the main streams, the Ogeechee River was divided into three flood damage reaches. The Canoochee River was considered as a single unit. Flood damages were related to the April 1960 flood, which is equivalent to a 10-year frequency flood for the basin. For the three reaches of the Ogeechee River, 237 acres of pastureland were inundated during the April 1960 flood. For the Canoochee River, 15 acres of cropland were flooded. For flood stages greater than the April 1960 flood, damages would occur to railroads, highways and bridges, pasture and livestock, and the turpentine industry. Average annual flood damages are estimated at $8,340, $10,000, and $2,600, respectively, for the lower, middle, and upper reaches of the Ogeechee River. Annual damages for the Canoochee River are estimated at $820, making a total of $21,760.

Means of Meeting the Needs

Although the flood problems of the Ogeechee basin are not great, certain steps appear desirable to prevent such problems from becoming greater. In a few areas, structures are required to reduce local problems.

The flood forecasting system is adequate for the basin and provides enough time for the people in the flood plain to remove livestock and equipment and, in case of major floods, for notifying officials of the danger to highways and railroads.

Flood plain management through local zoning appears desirable for regulating possible residential and industrial development of the flood plains along both main and tributary streams. Local flood problems should be clearly noted so that future buildings and improvements will not be located in the flood plains without full recognition of the flood hazard. Such studies and plans are authorized under the Georgia General Planning and Zoning Enabling Act of 1957, as amended, and Federal aid to assist urban areas with comprehensive planning and zoning is available under Section 701 of the Federal Housing Act. Section 206 of the River and Harbor Act of 1960 authorizes the Corps of Engineers to advise local governing bodies about flood hazards and the desirability of flood zoning regulations, when such information is requested. Flood plain management is discussed in Appendix 12, Planning.

Various plans of improvement for levees, channels, reservoirs, and diversion of floodwaters were considered for the main streams of the Ogeechee and Canoochee Rivers. The flood plains of these rivers are used principally for production of pulpwood and timber and for pasturing of livestock. Crop damage from major floods occurs on small scattered acreages cultivated primarily in subsistence crops. It is unlikely that much additional flood plain land will be converted to cropland in the future. Flood control on the main streams of the Ogee-

chee and Canoochee Rivers could best be carried out in combination with other purposes.

Of the 26 small upstream planning unit watersheds of the basin, it appears that flood control facilities, singly or in combination with other purposes, especially drainage, may be required in areas totaling 278,000 acres at an early date.

SECTION II – WATER SUPPLIES

General

Development and protection of safe adequate water supplies are needed for the growth of the basin. The abundance of satisfactory sources assures adequate quantities of water. Treatment, chlorination, and continuous surveillance of public water supplies are required to safeguard the water quality and public health.

Ground waters are the source of most of the basin water supplies. Good quality ground water is readily available except in the Piedmont province and the upper reaches of the Coastal Plain. Surface water is readily available in the lower basin but is seldom used because ground water is abundant. Shallow wells of the Piedmont province provide only limited water yield and are usually not dependable. One muncipality and three industries use surface water to supplement their inadequate ground water supplies.

The headwater streams of this areas are small, and the development of limited surface water supplies from sources within the basin would be expensive. The surface waters of the lower basin could be developed to supplement ground water supplies if needed. However, the extensive limestone aquifer of the basin provides a productive source of ground water.

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

Existing Facilities and Programs

Domestic Water Supplies

Domestic water supplies are defined as private individual supplies mainly designed to serve a single family. In 1960, an estimated 21,900 rural homes were served by 20,000 domestic water supplies. An estimated 8,000 people had no onsite water supply and obtained their water from nearby wells. There are numerous abandoned uncapped flowing artesian wells in the basin. Most of these wells are in the Lower Coastal Plain.

On the basis of a very limited field study in which less than 1 percent of the rural wells were inventoried, the 1960 domestic water supplies are estimated as follows. Nine thousand dug wells ranged in depth from 12 to 60 feet. Approximately 62 percent were equipped with pressure pumps, but only 50 percent met sanitary standards of construction. An equal number of drilled wells ranging in depth from 70 to 780 feet were all equipped with pressure systems, and 95 percent met sanitary standards of construction. Approximately 1,000 driven wells ranging in depth from 30 to 70 feet were all equipped with pressure systems, and all met sanitary construction standards. An equal number of bored wells ranged in depth from 18 to 145 feet, and 80 percent met acceptable sanitary standards of construction. Approximately 30 percent of the bored wells were equipped with pressure systems. With the exception of 18 percent of the shallow dug wells located in the upper portion of the basin, all of the domestic wells were providing adequate supplies of water in 1960.

Municipal Water Supplies

Including that portion of the city of Savannah which lies in the Ogeechee basin, there are 27 urban areas and 2 Federal installations in the basin with a combined 1960 population of 102,400. Municipal water systems of these communities serve 102,700 people. The reported average daily water demand totals 10.5 million gallons with less than 1 percent used by industry. In the lower part of the basin are many privately owned wells serving municipal and in-

WATER SUPPLIES
1960

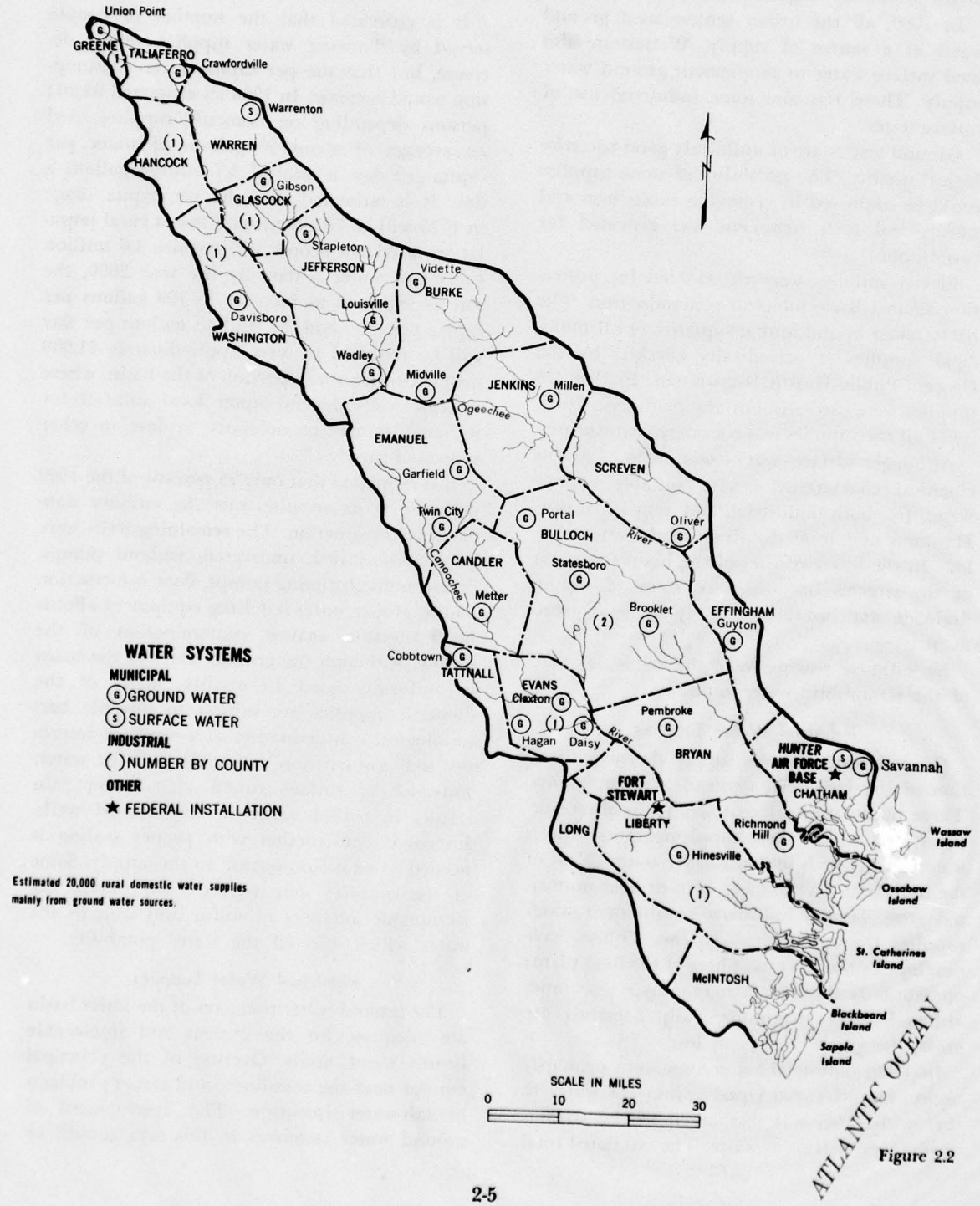


Figure 2.2

dustrial needs. Water supplied by these wells is not included in the total use. The per capita daily water use in the four largest towns ranged from 90 to 156 gallons. The average use for the urban areas was 90 gallons per person per day.

In 1960, all the urban centers used ground water as a source of supply. Warrenton also used surface water to supplement ground water supply. There was also some industrial use of surface water.

Ground waters are of uniformly good bacteriological quality. The potability of some supplies could be improved by removing excess iron and sulfur, and such treatment was provided for two supplies.

Eleven supplies were chlorinated for protection against bacteriological contamination. The bacteriological and sanitary quality of all municipal supplies is periodically checked by the Georgia Public Health Department. In 1960, 15 supplies were used without any treatment. Quality of all the supplies was considered satisfactory.

Although surface water was little used, its chemical characteristics were suitable as raw water for both industrial and municipal use. Hardness and total dissolved solids were quite low. In the lower reaches of the basin the water of the streams has the dark color of swamp drainage and would require additional treatment.

No estimate was made of the water demands of the semipublic water supplies.

Industrial Water Supplies

Ground water sources supply the major portion of the industrial demand at eight plants. Three plants use surface water for cooling purposes, and one of these supplements its process water supply with settled surface water. Most of the industrial development is in or near municipal areas. Several industries obtain their water supplies from municipal systems. Others have developed private wells. Three of the food plants operate only three or four months a year; and, although their maximum daily demands are great, the yearly average is low.

In 1960, industrial water uses were primarily nonconsumptive. An equal volume of water to that withdrawn was discharged to the streams or sewerage systems as waste. The estimated total industrial water demand was approximately one-half million gallons a day.

Needs and Opportunities

Domestic Water Supplies

It is estimated that the number of people served by domestic water supplies would decrease, but that the per capita water consumption would increase. In 1960 an estimated 98,800 persons depending on domestic supplies used an average of about 50 gallons of water per capita per day, a total of 4.7 million gallons a day. It is estimated that the per capita usage in 1975 will be 70 gallons and that a rural population of 66,000 people will require 4.6 million gallons of water a day. By the year 2000, the rate is expected to increase to 100 gallons per capita per day, and 3.1 million gallons per day will be required to serve approximately 31,000 people. In the upper portion of the basin, where shallow wells depend upon local rainfall for recharge, it may be necessary to develop other sources of supply.

It is estimated that only 75 percent of the 1960 domestic water supplies met the sanitary standards of construction. The remaining wells were improperly sealed, uncovered, without pumps, or had nonselfpriming pumps. Poor construction and improper water handling equipment affords no protection against contamination of the supply. Although the ground water of the basin is uniformly good in quality, many of the domestic supplies are subject to possible bacteriological contamination as a result of improper well construction or handling of the water. Entrance of surface runoff after heavy rain results in turbid water in unprotected wells. Improved construction with proper sealing is needed to afford protection to the supply. Some of the supplies were reported to contain objectionable amounts of sulfur and iron in the water which affected the water potability.

Municipal Water Supplies

The ground water resources of the lower basin are adequate for the present and foreseeable future water needs. Overuse of the principal aquifer near the coastline could create problems of salt-water intrusion. The development of ground water resources in this area should be

TABLE 2.1

Municipal Water Facility Needs

Period	Population served	Number of places requiring new or additional				Water use (m.g.d.)*
		Wells	Treatment	Elevated storage	Distribution systems	
1960 to 1975	146,800	6	17	21	27	22.5
1975 to 2000	237,000	8	10	6	27	47.3

*Million gallons per day.

properly controlled. The Piedmont province and the area immediately downstream have limited water resources which would affect development.

Several municipalities have reported that their water supply systems need improvement. In addition to these apparent needs, other facilities should be enlarged to assure an adequate supply to meet the projected growth and development of the community. The adequacy of existing facilities has direct bearing on the urgency of such needs and has been considered in estimating present needs. The two Federal installations have not been included in the tabulation of municipal water facility needs.

Prior to 1975, 17 of the 27 municipalities are expected to require additional sources or treatment of water, 21 will probably need elevated storage, and all 27 are expected to need to extend their distribution systems. Similar improvements are expected to be needed between 1975 and 2000 to insure adequate water supplies for future demands.

Projected needs are expected to be met predominantly by the development of ground water resources. However, this would not preclude the use of surface water supplies in areas where the ground water is limited. The upstream watersheds would provide an opportunity for municipal water supply storage in multiple-purpose structures.

On the basis of population projections, the daily water usage is estimated to be 22.5 million gallons by 1975 and 47.3 million gallons by 2000. Municipal water supply systems are expected to serve 146,800 people by 1975 and approximately 237,000 people by 2000. Water requirements for 1975 are based on an estimated average demand of 150 gallons per person per day for all urban areas. Water usage for the year 2000 was estimated at the rate of 200 gallons per person per day.

Industrial Water Supplies

Industrial growth would speed the economic development of the area, and the expansion of existing plants or the establishment of new industries would increase the water demand. It is estimated that, with industrial growth, the water demand for 1975 would be approximately 5 million gallons a day and that the demand would increase to approximately 7 million gallons a day by the year 2000. These needs can be met primarily by the construction of new wells.

Means of Meeting the Needs

Domestic Water Supplies

Each owner must develop his own supply consistent with his needs and capabilities. For personal and public safety, all new wells should be drilled, properly cased, sealed, and equipped with satisfactory pumps and pressure systems. Treatment of water supplies containing objectionable amounts of sulfur, iron, or hardness would be desirable. Such treatment is technically feasible; but, unless the quality is seriously impaired, the expense involved may be more than the individual owner desires to pay. Water users usually adapt themselves rather quickly to the

available supply and give little consideration to the improvement of its quality. It is estimated that about 15 percent of the domestic water supplies would be improved if proper handling were assured. There are many benefits derived from an adequate potable pressurized water supply.

Prior to 1975, an estimated 2,200 new drilled wells with pressure systems should be constructed, 2,000 existing wells should be covered and sealed to afford protection against contamination, and 1,800 pressure systems should be installed. After these improvements have been completed, a continuing program of rehabilitation and maintenance of all wells would be needed to assure satisfactory sources of supply in most of the basin to meet the rural water requirements to the year 2000. In the Piedmont province, however, where ground water is limited, the development of surface water sources may be required.

Local health departments could place additional emphasis on rural water supply programs by providing information and consultation to the owners. The selection of a good source, proper sanitary construction, and the installation of good pumps could provide protection and upgrade the domestic water supplies. The bacteriological quality could be checked to insure safety. To accomplish the upgrading of the domestic water supplies, positive leadership would be required. Without this, progress would be slow.

The Farmers Home Administration program for group development of rural water supplies would assist in the development of water supply for groups of rural homes. Because of the abundance of good ground water supply sources, the construction of individual wells would probably be the most economical method of providing rural water supplies.

Municipal Water Supplies

Municipalities must plan and provide for their own needs. Technical assistance can be obtained from Federal, State, and private sources. The ground waters, where available, can be developed more economically than surface water sources. Where ground water is limited,

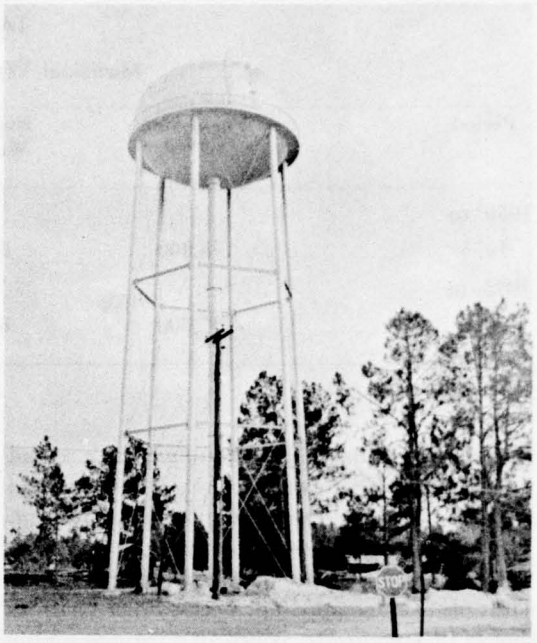


Figure 2.3 *Adequate Water Supply Facilities Enhance the Basin Economy.*

other available sources could be developed to supplement the supply. In some locations multiple-purpose structures in upstream watershed projects could provide water storage for municipal uses. The potability of some of the supplies could be improved by treatment. All supplies could be chlorinated. There are no apparent unusual development or treatment problems, and a capable consulting engineer can advise as to the best methods for developing adequate water supplies to meet all future demands. Assistance is also available to municipalities from the Housing and Home Finance Agency.

Industrial Water Supplies

The normal growth of existing industries and the development of new industries would require the expansion of facilities to provide adequate water supplies prior to 2000. Needed facilities would include new sources of supply, additional treatment plants, increased storage, and other water-handling equipment. With proper development of the water resources, adequate water supplies for the projected foreseeable development of the basin can be accomplished without difficulty.

SECTION III – NAVIGATION

General

The flows of the Ogeechee River and tributaries are insufficient to maintain dependable navigable depths except in the lower stream reaches. Lock and dam construction below mile 130 would be impracticable because of the low lands and the wide flood plains.

Existing Facilities and Programs

There are no commercial harbors in the basin. A few small private wharves are used by commercial fishermen. A wharf on the Ogeechee River at mile 23.2, owned by a private company engaged in barging pulpwood, is the only commercial terminal facility.

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 where it utilizes 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 reduced this depth. Maintaining an adequate depth is a continuing responsibility of the Corps of Engineers.

Commercial inland waterway traffic on the Ogeechee River is confined to a few commercial fishing boats and the movement of pulpwood downstream from mile 23.2 to Ossabaw Sound and the Intracoastal Waterway. Pulpwood movements decreased from 165,000 tons in 1956 to about 108,000 tons in 1958.

Commercial traffic on the Atlantic Intracoastal Waterway consists mostly of barge tows drawing 12 feet or less. Working craft, such as dredges, derrick boats, and pile drivers, also make frequent passages. In 1960, commodities moved on the Intracoastal Waterway totaled 973,748 short tons. This is about five times the tonnage moved in 1947. The principal items of the 1960 traffic were pulpwood, pulp, and paper, totaling 361,000 tons and petroleum and its products, totaling 340,000 tons. Other commodities transported were sand and gravel, iron and steel, and fertilizer.

Small pleasure craft, mostly outboards, use the lower Ogeechee River below Jencks Bridge at mile 52. Below Kings Ferry, mile 32.8, some pleasure boats are launched from trailers. Large numbers of privately owned, transient, pleasure craft use the Intracoastal Waterway when traveling south for the winter and returning north in the spring.

The Federal Government has made no improvements for navigation in the Ogeechee River, its tributaries, or any of the smaller streams in the basin. Numerous snags and debris obstruct the upper reaches of the channels.

A canal, long since abandoned for want of traffic, once connected the Ogeechee River at about mile 36 with the Savannah River.

Below mile 52, at Jencks Bridge, the river is considered navigable. The low-water controlling depth from Jencks Bridge downstream to Richmond Hill, mile 30.7, is about 2 feet. From Richmond Hill to the mouth of the river in Ossabaw Sound, depths range from 6 to 37 feet. This condition is shown by the stream profiles in Figure 1.17. Above Richmond Hill, fixed bridges limit vertical clearance above mean high water to 9 feet and horizontal clearance to 40 feet. The pulpwood wharf at mile 23.2 has ample approach channel depths to accommodate the vessels it serves.

Needs and Opportunities

Analysis revealed that there would be about 214,000 tons of prospective waterborne commerce annually in the Ogeechee basin. However, the points of origin or destination of these commodities were such that either the Savannah or Oconee Rivers would be a more convenient route for shipment. Commodities considered were pulpwood, cotton, cotton products, grain, rock, fuller's earth, kaolin, and petroleum products.

Harbor developments for commercial navigation in the basin are not needed at this time. However, industrial sites could be developed rather easily and economically along the lower reaches of the Ogeechee River below river mile 30.7, along the lower reaches of the South Newport River east of U. S. Highway No. 17, and

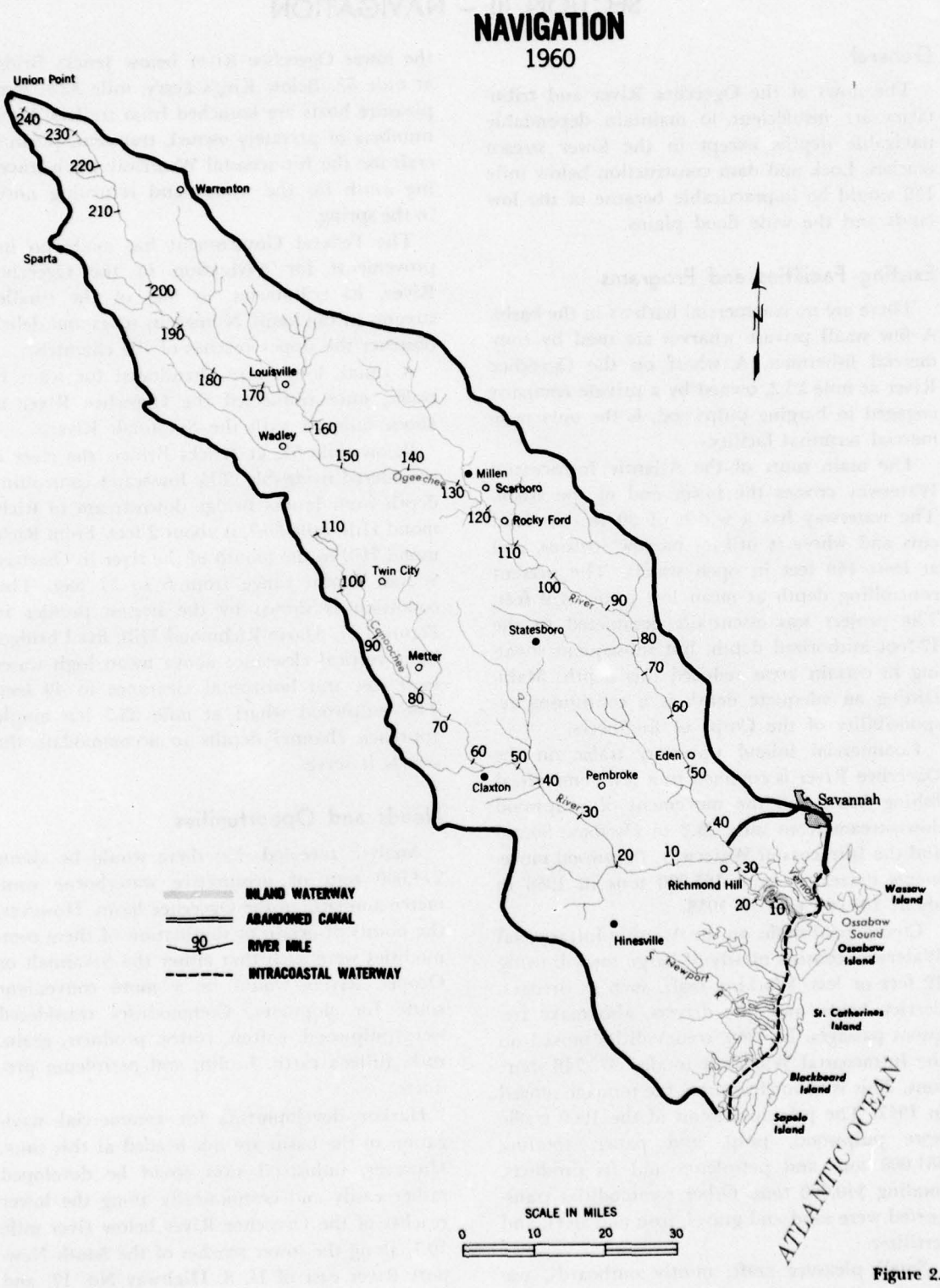

NAVIGATION
1960
Union Point
240
230
220
Warrenton
210
Sparta
200
190
180
Louisville
170
Wadley
160
150
140
Millen
Ogeechee
130
Scarboro
120
Rocky Ford
110
110
Twin City
100
100
River
90
Statesboro
80
Canoochee
90
Metter
70
80
60
70
60
50
Eden
Pembroke
50
40
Claxton
River
30
Savannah
40
20
10
30
Richmond Hill
Wassaw Island
20
10
Ossabaw Sound
Hinesville
Ossabaw Island
St. Catherines Island
Blackbeard Island
Sapelo Island
ATLANTIC OCEAN
INLAND WATERWAY
ABANDONED CANAL
90
RIVER MILE
INTRACOASTAL WATERWAY
SCALE IN MILES
0
10
20
30

Figure 2.4

along the Vernon River in Chatham County. Should this occur, navigation improvement in these areas may be desirable.

Projections of commercial traffic on the Intracoastal Waterway, based on traffic for the years 1947-1958, inclusive, indicate that shipments for 1975 and 2000 would total 2.54 and 4.68 million tons, respectively. The total for 1958 was 1.02 million tons. This increased traffic will result in a trend to larger or multiple-barge tows, and demands will probably make necessary a controlling depth of at least 12 feet and for increasing the 90-foot controlling width. Appendix 1 contains a discussion of increasing the width of four narrow cuts in the vicinity of Savannah. One of these is in the Ogeechee basin, but for convenience, it has been included with the other three as a unit in Appendix 1. Completion of the authorized Cross-Florida Barge Canal would stimulate additional usage of this stretch of the Intracoastal Waterway.

The condition of the lower Ogeechee River at this time is satisfactory for the pulpwood movement previously mentioned and for the few commercial fishing boats. No need for future improvement for these or any other type of commercial navigation is expected to develop. There are no navigation improvements proposed within the basin by any private or public agencies.

Development of inland navigation on the Ogeechee River would be faced with economic, geographic, and physical problems. The basin economy is such that little of its production is located for convenient shipment by water. Few of the import materials are suited to water transportation. Existing highways and railroads are adequate. The nearby Port of Savannah serves the region as a deep-water shipping point. The inland port of Augusta is being developed in the Savannah basin and will have barge terminal facilities. Industry projections for the basin do not indicate any significant change in water transportation requirements.

Means of Meeting the Needs

Although a survey of possible commerce showed that there would be an insufficient volume to justify any navigation improvements at this time, a rough estimate of the cost of providing a 9-foot channel from Louisville, mile 167, to the ocean was made. Excluding an upstream flow regulation reservoir, which would probably be required, the estimated cost of the improvement would be in excess of $95 million. Apparent benefits accruing to commercial navigation are so slight when compared to the cost of development that a more detailed cost analysis is not warranted in this Report.

SECTION IV – RECLAMATION, IRRIGATION, AND DRAINAGE

General

Drainage is the principal method of reclaiming land for agriculture, forestry, or other uses in the Southeast, and the terms reclamation and drainage are considered as synonymous in this Report. In the humid Southeast, irrigation, properly used to supplement rainfall, provides the opportunity for expanding farming operations and stabilizing income. The existing developments, needs and opportunities, and means of meeting the needs for drainage and irrigation are discussed separately.

Existing Facilities and Programs

Irrigation

Approximately 8,600 acres in the basin were irrigated in 1960, principally by sprinkler systems. About 7,200 acre-feet of water were used for irrigation. About 2,900 existing farm ponds supplied the irrigation water for 6,300 acres, streams for 1,400 acres, and wells for 900 acres. A small amount of land was irrigated by the furrow or open-ditch method. Subsurface irrigation is not practiced in the basin. Of the land that was irrigated, 77 percent was in the Upper Coastal Plain.

There were about 260 irrigation systems in the basin. The number of farms irrigating per county ranged from 0 to 141. No irrigation was reported in 5 of the 21 counties in the basin. Of land Classes I through IV which were irrigated in 1960, 69 percent of the irrigation was on Class II land, 17 percent was on Class III

DRAINAGE
1960

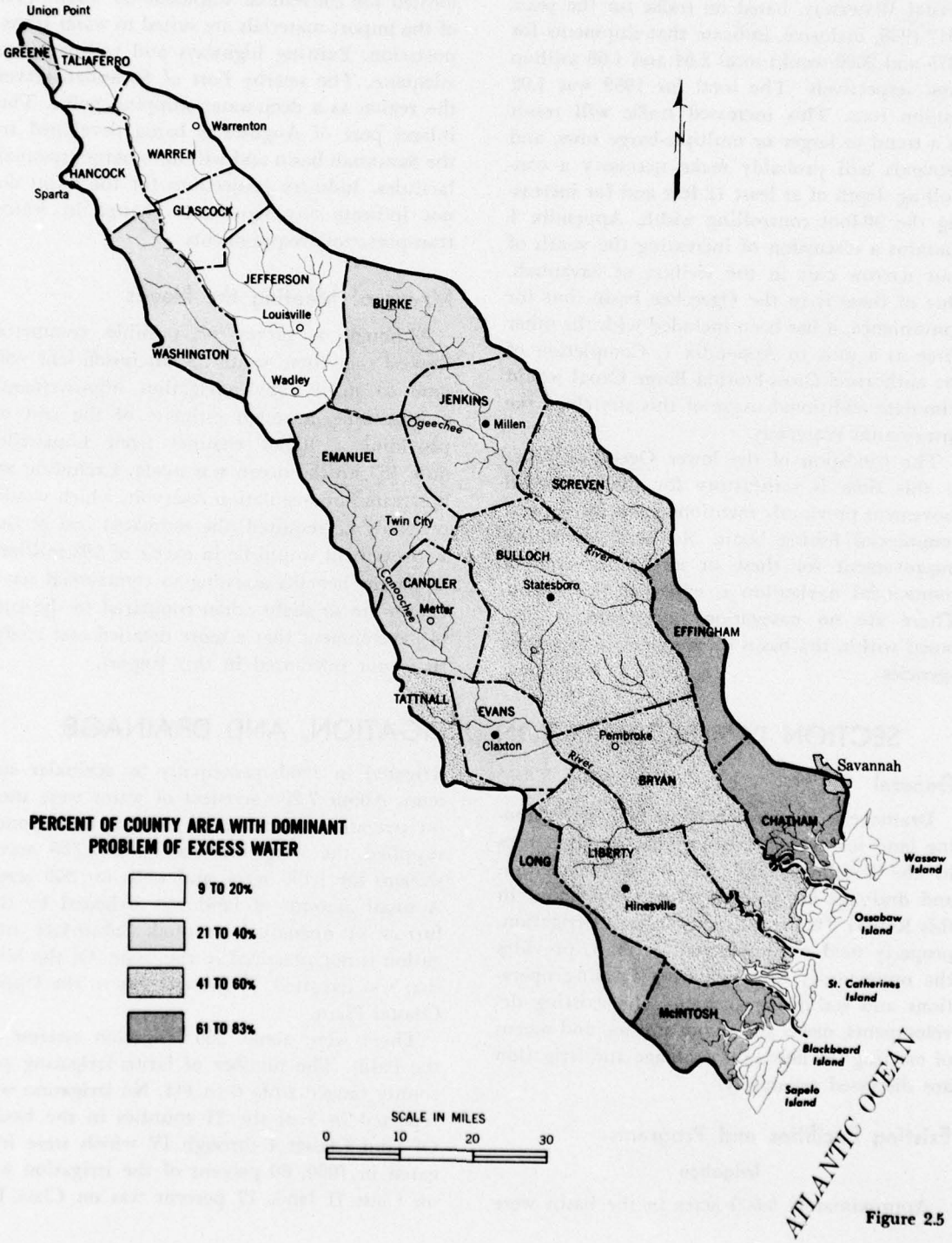


Figure 2.5

land, 8 percent was on Class I, and 6 percent was on Class IV land. One-third of the irrigated land in the basin was in Bulloch County. Bulloch, Candler, and Tattnall Counties in the Upper Coastal Plain accounted for over one-half of all the irrigated land. The total number of farms using irrigation is small; only 575 farms out of 8,200 use irrigation.

The major crop irrigated in 1960 was tobacco, with more than 2,500 acres, or about 30 percent of the total irrigated area. Corn, vegetables, and other field crops constituted the greater part of the remaining irrigated acreage.

Drainage

Almost 30,000 acres of land subject to water problems are already adequately drained by artificial means. Onfarm or individual-type drainage predominates and includes open main and lateral ditches, surface field ditches, and tile drains. Five drainage facilities each affecting 500 acres or more have been developed and benefit 9,500 acres. Three of these facilities were installed on farms by individual action and two were installed by small groups of landowners. All are in the Lower Coastal Plain in Bryan, Evans, Liberty, and Long Counties. Most of the drainage facilities are installed on pasture and cropland. Some woodland drainage is being installed, mostly on industry-owned lands, to improve timber stands, and to facilitate harvesting and management. No major drainage improvements have been authorized by the Congress for construction by the Federal Government.

Needs and Opportunities

Irrigation

Only a small percentage of the farms in the Ogeechee basin now have streams, ponds, or wells reliable enough to supply irrigation water when it is most needed.

Crop yields vary from year to year with irrigation. Costs and returns vary greatly from farm to farm. Farm potential for irrigation has to be individually analyzed.

The combination of such factors as soils and crop adaptability, farm and field size, and the proximity to water supply indicates that the Upper Coastal Plain has the best potential for future irrigation expansion.

Disregarding present land use or the availability of water, there are nearly 2 million acres of irrigable land in the basin. Of this land, 730,000 acres are in crops, 124,000 acres in pasture, 987,000 acres in forest, and 86,000 acres in other uses. About 1,311,000 acres of the irrigable land are in the Upper Coastal Plain.

Based on the increasing trend of irrigated land since 1954 and the available water supply, about 35,000 acres of cropland, pastureland, and nursery land would be irrigated by 1975 on an individual farm basis, and more than 79,000 acres would be irrigated by 2000.

However, the additional cropland expected to be irrigated during the period 1960-1975 totals 5,400 acres and from 1975-2000, 8,600 acres. These irrigated acres are based on assumptions embodying long-term projected prices and the criteria that incremental returns to the farmer at least equal the incremental operation, maintenance, and replacements costs, and without consideration of secondary effects or intangibles. Irrigation of home gardens, nurseries, lawns, and nonagricultural areas would be additional. The increase of 14,000 acres over the 8,600 acres irrigated in 1960 would total 22,600 acres expected to be irrigated by 2000. Based on these projected needs, about 3,900 acre-feet of additional water would be required for irrigation purposes by 1975 and 6,500 additional acre-feet would be needed from 1975 to 2000. The increase of 10,400 acre-feet over the 7,200 acre-feet needed as of 1960 would total 17,600 acre-feet needed by 2000. Generally, ample water is available for irrigation purposes. About 30 percent of the water stored in farm ponds can be used for irrigation. The basin is expected to contain more than 4,300 ponds by the year 1975, and nearly 7,000 ponds by the year 2000.

Drainage

As of 1960, excess water was the dominant problem on 1.4 million acres of land. Figure 2.5 shows the percentage of county area in the basin with a dominant problem of excess water. Drainage problems are caused by overflow from streams, tidal action, the overflow of low lying flatlands by hillside runoff, hillside springs, the

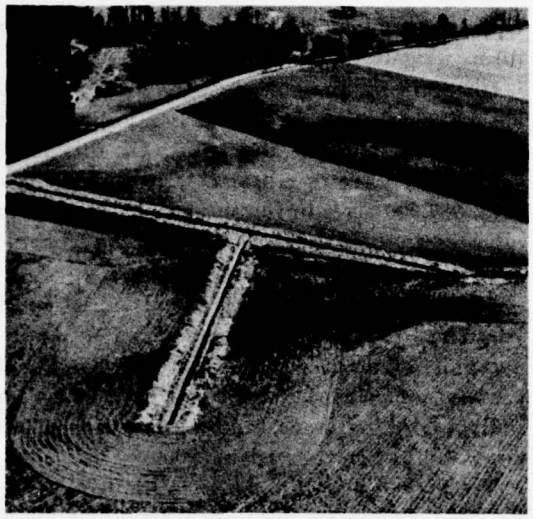


Figure 2.6 *Drainage Facilities Increase Crop Yields.*

accumulation of water in depressions, and by water tables rising near the land surface. Clogging of natural and artificial drains as a result of vegetative growth and siltation, and the reduced effectiveness of major streams as drainage outlets resulting from sedimentation are the major causes of adverse drainage conditions in the basin.

Additional wetland soils could be converted from a less intensive use to a more intensive use, or from a nonproductive state to one of reasonable production by the installation of proper drainage systems. Few tile drains have been installed, but if more intensive use is made of the wetland soils, additional opportunities exist for the installation of tile drains on some soil types.

Pump-type drainage has a potential where gravity outlets are not available in the Lower Coastal Plain.

To assist in meeting the projected need for two and one-half times the present woodland products, the removal of surface water from wet areas makes it possible to develop stands of adapted tree species. These areas, when drained, provide possibilities for increased production of woodland products and furnish better management opportunities, including fire suppression and prevention. Harvesting timber, pulpwood, and naval stores is also facilitated by surface water control in woodlands.

Means of Meeting the Needs

Irrigation

On the basis of studies made for this Report, it appears that crop-production requirements in the basin for 1975 and 2000 can be met without irrigation for all crops.

The future use of irrigation is expected to meet individual farm needs and desires rather than become an extensive production practice. Irrigated acreage would be expanded as justified by agricultural production demands and to the extent that such demands can be more economically met by irrigation than by other means. Some principal purposes for using irrigation are to improve the quality of crops; to produce high value crops such as vegetables and tobacco; to grow planting stock in nurseries; for crop insurance against drought conditions that may result from abnormal rainfall distribution; to assist with prompt germination and continuous plant growth of new seedings and the survival of transplanted material; to help in establishing vegetative cover on eroded areas; and to provide for better use of land in accordance with its capability. The more efficient levels of production provided by irrigation would permit and encourage desirable shifts of some lands to pasture and woodland.

Development of farm irrigation systems and farm-by-farm application of water-management principles and techniques are needed to realize the full benefits of irrigation. These programs would result from private initiative and ex-

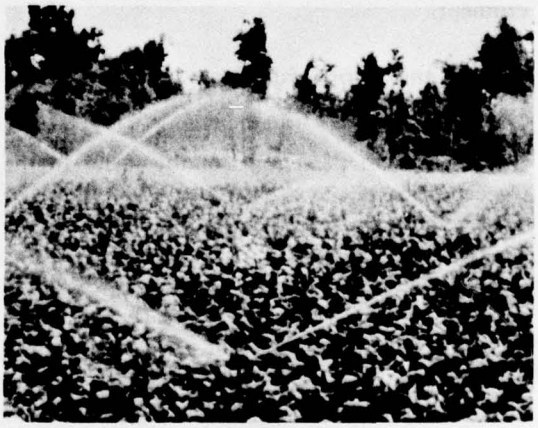


Figure 2.7 *Tobacco Is the Major Crop Irrigated and Most Irrigation Is Accomplished by Sprinkler Systems.*

penditures. Most of the irrigated acreages would consist of scattered or isolated tracts throughout the upland and along minor tributaries. Sprinkler irrigation systems are expected to continue as the major type of system used. Topography and soil conditions limit use of other types.

Studies of the 26 small upstream watershed areas indicate that 21 of them have potential for development of irrigation water supplies by group action on about 172,000 acres. However, no group projects for irrigation water supply would be needed in the foreseeable future. Further study under future conditions may show the need and feasibility for such action. Most of the potential projects involving irrigation could be developed by small groups or individual enterprises, privately financed. Federal construction of projects should take place only when private financing is not feasible. Development of potential projects would depend upon future national, regional, and local needs, changing economic conditions, and the determination or desirability of potential beneficiaries.

Technical, loan, and cost-sharing assistance available under the going programs of the U. S. Department of Agriculture would permit the installation of irrigation on additional areas. Acreages would be brought into the irrigation program to replace marginal farmland and to increase the efficiency of farm operations.

Additional studies would facilitate irrigation by providing information on water requirements and consumptive use of water by variety of crop, methods of irrigation, soil moisture-holding capacities, and many other related fields. Educational services would cooperate by making known the results of technological advances in equipment and irrigation practices.

Alternative plans for irrigation would essentially involve a change in the areas irrigated or adoption of other technological improvements and other management practices.

From the standpoint of the Nation and the Southeast River Basins area, there appears to be no urgent need to promote large-scale irrigation development in the Ogeechee basin. However, local interests in some areas would prefer to undertake irrigation in lieu of alternative means of increasing net returns from agricultural land use.

Drainage

Studies made for this Report indicate that crop production requirements in the basin for 1975 and 2000 can be met without drainage for all crops except forest crops.

Under conditions of agricultural land use expected by the year 2000, over 56,000 acres of cropland, about 30,000 acres of pastureland, about 1,165,000 acres of woodland, and more than 114,000 acres of other land could be drained.

The principal purposes for which drainage facilities would be used on cropland and pasture are to make possible improved land preparation, to facilitate seeding, cultivation, and harvesting, the objective being more efficient management and increased production. Acreages would be brought into the drainage program to replace marginal farmland and to increase the efficiency of farm operations. Woodland water control is contained in Section VII of Part Two of this Appendix.

Development of onfarm drainage systems and farm-by-farm application of water management principles and techniques would be needed 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. Additional tile mains and laterals and pumping would also be considered in applicable areas. Drainage works required on individual farms, together with minor lateral ditches and other works required to serve a group of farms, are generally considereed a non-Federal responsibility within the financial capabilities of local interests.

Based on the studies of 26 small upstream watershed areas considered for flood control and other purposes, including drainage, project-type action for drainage only and in combination with flood control would be required for early action on 278,000 acres of watershed areas. There are several additional projects and considerable acreage requiring local drainage work for which additional study is required. In the Lower Coastal Plain, the projects would primarily benefit woodland. In other areas, projects would benefit cropland, pasture, and woodland. Development of the protential 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 programs of the U. S. Department of Agriculture could be utilized in the installation of drainage facilities on additional areas.

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.

Additional studies on drainage problems and solutions including drainage practices, methods, equipment, operations, and management should be undertaken as a means of facilitating drainage developments. Accelerated educational services would be needed to make known the results of the additional studies.

From the national and Southeast River Basins area standpoint, there appears to be no urgent need to promote large scale drainage development in the Ogeechee basin. However, local interests in some areas may find it desirable to undertake drainage in lieu of alternative means of increasing net returns from agricultural land use.

Overdrainage can be a problem and can be avoided by proper planning of the measure.

SECTION V – HYDROELECTRIC POWER AND INDUSTRIAL DEVELOPMENT

General

Abundant, low-cost electricity has been a vital factor in the industrial development and economic changes that have occurred in the Ogeechee basin in the past 30 years. Rural, urban, and industrial supplies of electricity have played an important role in changing the standard of living, communications, and in employment patterns and potentials.

Industrial development in the basin has centered around the production of forest and agricultural products and the available labor. The latter, in conjunction with dependable electric power, has been an important factor in attracting apparel industries to the basin. Logging, saw milling, warehousing tobacco, ginning cotton, and feed and seed processing are also important traditional enterprises and should continue as such. However, major economic changes are occurring in which the standard of living, communications, transportation, and electric power are critical factors. Industrial development is discussed in Section IV of Part One of this Appendix.

The power-market area of which the Ogeechee basin is a part encompasses several States. Within this large market area are several power-supply areas. A power-supply area usually receives electricity from a single power utility or from a limited group of utlities serving a specific geographic area. The power-supply area served by the Georgia Power Company and the Savannah Electric and Power Company lies entirely within the State of Georgia. The Southeast River Basins area encompasses parts of four power-supply areas. In addition, certain municipalities extend into two basins. A case in point is Savannah which lies in both the Ogeechee and Savannah basins. In considering electric power requirements, Savannah has not been included in this Report but is covered in Appendix 1, Savannah Basin.

Existing Facilities and Programs

There are no hydroelectric-generating or thermal-electric generating plants located within the Ogeechee basin. The Ogeechee River has a very low gradient with a comparatively low streamflow that restricts any hydroelectric power development.

Excepting metropolitan Savannah, the basin receives electric power from the surrounding area over the integrated transmission system or

ELECTRIC POWER FACILITIES
1961

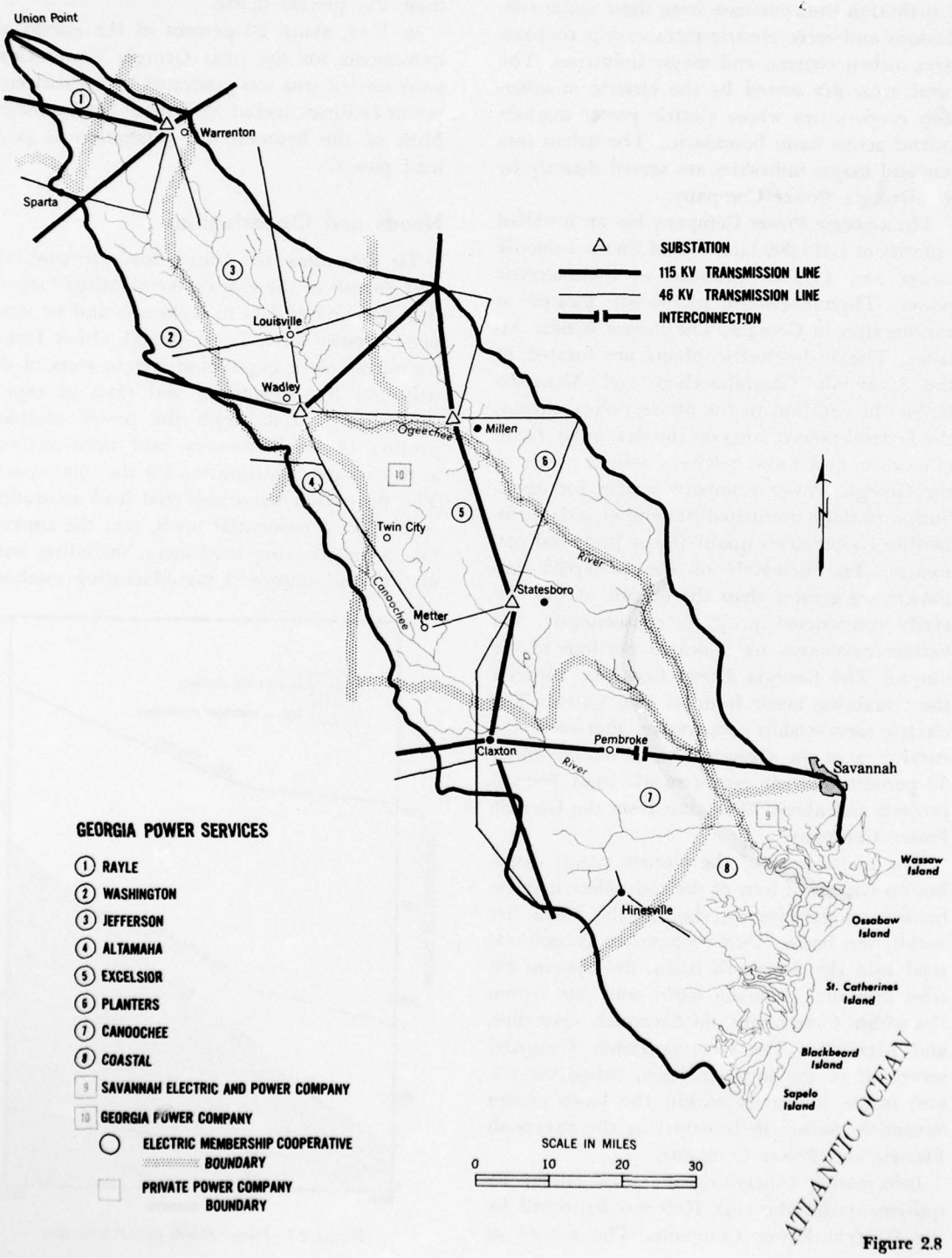


Figure 2.8

grid of the Georgia Power Company. This transmission grid serves major substations in and around the Ogeechee basin. Subtransmission and distribution lines emanate from these major substations and serve electric membership cooperatives, urban centers, and major industries. The rural areas are served by the electric membership cooperatives whose electric power markets extend across basin boundaries. The urban centers and major industries are served directly by the Georgia Power Company.

The Georgia Power Company has an installed capacity of 1,414,000 kilowatts of thermal-electric power and 417,250 kilowatts of hydroelectric power. Thermal-electric plants are located at various sites in Georgia. The largest is near Atlanta. The hydroelectric plants are located in the Savannah, Chattahoochee, and Altamaha basins. In addition to the above power output, the Federal powerplants on the Savannah, Chattahoochee, and Etowah Rivers deliver power to the Georgia Power Company system for distribution to those municipalities and electric membership cooperatives qualifying as preferred customers. The demands of the preferred customers are greater than the output of the federally constructed projects; consequently, the various customers are allocated portions of the output. The Georgia Power Company supplies the remaining needs from its own system. The electric membership cooperatives that serve the rural area in the Ogeechee basin receive about 30 percent of their requirements from Federal projects and about 70 percent from the Georgia Power Company.

The major part of the electric power distribution systems of four of the eight electric membership cooperatives serving in the basin lies within the basin. Two cooperative systems extend into the Savannah basin, five systems extend into the Altamaha basin, and one system lies within three basins, the Savannah, Ogeechee, and Altamaha. The Georgia Power Company serves all of the municipalities, urban centers, and major industries within the basin except Savannah. Savannah is served by the Savannah Electric and Power Company.

Information concerning the total energy requirements for the year 1959 was furnished by the Georgia Power Company. The nature of this data is such that information from adjacent basins overlaps and the total requirement shows the general magnitude of the total load rather than the precise figure.

In 1959, about 20 percent of the energy requirements for the total Georgia Power Company service area was generated by hydroelectric power facilities, including Federal developments. Most of the hydroelectric generation is peak-load power.

Needs and Opportunities

To determine the future load demand, the past growth of the electric membership cooperatives was analyzed as to customers and by usage per customer for a 7-year period. Other factors considered were population trends, rates of distribution line extension, and rates of capital expenditures. Data from the power company portion of the basin-area load were analyzed as to customer classification for the total system. The projection has considered load saturation, especially of residential loads, and the conversion to labor-saving machinery, including automation and improved manufacturing methods.

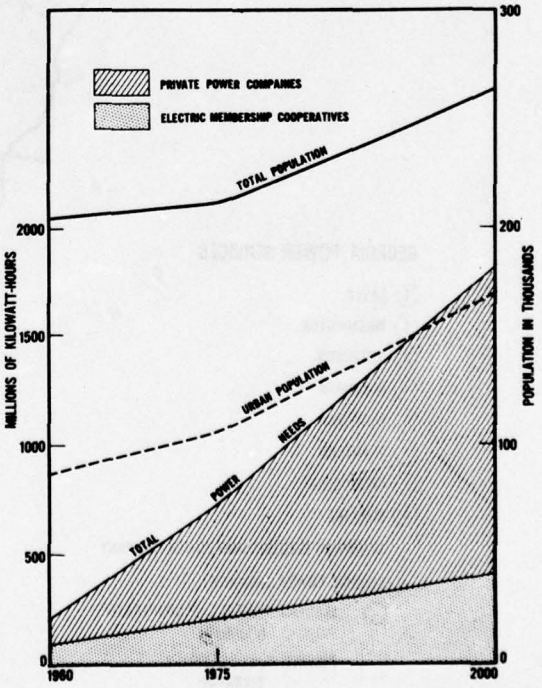


Figure 2.9 *Power Needs and Population.*

The demand created by the 1959 energy requirements, based on a 46-percent load factor, is about 51,800 kilowatts. The 1975 energy requirements are expected to have a demand, based on a 50-percent load factor, of 166,700 kilowatts. The 2000 energy requirements are expected to have a demand of 373,800 kilowatts, based on a 55-percent load factor.

The projections reflect the rural to urban shift in population, the increase in industrial developments, and the commercial development.

Means of Meeting the Needs

Hydroelectric power developments in the Ogeechee basin do not appear economically feasible. Future major power requirements in the basin would continue to be met from sources outside. This would necessitate expansions of the distribution system to meet increased demands.

To meet the increasing electric-power demands, the Georgia Power Company is constructing new hydroelectric-generating facilities, constructing new thermal-electric plants, enlarging and improving existing thermal-electric plants, extending existing transmission lines, and constructing new transmission lines.

Any additional development of hydroelectric power by Federal agencies in adjacent basins would also be utilized to the extent practicable in the Ogeechee basin.

SECTION VI – SOIL CONSERVATION AND UTILIZATION

General

Soil conservation and utlization 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 a row crop economy. By the mid-1930's, erosion had damaged much of the basin cropland. Since then, interest ir 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 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 type and degree of land problems. Capability classification is an interpretive grouping of soils for agricultural purposes. The groupings are based on a physical inventory of the 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 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.

SOIL CONSERVATION
1960

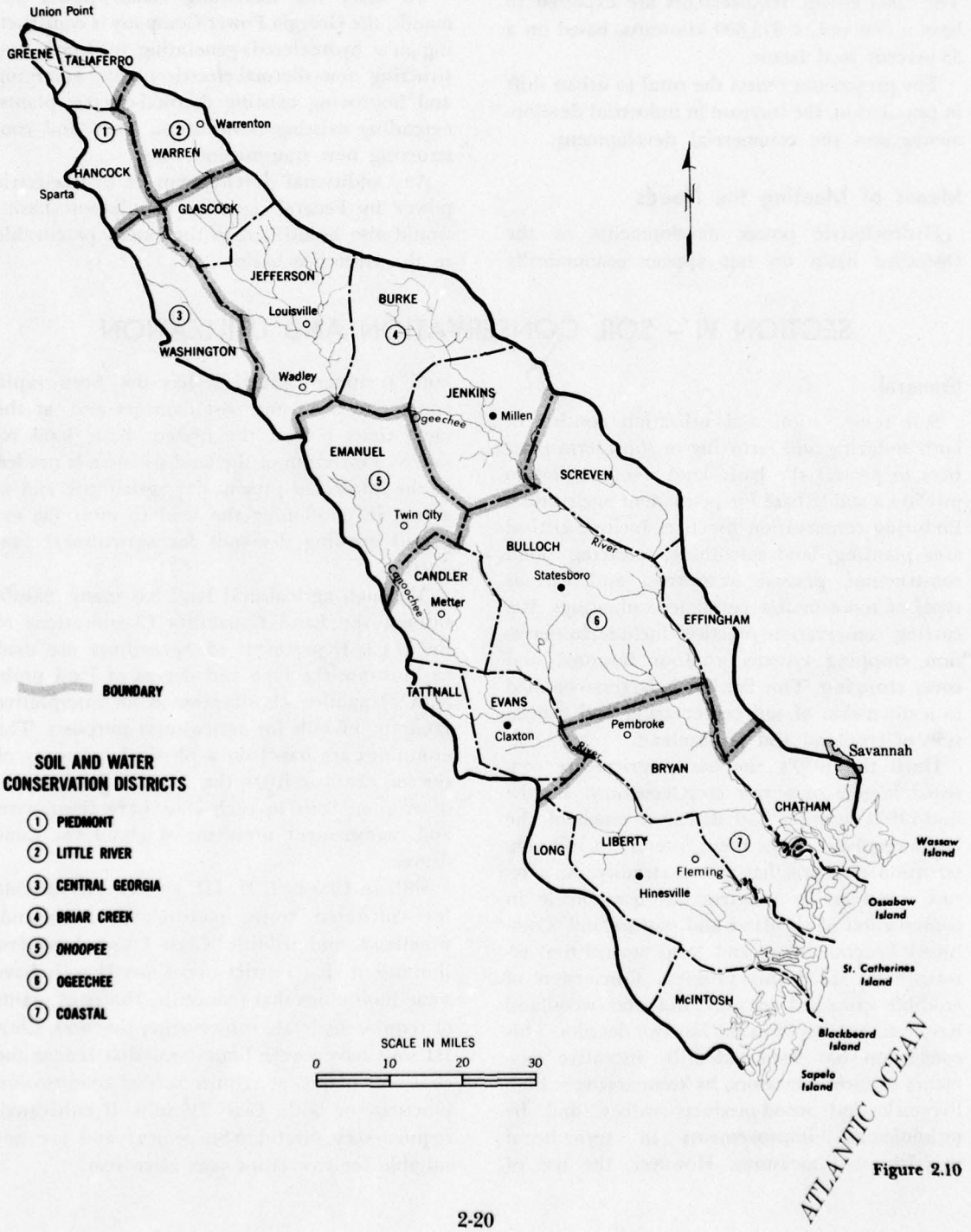


Figure 2.10

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.

Classifications for the land area devoted to agricultural uses are shown in Table 2.2.

Some 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 agricultural land in the basin is in Land Capability Class I. The remaining 98 percent has some restrictions in use and normally has some erosion, unfavorable soil condition, or water problems.

Existing Facilities and Programs

Erosion was, and is, a problem in the basin. As of January 1958, some 461,000 acres of cropland and pastureland and about 47,000 acres of other agricultural land had dominant erosion problems. At the same time, some 285,000 acres of cropland and pastureland and about 26,000 acres of other agricultural land had dominant unfavorable soil condition problems. Some 52,800 acres of cropland and pastureland and about 3,000 acres of other agricultural land had no problems that limited use.

As of 1960, some 2,900 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 two surface acres to a little over six surface acres and covered about 11,400 acres of land. About one-half of these ponds were used for livestock water, about 20 percent for irrigation water storage, and almost all of the ponds provided some fishing.

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 assistant, and education and information services.

The seven 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 few. Only two applications for Federal assistance for developing a watershed project 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 government installations, roads, and urban and industrial areas. Acreages in strip mining and related occupations are not a problem in the basin at present.

Federal agricultural installations total 323 acres. The 180-acre Southeast Tidewater Field

TABLE 2.2

Distribution of Land Use by Land Capability Classification—1958 (percent)

Land use	Land Capability Classification								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland	6.1	72.2	17.8	3.3	0.4	0.2	....	....	100
Pastureland	4.8	54.9	27.6	9.0	2.2	1.1	0.4	....	100
Forest land	0.5	20.2	27.4	8.9	27.9	1.8	13.3	....	100
Other	1.3	18.1	15.6	5.1	1.4	0.3	57.9	0.3	100
Basin average	2.1	34.5	24.1	7.2	17.9	1.3	12.8	0.1	100

Station at Fleming, Georgia, an Agricultural Research Service facility, is one of two soil and water conservation research stations in the Southeast River Basins area.

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, including about 27,000 acres of small water bodies, totaled 3,479,000 acres. Of this, some 3,080,000 acres were used in the production of agricultural products, including forest products. By the year 2000, an estimated 3,042,000 acres are expected to be available for agricultural production. This amounts to a 2 percent reduction in available land. The 38,000 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. 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 Ogeechee basin agriculture has long been and will remain a vital part of its economy. Row crop acreages in the future may decrease slightly, but livestock numbers and pasture acreages may increase. Some 838,000 acres were in cropland and pastureland in 1959. By 2000, 869,000 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 580,500 acres of cropland and pastureland, out of 969,000 acres in use, are expected to be in need of conservation treatment. Some 67 percent of all cropland and pastureland are expected to be in need of conservation treatment.

By 2000, it is expected that 217,700 acres of cropland will need treatment because of erosion problems. In addition, 165,000 acres of cropland are expected to need treatment because of an unfavorable soil condition. Some 197,800 acres of pastureland and rangeland are expected to need conservation treatment. Some of the treatments expected to be needed for pastureland by the year 2000 are as follows:

Treatment or control needed	Acres (1,000)
Establish or reestablish vegetation	125
Improve vegetative cover	72
Reduce overgrazing	53
Protect from fire	20
Erosion problems	12
Rodent control	3
Noxious plant control	34

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

By the year 2000, about 79 percent of the basin conservation treatment needs on both cropland and pastureland will be located in the Upper Coastal Plain.

Additional farm ponds would be needed in the basin to provide a share of the small impoundment fishing demands and provide water for livestock, irrigation, recreation, and a part of the conservation needs of many farms. By 2000, the number of farm ponds should increase to almost 7,000. This would add some 26,000 acres of additional surface water on farms.

Land conversion, or the shift in type of land use, would be a continuous process in the basin. About 4,600 acres in Land Capability Classes V to VII were planted to crops in 1959. Most of this acreage would likely shift to land more suited to cropping. Other shifts would be

Figure 2.11 *Maintaining Adequate Vegetative Cover Is an Important Conservation Measure.*

needed to fit a particular crop to a specific soil type. Still other shifts would be needed to replace land lost to urban growth and development. By 2000, some 83,600 acres of land now in pasture, woods, and other uses would need to be converted to cropland. Also, 116,000 acres of cropland, woodland, and other land would need to shift to pasture 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 may be installed would be affected by such factors as changing needs for agricultural products, general economic conditions, and future policies of Federal, State, and local agencies. Estimates as to the intensity of installation of conservation measures would be only a prediction which could not include all the future factors. The difference between complete installation of measures on areas needing conservation treatment and the degree of actual installation will entail a corresponding reduction in costs, quantities, and resulting effects.

To accomplish the land-use changes and meet the conservation treatment needs indicated above, sound soil and water conservation practices and high-level management would 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, were determined to be essential for attaining 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 treatment needs, high-level management could include the following: (1) Proper choice and rotation of crops; (2) control of excess water with drainage, vegetated waterways, contour operations, and structures; (3) use of correct amount 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 pastureland and rangeland 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 could be applied in sufficient quantities to grow plant cover that would protect the soil and provide livestock forage. The number of livestock and the grazing period could be regulated so that pasture plants can grow vigorously during the grazing season. Vegetative management could include proper mowing, the use of chemicals for weed and brush control, and fire protection. Water management could include an adequate number of properly distributed farm ponds.

The soil conservation and utilization of cropland, pastureland, and rangeland, as presented, is based substantially on continuation of the 1960 degree of development. As additional developments are carried out in future years, land use and treatment requirements included herein would have to be modified accordingly.

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

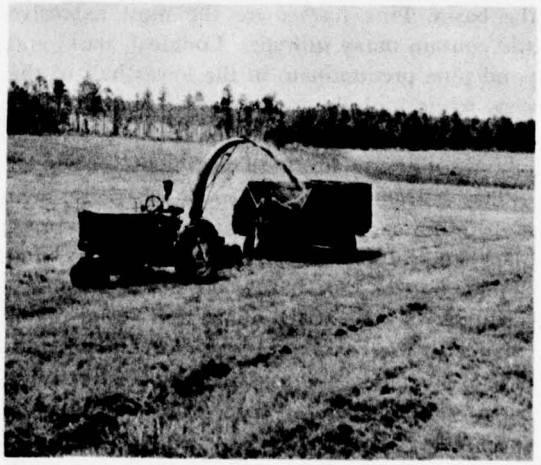


Figure 2.12 *Wise Use of Cropland Increases Farmer Returns.*

the year 2000. In many cases, technical assistance is limited to planning assistance only, and the establishment of practices is carried out by the farmer himself, or with assistance from other agencies or organizations. Because of this type of planning and programming, no attempt has been made to define technical assistance specifically by practices or measures.

Increased emphasis should be given annually to planning 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.

There were no watershed projects in the basin in 1960, but it is expected that three projects of this type will have been completed by 2000. Such projects would include, either singly or in combination, flood control, drainage, irrigation, recreation, sediment damage reduction, agricultural water management, or other uses. These projects require accelerated land treatment programs involving rapid or extensive installation of soil conservation practices to stabilize critical areas or to provide protection to the watershed area and to the planned works of improvement.

Land treatment measures improve hydrologic conditions, reduce sediment production, and assist in the reduction of runoff. Needed 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 provision of Public Law 566 where such action is needed to help solve the problem in designated watersheds.

SECTION VII – FOREST CONSERVATION AND UTILIZATION

General

The Ogeechee basin is a major wood-producing area. Of the total 2,242,000 acres in forests, about 39,000 acres are noncommercial. About 240,000 acres of commercial forest land are in Federal ownership. Three thousand acres are in other public holdings. The remaining 1.96 million acres of commercial forest land are privately owned. Some 960,000 acres of this are parts of farms.

Four major forest-type groups are found in the basin. Pine forests are the most extensive and contain many subtypes. Longleaf, slash, and pond pine predominate in the lower half of the area, while loblolly and shortleaf pine predominate in the upper basin. Slash, longleaf, and loblolly pine are the most prevalent species.

The bottom land hardwood types are next most common. The dominant species are cypress, black and tupelo gums, maple, ash, oaks, and poplar. Bottom land hardwoods are found mainly in the Lower Coastal Plain and along major streams in the basin. The oak-pine and upland-hardwood types are scattered throughout the basin. Major hardwood species are oak, hickory, sweet gum, and poplar. Most pine and bottom land hardwood sites have good growth potential. The upland-hardwood and oak-pine sites are generally not as productive as other sites. The poorer returns from such areas lower the incentive for good management. Stands have been depleted with little consideration of replacement.

The 2,203,000 acres of commercial forest land contain 3,579 million board feet of sawtimber, 2,222 million board feet of softwoods, and 1,357 million board feet of hardwoods. In terms of total merchantable timber, there are 698 million cubic feet of softwoods and 528 million cubic feet of hardwoods. Some 56 million cubic feet of growing stock were cut in 1959 for all products. Pulpwood was the major product harvested, closely followed by sawlogs. The remainder was cut into barrel logs and bolts, fuel-wood, piling, poles, posts, ties, and miscellaneous products. The annual value of the wood before harvesting was about $5.6 million. Although no pulpmills are located within the basin, it supplies pulpwood for 8 mills within trucking distance. In the past 5 years, more than 320,000 cords have been harvested in the basin annually. There are approximately 100 sawmills or planer mills, 5 veneer and plywood mills, 5 wood-treatment plants, 4 furniture plants, 8 cabinet woodworking shops, and 4 miscellaneous wood-using industries in the basin. Individually, these plants are small. As a group, they represent a large percent of the industrial payroll.

FORESTRY
1960

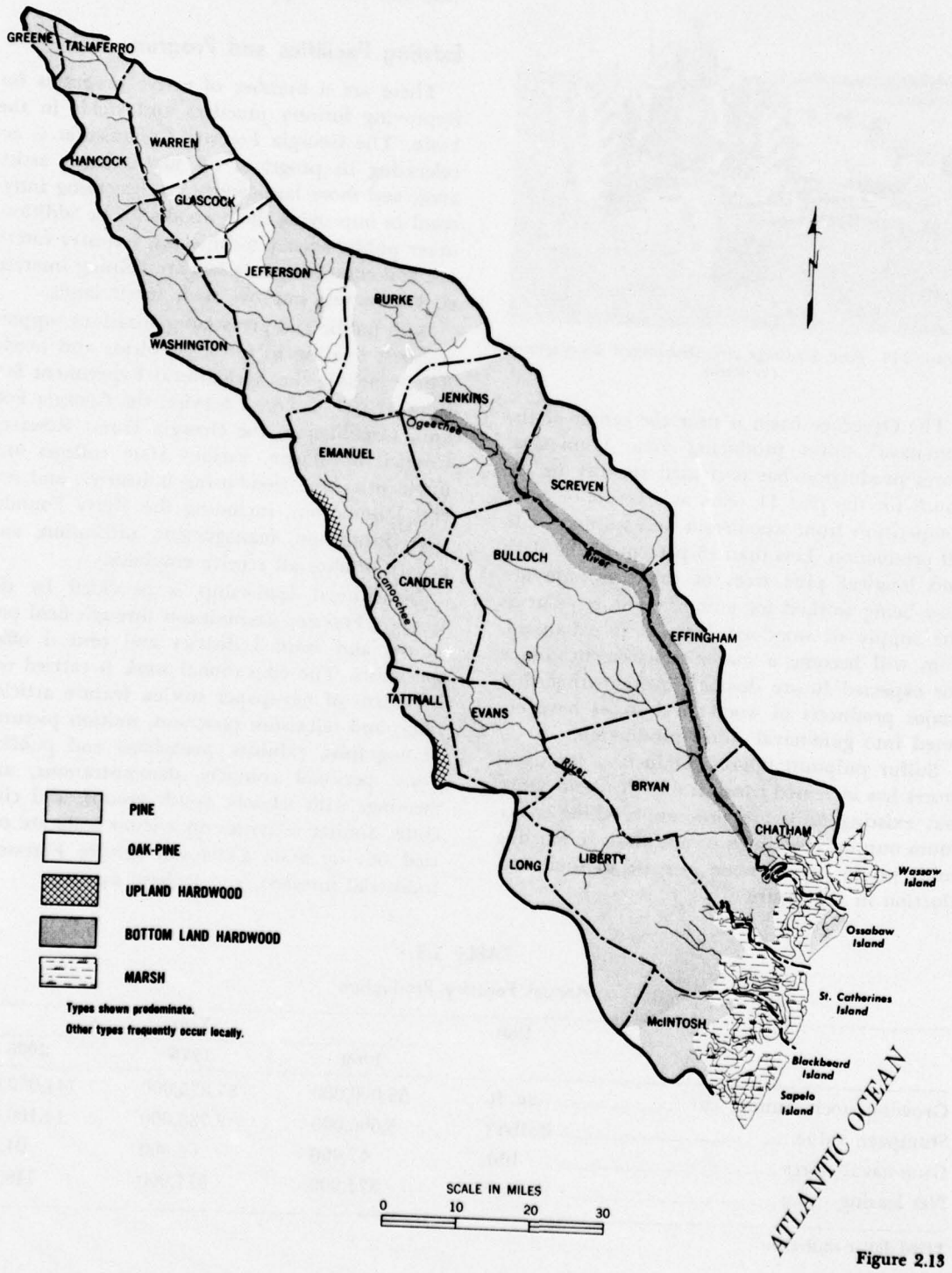


Figure 2.13

Figure 2.14 *Pine Seedlings Are Distributed Throughout the Basin.*

The Ogeechee basin is near the center of the gum-naval stores producing area. Gum-naval stores production has decreased steadily in the South for the past 11 years as a result of price competition from wood-rosin and sulphate tall-oil production. Less than 15 percent of the slash and longleaf pine trees of economic size are now being worked for gum-naval stores, but as the supply of wood-naval stores is exhausted, gum will become a major replacement source for expected future demand. Anticipating this, major producers of wood-naval stores have entered into gum-naval stores production.

Sulfur pulpmill tall-oil production for naval stores has increased considerably in recent years, but existing mills are now approaching maximum output. New mills or additions to existing mills would permit some increase in total production in the future.

Approximately 187 crops, 10,000 faces per crop, of turpentine trees are being worked in the basin. The 46,800-barrel yield of gum in 1959 was worth approximately $1,870,000.

Existing Facilities and Programs

There are a number of active programs for improving forestry practices and yields in the basin. The Georgia Forestry Commission is accelerating its programs for management assistance, and more landowners are becoming interested in improving their woodland. In addition, other public agency technicians, industry foresters, and consulting foresters are helping interested landowners improve their forest lands.

Both public and private organizations support research relating to forest problems and needs. These include the Agricultural Experiment Stations, the U. S. Forest Service, the Georgia Forestry Commission, the Georgia Forest Research Council at Macon, various State colleges and universities, the wood-using industries, and several foundations, including the Herty Foundation. Protection, management, utilization, and genetic studies all receive emphasis.

Educational leadership is provided by the Georgia Forestry Commission through field personnel and trained district and central office specialists. The educational work is carried out by means of newspaper stories, feature articles, radio and television programs, motion pictures, photographs, exhibits, pamphlets and publications, personal contacts, demonstrations, and meetings with schools, youth groups, and civic clubs. Similar activities on a lesser scale are carried out by State Extension Service Foresters, industrial foresters, and Federal foresters.

TABLE 2.3

Annual Forestry Production

	Unit	Year		
		1960	1975	2000
Growing stock, annual cut	cu. ft.	56,000,000	87,875,000	141,000,000
Stumpage value	dollar*	5,600,000	8,788,000	14,100,000
Gum-naval stores	bbl.	47,000	64,000	94,000
Net leasing value	dollar*	374,000	514,000	748,000

*1960 dollar equivalent.

All of the woodland in the basin, except 45,800 acres in Glascock County, is under organized fire protection. The Georgia Forestry Commission has reduced wildfire losses, but they are not fully staffed or equipped to sustain this record through critical fire periods. Recent studies indicate that they are spending about one-half of what is needed to maintain a basic organization required for adequate protection.

The Georgia Forestry Commission has the largest program of any State in the Union for producing seedlings and was able to meet the 1960 demand. During the past several years, the State produced more than 200 million seedlings annually. In addition, pulp and paper companies and other organizations in the State produced seedlings for their own use and for limited distribution to farmers. Approximately 131 million Georgia Forestry Commission seedlings were planted on 164,000 acres in the Ogeechee basin in the last 10 years. Farmers planted most of the trees. Some of the lands were planted under the Soil Bank and Agricultural Conservation Programs.

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. Of the 313 gum naval-stores producers in the basin, some 200 are enlisted in the Naval Stores Conservation Program and work 1,590,000 of the 1,870,000 trees now treated for naval-stores production.

There have been no major epidemics of insects or diseases in the woodlands of the basin. Localized losses occur each year, and damages are appreciable, although not generally spectacular.

All of the forest land in public ownership is under management. Protection is generally of high caliber. Because of budgetary limitations, however, management levels fluctuate. This could adversely affect long-term plans and future production goals.

The pulp and paper companies own or have under long-term lease 381,000 acres of land in the basin. These forests are managed primarily for pulpwood and, as a rule, can be considered well managed and protected. Much work, however, remains to be done to bring stands to desired conditions.

Figure 2.15 *Successful Pine Plantations Help Meet Future Demands of Wood Products.*

The remaining forest lands are also privately owned. Farm woodlots, which make up a little less than half the total woodland, are generally managed inadequately. Less than 10 percent of the farmowners apply standard management measures to their lands.

Needs and Opportunities

By the year 2000, the national demand for wood products is expected to more than double. A large share of this increase in growth is needed from areas such as the Ogeechee basin where timber growing and market conditions are favorable. By the year 2000, approximately 141 million cubic feet of growing stock should be cut annually in the basin. The stumpage value is expected to be $14.1 million as compared to $5.6 million in 1959.

The wood-naval stores industry will eventually use all the economically suitable stumpwood, and gum-naval stores production will have to be doubled to maintain total present output of

naval-stores products. Enough slash and longleaf pine of suitable size will be available for efficient production. Net leasing value of the increased number of trees to be worked, allowing for reduction in wood growth, would be $748,000 in the year 2000.

Gum production now totals about 47,000 barrels annually. This should increase to nearly 94,000 barrels by the year 2000.

Means of Meeting the Needs

The forest development program requires two and one-half times present timber production and a doubling of gum-naval stores production in the basin by the year 2000. Improved practices and coordinated individual and community efforts will be more essential to the production program than they are at present. The basin forests are expected to meet established requirements without major legislative or ownership changes. Program recommendations reflect items of work remaining to be done as of January 1960.

The major uses of forests are usually compatible but there are specific problems related to each which demand attention. Forest-resource development would be served by: (1) Protecting forests from destructive wildfire, insects, disease, and grazing; (2) planting trees to repair erosion damage and to bring idle timberlands into production; (3) harvesting and managing timber stands wisely so that they will contribute their share to the Nation's wood and naval-stores requirements; (4) providing better and safer use of forest range, consistent with other uses; (5) developing the recreational and wildlife resources of the forest lands; and (6) managing and utilizing the forest so as to leave less waste in the woods and to maintain favorable watershed conditions, including special provision for soil stabilization, cover restoration, and other protective works.

In certain instances, demands of other functions would reduce production of forest products from specific areas. To make up for these losses, management and production on the remaining commercial forest land could be intensified to a level that would meet production goals.

Some strengthening of forestry programs on public lands is required. Additional personnel are needed to make inventories, prepare growth studies, prescribe burns, and to perform other duties associated with management work. Although protection from wildfire has been good, additional fire-control organization is needed to insure safety during critical periods.

Included in the needs for private land is availability of credit and insurance to small-unit operators. In the past, landowners often have had to liquidate immature forest holdings because credit was not available. Such programs would lead to more stable ownership and operation.

A greatly accelerated program of technical assistance to the owners or operators of small forest areas is also needed. Most of these woodland holdings require some treatment. Applying recommended measures would greatly increase the efficiency of forest operation and would help to achieve production goals for the basin. Additional technical foresters are needed to supply the landowners both information and guides for properly managing their woodland.

Forest research should be intensified to achieve production goals. The many promising fields in research could lead to increased growth and use of products. Studies should be made to determine if new incentives or laws are needed to help increase output of wood products.

Because of the long-term nature of timber crops, a forest development program cannot reach full effectiveness by the year 2000. It takes a tree seedling 40 years or more to produce high-grade sawlogs. Therefore, recommended forestry measures should be installed as quickly as possible. Some measures would produce immediate results, but these results are needed to meet the immediate increase in demand for wood.

SECTION VIII – FISH AND WILDLIFE

General

Fish and wildlife resources have contributed much toward meeting the needs for food and outdoor recreation of the people residing in and outside the Ogeechee basin. Hunting and fishing constitute a vital part of the lives of the people,

FISH AND WILDLIFE
1960

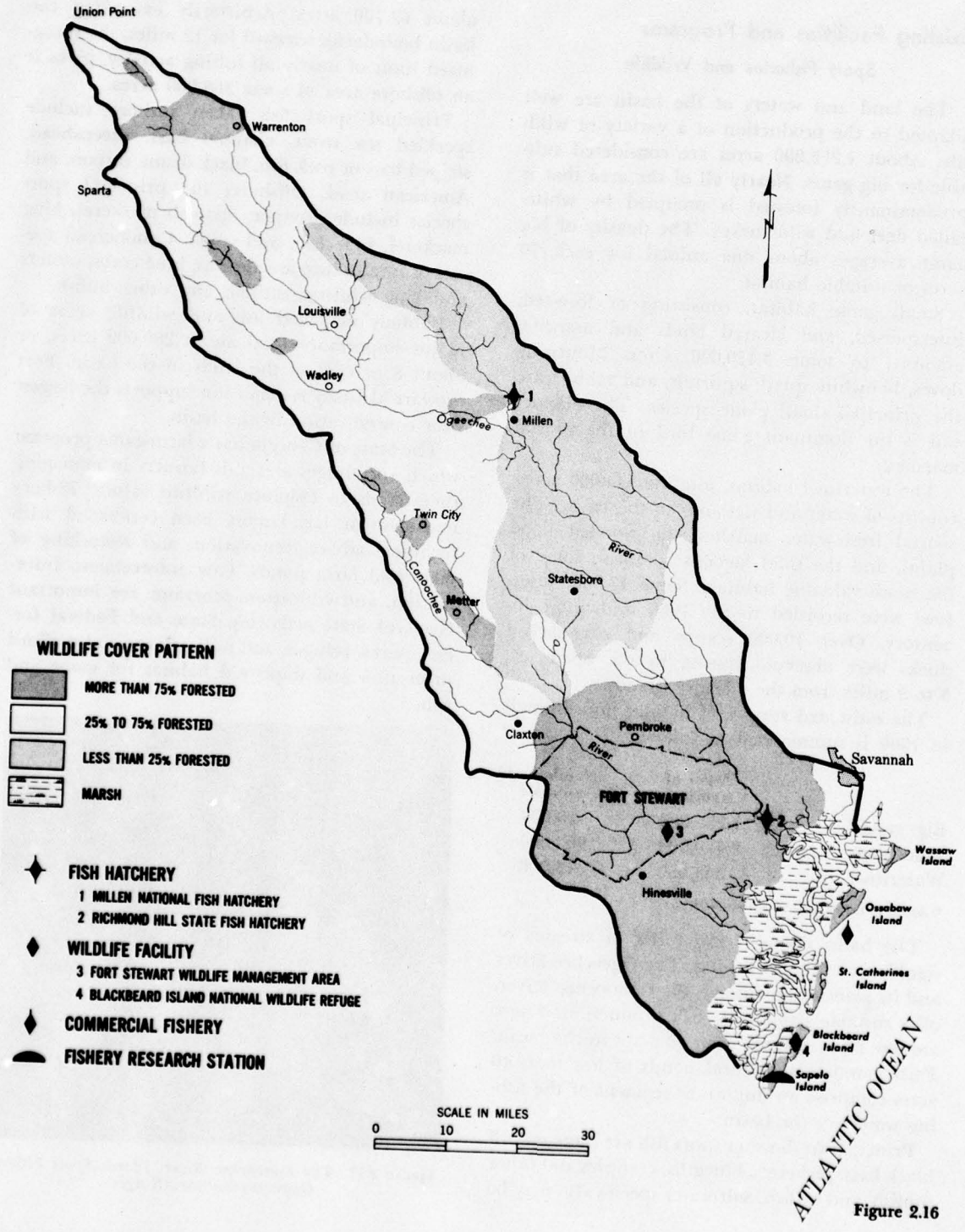


Figure 2.16

and commercial fishing is a source of livelihood to many residents along the coast and near the mouth of the river.

Existing Facilities and Programs

Sport Fisheries and Wildlife

The land and waters of the basin are well adapted to the production of a variety of wildlife. About 1,255,000 acres are considered suitable for big game. Nearly all of the area that is predominantly forested is occupied by white-tailed deer and wild turkey. The density of big game averages about one animal for each 70 acres of suitable habitat.

Small game habitat, consisting of forested, interspersed, and cleared lands and marshes, amounts to some 3,470,000 acres. Mourning doves, bobwhite quail, squirrels, and rabbits are the principal small game species. The clapper rail is the dominant game bird of the coastal marshes.

The waterfowl habitat, totaling 544,000 acres, consists of water and wetlands in the basin. The coastal fresh-water marshes, the wooded flood plains, and the tidal lagoons comprise some of the more valuable habitats. Some 17,000 waterfowl were recorded in the 1960 midwinter inventory. Over 10,000 scaups and ring-necked ducks were observed resting in the open sea, 3 to 5 miles from the offshore islands.

The estimated supply of habitat and animals in 1960 is summarized as follows:

	Acres of habitat*	Number of animals
Big game	1,255,000	18,000
Small game	3,470,000	902,000
Waterfowl	544,000	17,000

* Areas overlap and are not additive.

The basin contains 296 miles of streams of significance to sport fishing. The Ogeechee River and its principal tributary, the Canoochee River, offer suitable habitat for fish production. There are few lakes of more than 40 acres in the basin. Farm ponds and natural ponds of less than 40 acres comprise an important segment of the fishing waters in the basin.

Principal fresh-water sport fish are large-mouth black bass, pickerels, bluegills, crappies and other sunfish, and catfish. Salt-water species also may be taken along the lower reaches of the Ogeechee River. The river is noted for its annual run of American shad which spawn in its waters.

The surface area of the inshore waters totals about 62,700 acres. Arbitrarily extending the basin boundaries seaward for 12 miles, the recognized limit of nearly all fishing activity, gives it an offshore area of some 368,000 acres.

Principal sport fish taken inshore include speckled sea trout, channel bass, sheepshead, striped bass or rock fish, black drum, tarpon, and American shad. Offshore, the principal sport species include grouper, Spanish mackerel, king mackerel, blue fish, and cobia. Commercial species of importance are shrimp, blue crabs, oysters and king whiting, mullet, and other finfish.

Publicly managed fish and wildlife areas of major importance total about 286,000 acres, or about 8 percent of the lands in the basin. Fort Stewart Military Reservation supports the largest deer concentration in the basin.

The State of Georgia has a farm-game program which encourages and aids farmers in managing their lands to enhance wildlife values. Fishery management has largely been concerned with technical advice, renovation, and restocking of lakes and farm ponds. Law enforcement, information, and education programs are important facets of State activities. State and Federal forests, parks, refuges, and military areas also afford protection and improved habitat for game and fish.

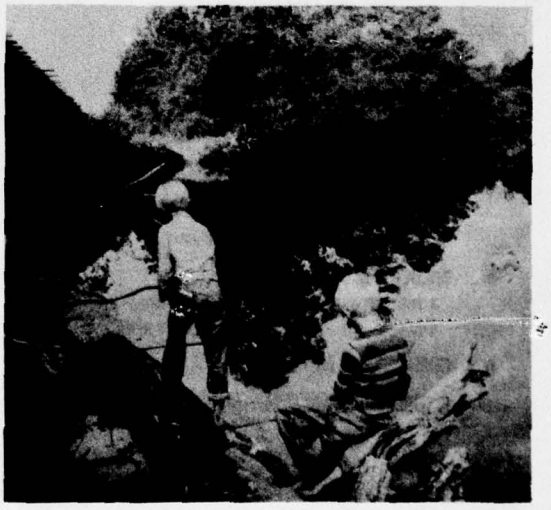


Figure 2.17 *The Canoochee River Affords Sport Fishing Opportunities for All Ages.*

TABLE 2.4

Fish and Wildlife Areas and Installations

Name of unit	Administering agency	Acreage
Federal		
Blackbeard Island National Wildlife Refuge	U. S. Department of Interior	6,000
Fort Stewart	U. S. Army	280,000
Millen National Fish Hatchery	U. S. Department of Interior	*
State		
Richmond Hill State Fish Hatchery	Georgia Game and Fish Commission	*
State and private		
Sapelo Island Marine Laboratory	University of Georgia	*

* Less than 1,000 acres.

Commercial Fisheries

Commercial fishing is an important coastal enterprise. The catch in 1959 totaled 9.7 million pounds and was worth $1.3 million to the fishermen. The principal seafoods are shrimp and crabs. These are processed locally and distributed to markets throughout the Eastern United States. The harvest of crabs has increased rapidly during the past 10 years. Of the various finfish taken by commercial fishing operations, king whiting and flounder are the most important.

The development of commercial fisheries is being aided by the Georgia Game and Fish Commission and the U. S. Bureau of Commercial Fisheries.

The University of Georgia Marine Institute, with laboratory facilities on Sapelo Island, is conducting research into the organic productivity of the estuaries and marshes and the biochemistry of the nutrient elements. Technological services of the Bureau of Commercial Fisheries are directed toward developing new markets for fishery products. This agency also provides market news service and assists the industry with loans to qualified fishermen.

Needs and Opportunities

Sport Fisheries and Wildlife

In 1960, hunting and fishing afforded approximately 696,000 user-days of outdoor recreation. Approximately 142,000 user-days of demand remain unsatisfied. By the year 2000, it is expected that this will increase to around 1,162,000 user-days.

The total population increase and trend toward urbanization were considered to be the decisive factor in projecting hunting and fishing requirements. Per capita demand for hunting and fishing decreases as the degree of urbanization increases.

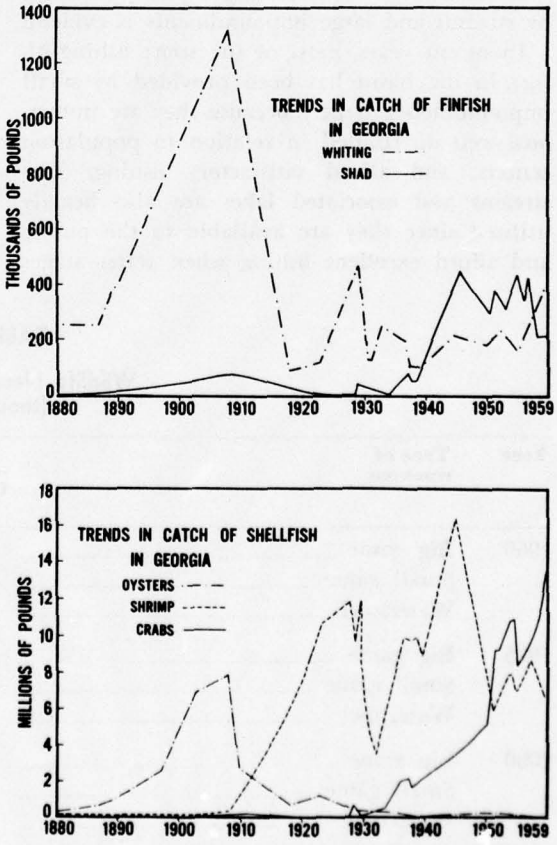


Figure 2.18 *Trends in Commercial Fisheries Catch.*

Use of publicly owned and managed areas is expected to 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 could make it increasingly difficult for the urbanite to find a place to fish and hunt, despite increases in travel, leisure time, and personal income.

An analysis of the needs for hunting opportunity reveals a current deficit in small game and waterfowl resources and a probable deficit in 1975 and 2000. Small game resources have traditionally supported most of the hunting effort and may be expected to do so in the future. It is recognized that the supply and availability of small game and waterfowl would become more critical. On the other hand, big game hunting should continue to increase in popularity with the expected increase in white-tailed deer and wild turkey.

A deficiency in the fishing capacity afforded by streams and large impoundments is evident.

In recent years, most of the sport fishing effort in the basin has been provided by small impoundments, largely because they are numerous, well distributed in relation to population centers, and afford satisfactory fishing. The streams and associated lakes are also heavily utilized since they are available to the public and afford excellent fishing when water stages are favorable. There is a demand, however, for more large impoundment fishing.

These considerations led to the establishment of goals which place greater emphasis in the future on large impoundment fishing now limited by the small acreage of this type habitat.

Interest in salt-water fishing has increased markedly with improvement in boats and fishing gear and is expected to continue to increase in the future. No problem of supply is foreseen. The coastal waters are capable of producing far more fish than are required to meet projected requirements.

Commercial Fisheries

By the year 2000, it is estimated that the demand for food fish landed at ports in the Ogeechee basin will increase to 20.4 million pounds. This reflects the projected increase in national population, and a constant rate of per capita consumption equivalent to the national average of 11.0 pounds, edible weight. Future requirements by kind of fishery resource were distributed on the basis of trends in supply, availability, costs of production, and other factors.

The shrimp fishery was expanded in the early 1940's in response to increased demand coupled with improved techniques of processing and marketing. With full utilization of known supplies, however, further expansion of this industry was curtailed.

TABLE 2.5

Wildlife Needs and Supply (thousands)

Year	Type of resource	Needs	Supply		Deficit
		User-days	Acres of habitat	User-days capacity*	User-days
1960	Big game	32	1,255	90	0
	Small game	194	3,470	150	44
	Waterfowl	16	544	6	10
1975	Big game	75	1,255	100	0
	Small game	200	3,470	150	50
	Waterfowl	16	544	6	10
2000	Big game	84	1,255	120	0
	Small game	181	3,470	150	31
	Waterfowl	14	544	6	8

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

TABLE 2.6

Sport Fishing Needs and Supply
(thousands)

Year	Type of resource	Needs	Supply		Deficit
		User-days	Acres of habitat	User-days capacity*	User-days
1960	Streams	133	4	80	53
	Large impoundments	30	3	30	0
	Small impoundments	310	11	275	35
	Salt water	123	430	2,150	0
1975	Streams	113	4	80	33
	Large impoundments	113	3	30	83
	Small impoundments	340	17	425	0
	Salt water	203	430	2,150	0
2000	Streams	128	4	80	48
	Large impoundments	128	3	30	98
	Small impoundments	383	28	700	0
	Salt water	244	430	2,150	0

* Based on existing and prospective fish populations, with normal expansion of going programs.

Oyster production reached its zenith in the early 1900's when there was an abundance of oysters and a demand for canned products. A continued increase in the demand for crab meat is also expected. As for other fishes available to the fishermen, there seem to be ample supplies and a potential market, if food products can be produced that will meet with wide public acceptance.

TABLE 2.7

Commercial Catch Requirements
(thousands of pounds)

Resource	1960*	1975	2000
Shrimp	4,070	4,300	4,600
Crabs	5,380	5,800	7,300
Oysters	80	100	200
Selected finfish	150	200	300
Other fishes	20	2,200	8,000
Total	9,700	12,600	20,400

* Based on average annual catch 1955-59.

Means of Meeting the Needs

An analysis of the fish and wildlife potentials within the Ogeechee basin revealed that, with more intensive management and increased availability of fish and wildlife resources, the projected demand for food, hunting, and sport fishing can be met.

Special provision should be made to safeguard the wildlife resources of the Golden Isles, if they are developed for public recreational purposes. These areas along the coast are unique in that they have provided refuge for an abundance of wildlife since early colonial days. The inlets to the ocean have an abundance of marine fish. The development of these areas would undoubtedly increase the use of both wildlife and fish resources.

Wildlife

Big game development affords one of the most feasible means of meeting the future demand for hunting. With more extensive management, the habitat could readily supply the expected big game demand, plus a considerable amount of unsatisfied demand for small game and waterfowl hunting. The general trend in land use favors big game enhancement. Some loss of habitat is expected through urban and industrial development, but this may be generally offset by conversion of other lands to forests. Current 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 consid-

erably. Greater understanding on the part of forestry interests of game values, however, may be expected, with continued emphasis on a program involving private landowners, conservation agencies, and the sportsman.

Under these favorable conditions and with sustained management at the present level, an inventory of 24,000 big game animals is expected by the year 2000. This will be more than enough to meet the minimum standards for this type hunting if the big game population is well distributed throughout the area of suitable habitat and that at least one-half of the range is open to public hunting.

The key features of this program would consist of a system of management areas totaling about 360,000 acres which could be developed cooperatively by Federal, State, and private interests. Industrial tree farmers would play an important part in the implementation of this program. Several of the owners of larger tree farms have shown interest in developing wildlife resources on their lands. A coordinated approach to timber-wildlife management may be attained in management areas, similar to programs now underway in national forests.

The task of developing small game resources to meet the demand lies primarily with the landowners, particularly farmers. Bobwhite quail and mourning dove are prevalent because of the type and pattern of land use. Employment of agricultural practices which provide food and cover for wildlife could be encouraged. Prescribed burning, roadside planting, and establishment of food and cover strips could be employed more extensively by owners of commercial forests. Emphasis could 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 could be carried out on all suitable habitat.

Figure 2.19 *Quail Hunting Is Growing in Popularity.*

Meeting the demand for waterfowl hunting is not a problem which can be effectively attacked solely by more intensive management, although this would be of some value. Basically, this problem has its roots beyond the borders of the basin. The duck population along the Atlantic Flyway, after remaining essentially static for several years, has resumed its decline. However, the waterfowl value of the Ogeechee basin wetlands should be enhanced by a program oriented toward preserving and developing the existing wetlands to increase the attractiveness of the habitat and by increasing production of resident species.

The establishment of waterfowl management areas and development of coastal-marsh and inland water and wetland areas would help to meet this need. Impoundments designed for other purposes should include waterfowl management facilities wherever they are feasible.

The local supply of ducks might be increased by a regional program of wood-duck nesting boxes. A pilot program to test the feasibility of this type program on an extensive scale could be considered. The establishment of nonmigratory ducks in the coastal marshes and inland water areas also could be explored.

The establishment of additional regulated shooting preserves by local interests for small game and waterfowl hunting could be encouraged, since this type of sport affords reasonably satisfactory hunting and does not depend upon resident game supplies.

Sport Fisheries

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

It is expected that, if the present trend in farm-pond construction continues, there will be more than enough fish produced in small impoundments to sustain the demand for this type of fishing. An expansion of the current fisheries

program, however, will be needed to service these and other impoundments and thereby increase the acreage which affords quality fishing.

There is a marked deficit in the acreage of large impoundments. The present or potential production of fish in the existing large impoundments is in no way adequate to serve the general public. New waters must be created.

Field surveys have revealed numerous sites well adapted to the construction of large reservoirs. These would satisfy the need for this type of fishing if developed primarily for this or multiple-purpose use. A minimum of 9,800 additional acres of large impoundments, with management at the present level, will be required to produce the weight of fish necessary to satisfy the anticipated fishing pressure. As an alternative program, a minimum of 1,300 additional acres of large impoundments with management at a high level, primarily for sport fishing, would suffice.

A deficit in the supply and availability of sport fish in the streams is also apparent. Therefore, management to meet the demand for stream fishing depends largely upon improvement of existing habitat and development of public access and facilities in the streams. Minimum facilities at each site should include a concrete boat-launching ramp and parking area. Camping facilities at a number of those sites would increase their utility.

Realization of the full potentials of the streams requires flow regulation to increase productivity and extend the period when conditions are favorable for sport fishing. Flow regulation would also permit needed stream fluctuation for best fish production and harvest. Regulated streamflow, along with sewage treatment and proper disposal of industrial wastes, would also reduce pollution problems and enhance the stream values.

The capacity of the salt-water fishery resources to satisfy the projected demand is limited more by the number and type of facilities for fishing than by the extent and productivity of habitat. The inshore waters of the basin are apparently capable of maintaining their present high productivity if dredging and filling operations are held to a minimum. However, there is need for improved services, accommodations, and more facilities if the resources are to be more fully utilized.

At present, salt-water sport fishing centers are small villages on the bluffs overlooking the vast marshes of the coastal regions. Existing accommodations range from primitive to modern and help create a unique setting.

To preserve this unusual setting and enhance the value of the sport fishery, there is a need for additional motels, boatels, and new fishing camps with complements of boats and guides. Public access sites to salt water could be developed and equipped with launching ramps or power hoists, fishing piers, parking areas, and associated facilities.

Commercial Fisheries

The crab fishery affords an opportunity for meeting the needs for seafood. This crustacean is abundant in the coastal waters, and the market for it has been growing steadily. Landings of this species have risen sharply during the past 10 years, and the outlook for continued increased catches is good.

The once-valuable oyster fishery in the basin has declined. Many productive oyster reefs are closed to commercial harvest because of pollution. Many others have been overexploited. Only two firms were engaged in this fishery in 1961. This fishery could be renovated by extensive and intensive surveys of potential bottoms, adequate pollution abatement measures taken, and more efficient practices for the fishery developed.

Known shrimp resources are fully utilized at the present time. More extensive knowledge is needed concerning the biology of shrimp and the effects of fishing on the populations. Discovery of new shrimping areas appears to be a possibility.

The catch of finfish could be expanded and the methods of processing and distribution improved. Studies could be undertaken to correct existing methods of handling and processing finfish and to create products of more competitive quality. Improved gear and methods of fishing could be developed and the fishing effort intensified. The program of exploratory fishing could be accelerated to find additional potentials for augmenting the commercial harvest of finfish.

The culture of selected finfish and shellfish could be investigated. The feasibility of shrimp farming could be demonstrated by actual production in coastal impoundments. Hard-shell clams may be a future source of commercial farming operations. Studies could also be made of management and possible commercial cultivation of stone and soft-shelled crab.

SECTION IX – RECREATION

General

The natural setting of the Ogeechee basin is its primary recreation resource. The Piedmont hills, the rolling countryside of the Upper Coastal Plain, the heavily timbered flatlands of the Lower Coastal Plain, the seacoast, and the Golden Isles offer extensive opportunities for recreation development. The basin has transportation routes that carry heavy tourist traffic between the northeastern United States and Florida. It is also close to major urban centers such as Savannah, Augusta, Atlanta, and Macon. With a minimum of investment, the basin could provide a vacation spot for urbanites of the Southeast, a stopover for the traveler, and increased recreational opportunities for its residents and nonresidents.

Existing Facilities and Programs

The Ogeechee has few developed public outdoor recreation areas. There are only two State parks in the basin. The many areas of unsual interest are generally undeveloped. The Lower Coastal Plain with its flat pinelands also has coastal islands, marshes, and tidal estuaries noted for their history and natural beauty. There are many summer homes in the coastal area, and tourist facilities are located along U. S. Highway No. 1, 301, and 17. There are no known archeological sites within the basin, but there are numerous historic sites.

The Ogeechee River is used for fishing and boating. Wassaw, Ossabaw, St. Catherines, and Sapelo Islands are privately owned, and access is difficult and restricted. The Intracoastal Waterway winds its way between the islands and the mainland, but only one area near Savannah offers facilities for boating along the protected route.

General outdoor recreation areas include Magnolia Springs and Lincoln State Parks located near Millen in the center of the basin. Lincoln State Park is administered by the Georgia Department of State Parks. This 54-acre recreation area had 17,000 visitors in 1959. Magnolia Springs State Park is also administered by the Georgia Department of State Parks. Ninety-four thousand people visited this 1,106-acre park in 1959.

Much recreation activity is unrecorded. Wayside areas, local parks, and unspecified areas used for boating and swimming form a major part of public recreation accommodations.

A natural environment area is Blackbeard Island National Wildlife Refuge which is administered by the U. S. Bureau of Sport Fisheries and Wildlife and contains some 5,600 acres. It is located opposite the north end of Sapelo Island and is accessible only by boat.

The historic and cultural areas of the basin are numerous. They could form the nucleus for public outdoor recreation planning. Fort McAllister was erected by the Confederates in 1861 on the south bank of the Ogeechee River near its mouth. It withstood Union attacks until it was captured in December of 1864. Its well-preserved ramparts and bricklined oven may still be seen. The Georgia Historical Commission is restoring the network of underground facilities and is making provisions for improving the access road. Its present facilities accommodated 35,000 visitors in 1959.

Midway Church is a white clapboard structure located at Midway in Liberty County on U. S. Highway No. 17. This building, the fourth on the site, was built in 1792 and is reputed to be the second oldest building in the State. The old cemetery is across the highway from the church. The construction is reminiscent of a Colonial New England meeting house. The church was established by a group of New England Puritans who settled the area. A museum has recently been established here.

In Louisville, near the public square, is an unwalled structure known as the Old Slave Market, which tradition claims, was built in

RECREATION
1960

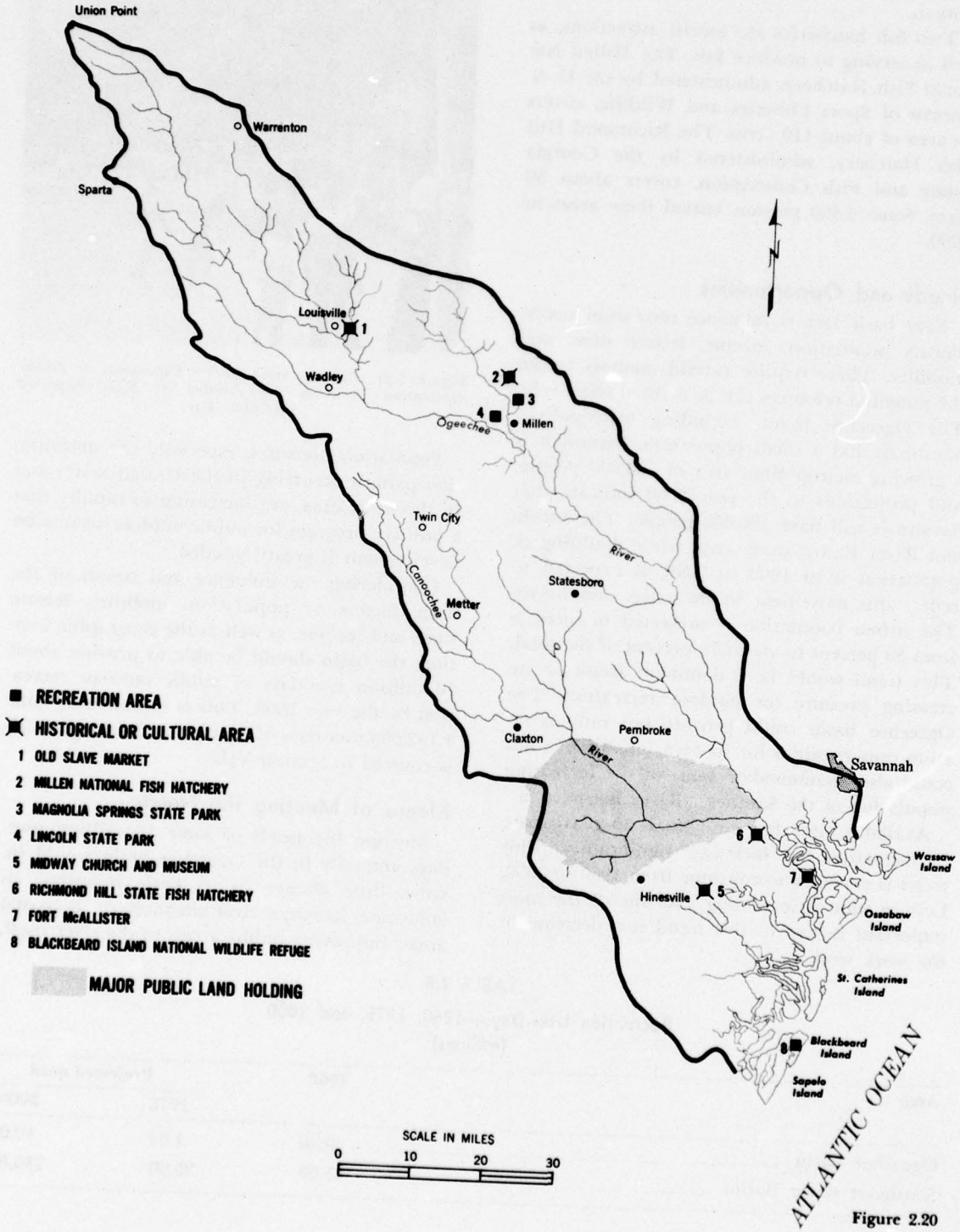


Figure 2.20

1758. In the market house is a bell sent by the King of France as a gift for New Orleans. The bell was captured by pirates and sold in Savannah.

Two fish hatcheries are tourist attractions, as well as serving to produce fish. The Millen National Fish Hatchery, administered by the U. S. Bureau of Sport Fisheries and Wildlife, covers an area of about 110 acres. The Richmond Hill Fish Hatchery, administered by the Georgia Game and Fish Commission, covers about 50 acres. Some 4,400 persons visited these areas in 1959.

Needs and Opportunities

Four basic factors influence recreation needs, namely population, income, leisure time, and mobility. These require careful analysis before the potential resources can be utilized effectively. The Ogeechee basin, excluding metropolitan Savannah, has a small population. Savannah is a growing metropolitan area of 188,000 people, and projections to the year 2000 indicate that Savannah will have 390,000 people. The Southeast River Basins study area, while doubling in population from 1960 to 2000, is expected to reflect this movement to the cities and towns. The urban population is projected to increase from 50 percent to about 75 percent of the total. This trend would be a dominant factor in increasing pressure for outdoor recreation. The Ogeechee basin could provide not only recreation opportunities for its own inhabitants, but could also accommodate some of the increasing population of the Southeast River Basins area.

Available time for individuals to participate in recreation has increased significantly. This trend is expected to continue from 1960 to 2000. Leisure time is increasing and one of the most important factors in this trend is a decrease in the work week.

Figure 2.21 *Lincoln State Park — Expansion of Public Recreation Facilities Are Needed to Meet Expected Increased Use.*

Population pressures, especially the urbanization pattern occurring in the United States and in the study area, are increasing so rapidly that a positive program for public outdoor recreation development is greatly needed.

Considering the influence and trends of the basic factors of population, mobility, leisure time, and income, as well as the geographic location, the basin should be able to provide about 10 million user-days of public outdoor recreation by the year 2000. This is exclusive of some 1,162,000 user-days of hunting and fishing which is covered in Section VIII.

Means of Meeting the Needs

Meeting the needs of some 10 million user-days annually in the Ogeechee basin would involve little change in its basic resources, its landscape, its major river channels, or its coastal areas. Improving public access to the river itself,

TABLE 2.8

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

Area	1960	Projected need	
		1975	2000
Ogeechee basin	0.26	4.34	10.00
Southeast River Basins	35.00	95.00	230.00

Figure 2.22 *Magnolia Springs State Park—Projected Increase in User-Days of Recreation Will Require Expansion of Facilities.*

developing historic areas to absorb public recreation, and providing access to and accommodations at ocean beaches are ways to provide greater opportunity to the people of both the basin and the region. It is desirable for a recreation facility to provide variety and adventure. The Ogeechee basin can offer these with a positive program for the development of the land and water recreation resources.

Public recreation areas which now adequately meet local needs will not do so in the future.

Expanding facilities at existing recreation areas would satisfy only a modest demand because of the few existing areas in the basin. Several areas can be expanded beyond their present facilities and would supply additional opportunity to satisfy some recreation needs. Magnolia Springs and Lincoln State Parks can be expected to undergo increased use with some increase in facilities.

Midway Church, the Old Slave Market in Louisville, and several old forts could serve as centers for recreational development. Blackbeard Island National Wildlife Refuge and the fish hatcheries could also serve as points of interest, but it is the seacoast and the heavily timbered land and quiet waters which attract those seeking outdoor recreation.

Eight existing areas could be expanded to provide 300,000 user-days in 1975 and 590,000 user-days by 2000. Development of new areas would provide 4.04 million user-days in 1975 and 9.41 million user-days in 2000.

New opportunities for outdoor recreation would most effectively provide recreation for the public if public access and availability is provided. Also, proper sanitary facilities, supervision and administration, and protection are necessary supporting measures. Water-based recreation has the greatest demand and lends itself to a type of development which can be most effectively translated into action. Broadly speaking, access programs designed to open up water areas, a large fresh-water area, and better facilities on the seacoast can best meet these pressures in the Ogeechee basin.

General outdoor recreation areas could include public access areas to lakes, reservoirs, rivers and seacoast and park-type areas. An access program could involve development of public-access areas on the Ogeechee and Canoochee Rivers and in the coastal area between the mainland and the offshore islands. Areas would range in size from about 10 acres to about 75 acres, depending upon opportunities at the sites selected. The sites could be located so that ultimately there would be one access area for about every 5 miles

TABLE 2.9

Projected Increase in User-Days of Outdoor Recreation at Facility Areas to Meet Needs—1975-2000 (thousands)

Facilities	1960	Increase to 1975	Increase 1975-2000	Total user-days 2000
Enlarging existing areas	260	40	290	590
New areas	---	4,040	5,370	9,410
Total	260	4,080	5,660	10,000

of stream on the lower reaches of the rivers and for about every 10 miles of stream on the upper reaches in addition to access areas at reservoirs. Several general outdoor recreation areas of the park-type, some of which may be associated with reservoirs and located in the upper and lower parts of the basin, could round out the needs to satisfy the demands for this type of recreation.

The needs for natural-environment-area recreation could be met by development of the offshore islands and a large fresh-water lake.

Use of all the Golden Isles along the Atlantic coast of the Southeast River Basins study area could be considered to meet the recreational needs of the area. Projected public outdoor recreation needs indicate the desirability of providing for public recreational use of four of these islands. The islands now have a limited number of owners, some of whom have expressed an interest in selling or donating their lands to some governmental or other nonprofit entity for development. Some of the islands could normally be developed through the sale of small lots with or without a plan to preserve their unique, scenic, and wildlife values.

For the entire Atlantic coast of the Southeast River Basins study area, two of these islands could serve as national seashore areas and two could be developed by non-Federal interest, preferably under State auspices. For purposes of this study, it was assumed that certain islands would be acquired by Federal or non-Federal interests. Of primary concern is the assurance of availability of these islands to the general public while they are still relatively undeveloped.

Immediately southeast of Savannah is heavily wooded Wassaw Island. This island has 4 miles of very good beach, but it is inaccessible by car and undeveloped.

Ossabaw Island, which is also inaccessible by car, lies at the mouth of the Ogeechee River and is one of the islands known to the Spanish as the Golden Isles. Ossabaw contains 24,000 acres, has 8 miles of beach, and is covered with large pines, magnolias, oaks, bays, dogwoods, and azaleas. The island is privately owned and has retained much of its natural beauty.

St. Catherines Island was once the site of the most important Spanish mission on the Georgia coast. It is a 13,600-acre, heavily wooded, island with a high promontory on the eastern side overlooking the ocean and the extensive beach. In addition to its Spanish lore, much Revolutionary history has been associated with the island. The area is also privately owned and has no highway connection with the mainland.

Sapelo Island is similar in size and character to St. Catherines Island and was the site of another Spanish mission. The island was reserved as an Indian hunting ground, and since it has no highway connection with the mainland, it retains much of this wildlife atmosphere. Blackbeard Island, east of the adjoining northern half of Sapelo Island, is a national wildlife refuge.

A large fresh-water lake with appropriate recreation facilities could do much to meet future recreation needs in the basin. Such a lake could provide a desirable balance in the outdoor recreation opportunities in the basin. Its location on the Canoochee River would preserve the free-flowing Ogeechee River in its natural state and enhance its recreation activities.

Historic and cultural area development could also satisfy some of the demands for recreation. The following locations provide an opportunity to meet these needs. Development of additional areas of this type could meet the balance of the recreation demands.

Fort Morris, 10 miles out of Midway, was built in 1776 to defend the prosperous port of Sunbury from the British. Well-preserved earthworks may still be seen where continental troops garrisoned the fort.

On Sapelo Island are the remains of a building known as Le Chatelet, or "Chocolate" as the Negroes called it. Le Chatelet was built at the end of the 18th century by the Marquis de Montelet, a refuge from the Santo Domingo slave uprising.

Fort Wimberly is a ruined tabby, an oyster shell material similar to concrete, fortification built in 1741 to defend the Savannah colonists against the Spanish. Although the bastion is over two centuries old, the embrasures through which the colonists fired are still discernible.

SECTION X – SALINITY AND SEDIMENT CONTROL

General

Problems of salinity and sedimentation are localized and are not significant in the Ogeechee 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.

Saline soil problems occur on a total of 155,200 acres in the basin in four counties as follows: Chatham, 37,700 acres; Liberty, 75,000 acres; McIntosh, 28,700 acres; Bryan, 13,800 acres. The application of saline water for irrigation to some 9,000 acres in Chatham County and 1,800 acres in Bryan County necessitated abandonment of these lands. No acreages were reported to have a saline problem created or accelerated by heavy fertilization.

The area of saline soils in the Ogeechee basin represents less than 5 percent of the total basin area. Because of the relatively small amount of land involved and the costs associated with reclamation, no concerted effort has been made to reclaim or rehabilitate areas lost to saline conditions. Saline soils are used largely for grazing cattle and as a habitat for native wildlife. Salt-water marshes are moving inland because of the rising sea level, and as a result, the plant life is changing from fresh to salt water types. Salt-water intrusion of ground water supplies is a problem in Chatham County in the Savannah basin. This situation could develop in the Ogeechee 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.

The sediment yield of the Ogeechee River is very low, because much of the drainage area is gently rolling to almost level land. The concentration of suspended sediment of streams in the Ogeechee basin usually ranges from 5 to 100 parts per million and rarely exceeds 100 parts per million. Annual suspended loads are probably in the range of 5 to 15 tons per square mile. Incomplete data suggest that the bedload may constitute 10 to 50 percent of the total sediment load. Concentrations of such low magnitude do not present serious problems.

In general, erosion and thus sediment load and damage are greater per unit of area in the Piedmont province and decrease toward the Lower Coastal Plain.

Existing Facilities and Programs

There are no existing programs specifically for salinity control.

The soil and water conservation programs for land treatment, and the project action program for flood prevention and drainage, have considerable effect on preventing and controlling sediment problems.

Needs and Opportunities

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

Erosion damage reduction for critical sediment producing areas is a problem on about 50,000 acres of land. Of this acreage, project action may be needed on 19,800 acres involving 2,200 farms. These acreages occur mostly in upland areas where intensive cultivation has resulted in accelerated erosion. Erosion control would correct a large part of the sediment problem of the basin. The reduction of sediment would prolong the useful life of and enhance downstream water developments.

The acreages estimated to require land-treatment measures by the years 1975 and 2000 are given in Section VI, Soil Conservation and Utilization. Although these measures are not specifically for sediment control, one effect of them would be to reduce sediment production.

Roadside erosion problems occur predominantly along 877 miles of unsurfaced county-maintained roads, resulting in an estimated loss of about 108,000 tons of soil material annually. Stabilization of these eroding areas could reduce sediment delivery. Treatment and stabilization of roadside areas would result in reduction of

SEDIMENT
1960

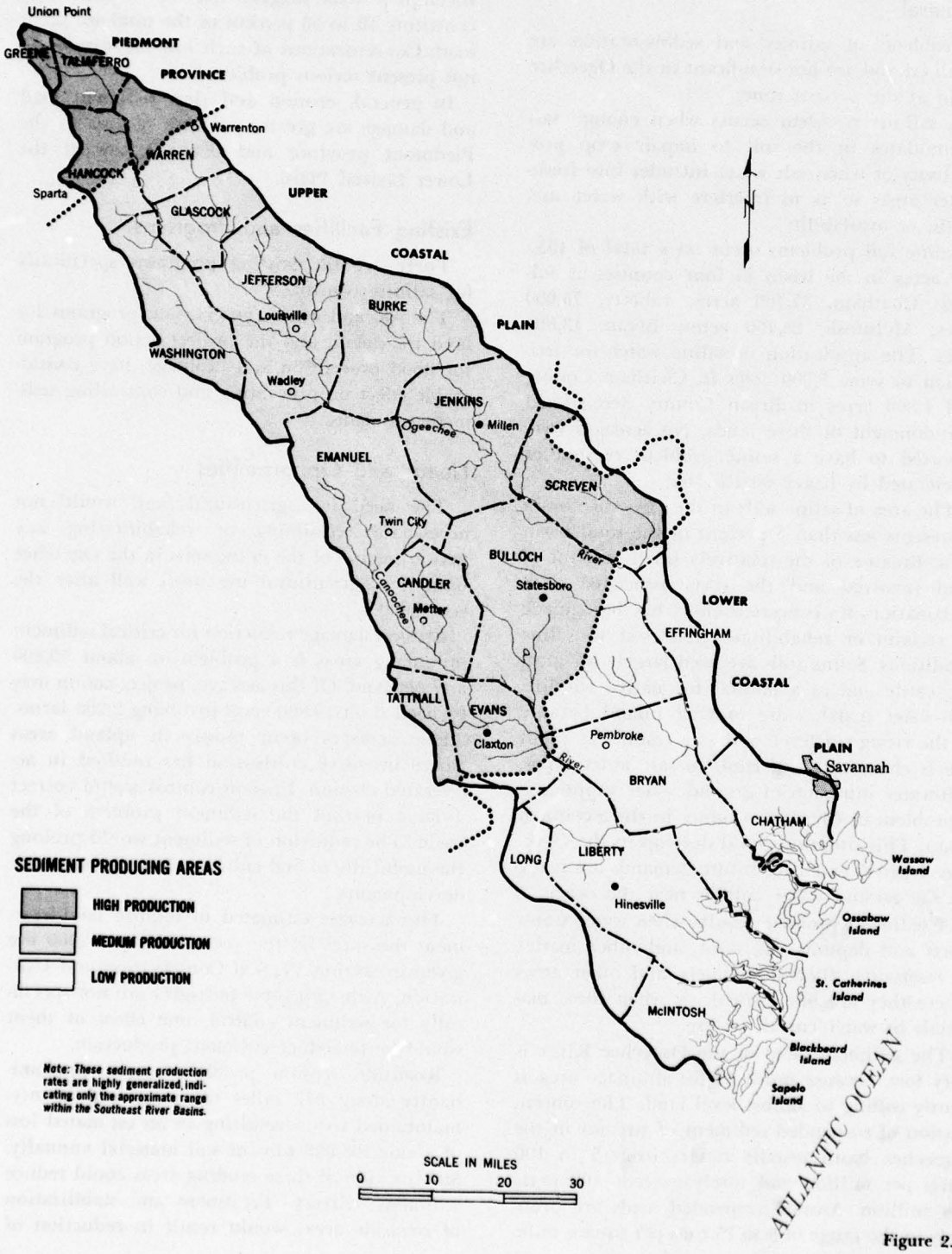


Figure 2.23

maintenance costs, at least as much as the cost for treatment. Thus, roadside erosion control is economically feasible. Application of the recommended measures is estimated to be at least 90 percent effective in reducing rates of soil loss.

The measures recommended for sediment control along the highways can be installed effectively as parts of overall watershed treatment and highway programs. This approach utilizes local government entities and other sources of financial and technical assistance programs. With the expected new highway construction, roadside erosion control needs probably would increase 15 percent by 1975 and 25 percent by 2000.

Over the past 20 years, farmland conservation practices and the increase in tree-seedling plantings have greatly reduced erosion and sediment loads. Individual landowners and operators have applied measures for conserving, utilizing, and improving various types of land uses in the basin. These measures have been effective in reducing sediment problems and include vegetative stabilization, management practices, and grade-stabilization structures. Thousands of farm ponds have been built which, collectively, have a large sediment trapping capacity.

Means of Meeting the Needs

Salinity in the soil is not a major problem in the basin at the present time. Foresight and planning can do much to prevent damages from occurring. Near the Atlantic coast, the withdrawal of ground water supplies can be controlled so that the backflow of ocean water into the aquifer does not occur. Such control must be based on an accurate geologic estimate of the safe yield balanced against the proposed use. To prevent the occurrence of major losses from the rising ocean water, a reasonable zoning program for land use in coastal areas is probably needed. This, of course, is not entirely a salinity problem. Under existing legislation, zoning would be done by the cities and counties. However, since this is a matter of regional importance, regional planning would greatly aid in clarifying the problem and stimulating needed action.

Studies indicate that a sediment control program is needed in the basin. However, the control measures considered should be planned in conjunction with other objectives and in plans for other purposes.

Sediment control, insofar as it affects agricultural and other land in the basin, can in part be achieved by an overall watershed treatment program, including impoundment-type structures. This would include land-treatment measures on the 19,800 acres of land requiring project action for erosion damage reduction. The remaining sediment control needs can be met by the existing nonproject, soil and water conservation program.

SECTION XI – POLLUTION ABATEMENT AND PUBLIC HEALTH

General

Public health is an important consideration in resource development. Economic growth is retarded when poor health causes a loss in production or necessitates high expenditures for personal medical attention. Programs in this field are concerned with protecting and 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 and 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 this Report. The basic objectives 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-dis-

POLLUTION ABATEMENT
1960

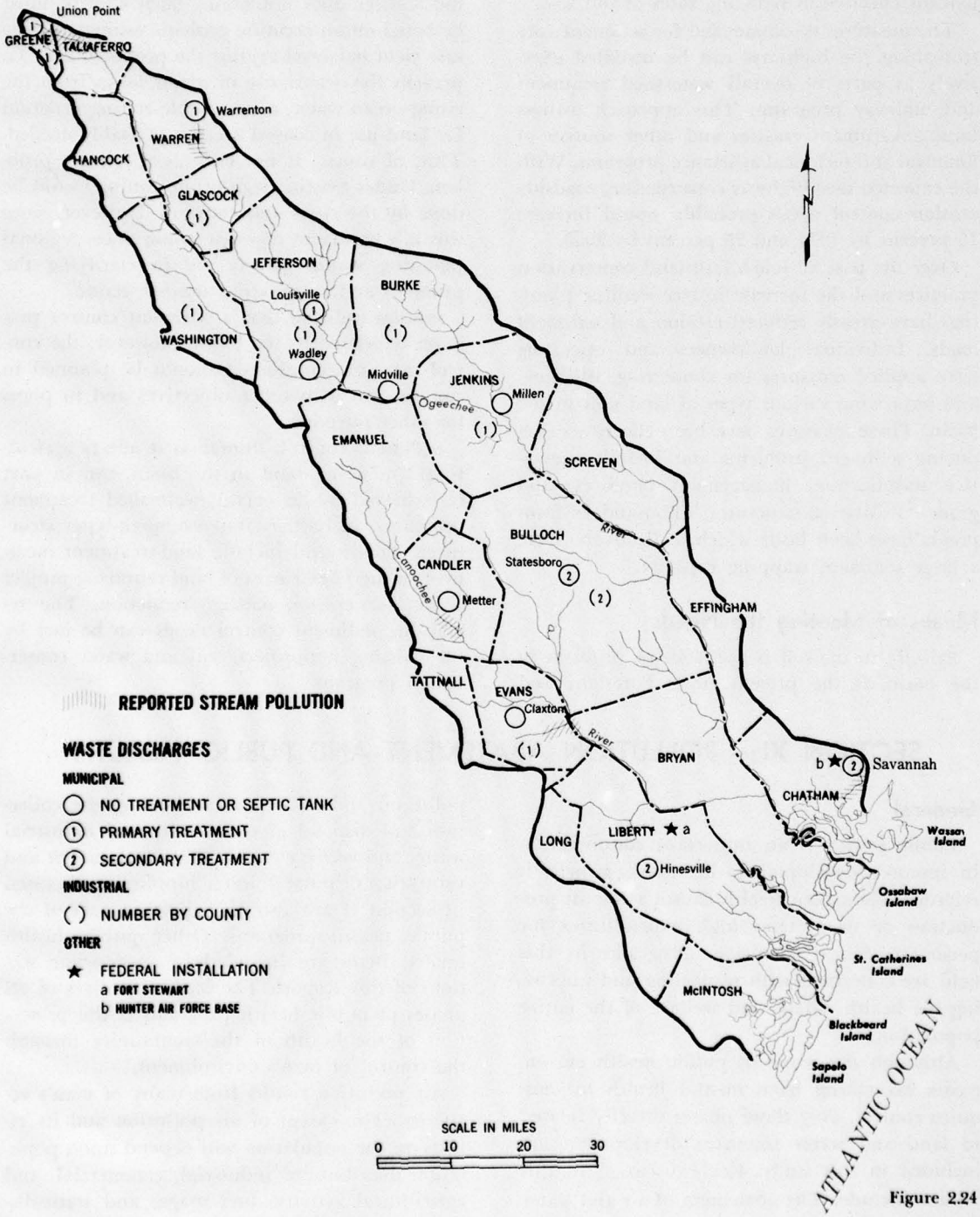


Figure 2.24

posal practices. Meteorological factors, 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. While there are no major air pollution problems originating within the basin, the area should be included in an overall air pollution program which is essential for the protection of the surrounding atmosphere of the Southeast River Basins area.

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 the water-pollution control program is to prevent waste loading that exceeds the assimilating capacity of the receiving streams so that water of suitable quality may be available for reuse.

Solid municipal and industrial waste requires land for disposal. The proper disposal of such material can provide for land reclamation and reduce the leaching of materials which could detrimentally affect the quality of the water.

Background levels of radiation should be determined for the basin. Continued radiological monitoring would then 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 are not only a nuisance but also may carry disease. Land and water management practices are an essential part of a vector control program.

An adequate, coordinated, public health program is essential for full development of the land and water resources of the basin.

Existing Facilities and Programs

Pollution Abatement

In general, the basin is relatively free from pollution problems. However, some problems do exist where waste discharges exceed the assimilative capacity of the receiving stream. In cases where it would be difficult to provide adequate dilution water, tertiary treatment of the waste may be required.

The Piedmont and upper part of the Ogeechee basin have shallow top soils. The streams of these areas become turbid but carry relatively light loads of silt during heavy runoff. In the lower part of the basin, both the main river and its tributaries have wide swampy flood plains. These swampy areas tend to keep the turbidity in the streams low but contribute a typical brown stain and slightly change the physical and chemical quality of the water. After extended periods of drought, heavy runoff from the swamps may create some pollution problems. During normal flow conditions, the swamps provide a rather effective barrier against contamination resulting from the manmade pollution carried by surface runoff.

The city of Warrenton and some of the industrial plants of the basin augment their ground water supplies from surface water sources. Since most of the water supplies of the basin are obtained from ground water sources, the discharge of municipal and industrial waste tends to augment the flow of the receiving stream. Estimates of volumes of waste discharged are based on water use. There were no facilities for accurately measuring waste flows. Data obtained for the inventory include waste loadings from Fort Stewart and Hunter Air Force Base and from part of the city of Savannah discharging waste into the Little Ogeechee River system.

In addition to Savannah, 10 other urban areas and 2 Federal installations in the basin have municipal sewerage systems. The 1960 population for these urban centers totaled approximately 94,000. This included 10,000 persons stationed at the two Federal installations and approximately 55,000 living in the Savannah metropolitan area. About 64,400 persons were served by municipal sewerage systems in 1960.

Sewage-treatment facilities were included in 8 of the 13 sewerage systems. The equivalent of both primary and secondary treatment was provided for 6.5 million gallons of sewage daily. Three million gallons per day of these effluents were chlorinated before discharge. Primary treatment was provided for an estimated 350,000

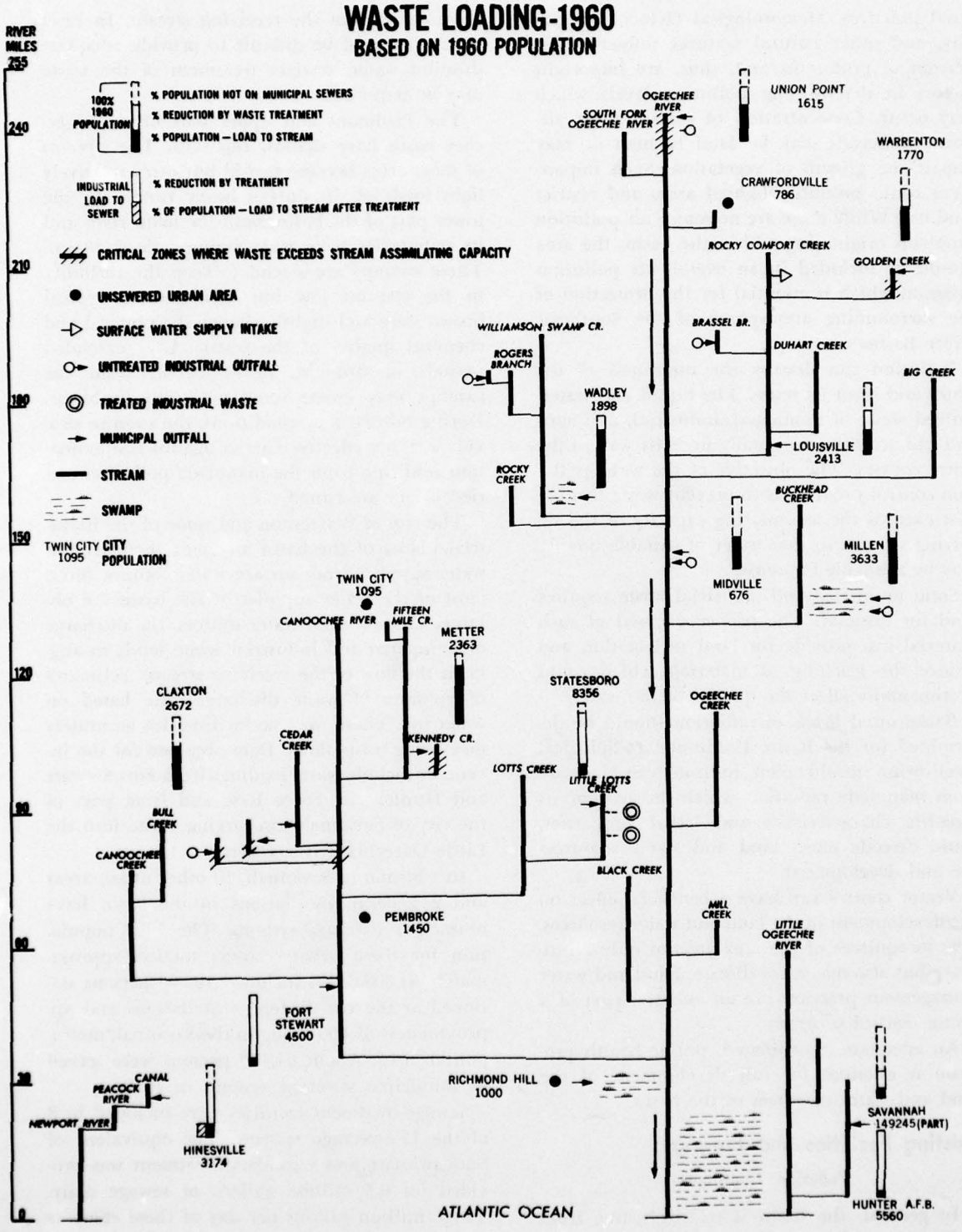

WASTE LOADING-1960
BASED ON 1960 POPULATION
RIVER MILES
255
240
210
180
150
120
90
60
30
0
100% 1960 POPULATION
% POPULATION NOT ON MUNICIPAL SEWERS
% REDUCTION BY WASTE TREATMENT
% POPULATION — LOAD TO STREAM
INDUSTRIAL LOAD TO SEWER
% REDUCTION BY TREATMENT
% OF POPULATION — LOAD TO STREAM AFTER TREATMENT
CRITICAL ZONES WHERE WASTE EXCEEDS STREAM ASSIMILATING CAPACITY
UNSEWERED URBAN AREA
SURFACE WATER SUPPLY INTAKE
UNTREATED INDUSTRIAL OUTFALL
TREATED INDUSTRIAL WASTE
MUNICIPAL OUTFALL
STREAM
SWAMP
TWIN CITY 1095 CITY POPULATION
OGEECHEE RIVER
SOUTH FORK OGEECHEE RIVER
UNION POINT 1615
WARRENTON 1770
CRAWFORDVILLE 786
ROCKY COMFORT CREEK
GOLDEN CREEK
WILLIAMSON SWAMP CR.
ROGERS BRANCH
BRASSEL BR.
DUHART CREEK
BIG CREEK
WADLEY 1898
LOUISVILLE 2413
ROCKY CREEK
BUCKHEAD CREEK
MILLEN 3633
MIDVILLE 676
TWIN CITY 1095
CANOOCHEE RIVER
FIFTEEN MILE CR.
METTER 2363
CLAXTON 2672
STATESBORO 8356
OGEECHEE CREEK
CEDAR CREEK
KENNEDY CR.
LOTTS CREEK
LITTLE LOTTS CREEK
BULL CREEK
CANOOCHEE CREEK
BLACK CREEK
PEMBROKE 1450
MILL CREEK
LITTLE OGEECHEE RIVER
FORT STEWART 4500
CANAL
PEACOCK RIVER
NEWPORT RIVER
HINESVILLE 3174
RICHMOND HILL 1000
SAVANNAH 149245(PART)
HUNTER A.F.B. 5560
ATLANTIC OCEAN

Figure 2.25

TABLE 2.10

Sources of Municipal Pollution

Municipality	Population		Treatment			Receiving stream
	1960	Served	Type[1]	Design capacity PE (1,000)	Waste load PE[2] (1,000)	Load to stream
Union Point	1,615	1,200	(1)	2.0	1.2	North Fork, Ogeechee; Effluent clear; PE 600
Warrenton	1,770	1,200	(1)	3.0	1.2	Golden Creek; Effluent turbid; PE 800
Louisville	2,413	1,500	(1)	4.0	1.6	Rocky Comfort Creek; Effluent clear; PE 800
Wadley	1,898	1,500	none	----	1.5	Swamp (4.5 miles to river); PE 1,500
Midville	676	300	none	----	0.3	Ogeechee River; PE 300
Millen	3,633	2,400	none	----	3.0	Swamp to creek; Effluent colored; PE 3,000
Metter	2,363	2,000	(0)	0.6	2.0	Kennedy Branch; Effluent gray; PE 2,000
Claxton	2,672	1,800	(0)	----	1.8	Branch of Canoochee; Effluent gray; PE 1,800
Statesboro	8,356	8,000	(2)	10.0	8.0	Little Lotts Creek; Effluent clear; PE 800
Hinesville	3,174	2,400	(2)	5.0	3.0	Peacock River; Effluent clear; PE 300
Savannah[3]	149,245	32,000	(2)	25.0	30.0	Cassey Canal;
			(3)	2.8	2.0	Vernon River; Effluents clear; PE 3,200
Federal installations						
Fort Stewart		4,500	(2)	50.0	5.0	Canoochee River;
			(3)	0.5	0.5	Effluent clear; PE 500
Hunter Air Force Base		5,560	(2)	7.5	5.6	Little Ogeechee River; Effluent clear; PE 560

NOTES:
[1] (0) Septic tank serving a part of the population; (1) Primary treatment; (2) Secondary treatment; (3) Stabilization ponds.
[2] Includes some industrial wastes; volumes and strength of combined wastes are estimated: PE = population equivalent, based on pollutional effect of waste. The PE shown is the estimated theoretical loading on the streams, based on the degree of treatment.
[3] Only 55,105 are located in the Ogeechee basin.

gallons of sewage daily and half of this flow was chlorinated after treatment and before discharge to the streams. The remaining 1 million gallons of sewage discharged from the sewage systems received no treatment before discharge. Of this amount, approximately 0.6 million gallons were discharged into swamps which provided some retention and natural purification before the wastes reached the main drainage system.

Four urban areas, with 1960 populations of 800 or more, were classed as unsewered urban areas. Some of the wastes were handled by individual septic tanks. This method of waste disposal, which is not recommended, is also used by some of the people living in the sewered communities who have no connection to the municipal systems.

The type of wastes and the treatment provided by nine industrial plants inventoried in 1960 are listed in Table 2.11. Three of the food-canning plants operate on a seasonal basis processing fresh produce. These plants provide only

TABLE 2.11

Industrial Pollution Discharged to Streams*—1960

Industry		Volume of waste (m.g.d.)	PE or type of waste	Type of treatment	Receiving stream
Type	Number of plants				
Food	8	0.050	4,100	Grassland filter	None
		0.040	3,360	Screening	Brassel Branch (3-month operation)
		0.120	8,000	Screening	Rogers Branch (6-month operation)
		0.085	3,060	Traps	Branch to Canoochee River
		0.001	45	Septic tank	Branch to Ogeechee River
		0.008	360	None	Swamp to Ogeechee River
		0.003	580	Pond	Cedar Creek
		0.025	(organic)	Screening	Ogeechee River (4-month operation)
Textile	1	0.095	(dye process)	None	North Fork, Ogeechee River

* Industries discharging to land surface or water course.
m.g.d. = million gallons per day.
PE = population equivalent.

screening for their wastes. The liquid waste from one meat-packing plant is disposed of on a grassland filter. The wastes are sprayed onto pastureland through a portable irrigation system. The grassland filter area is used for pasturing cattle. There is little or no runoff from the area, and the growth of Bermuda grass provides excellent pasture.

A metal industry is not listed in the table because its limited waste is discharged through a septic tank into a tile field. These wastes are all absorbed into the ground, and none reach the surface water drainage system. Other industries of the basin provide little or no treatment for their wastes.

Streamflow at some of the points of discharge are inadequate to provide effective dilution. Where the waste load discharged to the receiving stream exceeded the assimilating capacity, unsatisfactory conditions existed in 1960.

Vector Control

The coastal area of the Ogeechee basin has extensive tidal marshlands and, consequently, a serious problem from biting insects. These insects annoy residents and visitors to recreational areas. The salt-marsh mosquitoes are the most formidable pests of the group. At times, these pests swarm in such numbers that outdoor activities during the day or night are almost intolerable. Large broods frequently occur after unusually high tides or heavy rains. Each coastal county is estimated to have about 10,000 acres of mosquito-breeding salt-marsh areas.

Fresh-water swamps, marshes, and low-lying areas that receive floodwater also permit mosquitoes to breed. Each coastal county is estimated to have about 5,000 acres of these mosquito-breeding areas.

Raw or inadequately treated sewage that is discharged into stagnant drainage canals and swamps has created Culex mosquito-breeding areas near many communities. In about 25 percent of the towns studied, overflowing septic tanks have created ideal places for mosquito breeding.

Other mosquito-breeding areas include ponding of flow from coastal artesian wells, dredge-spoil areas near Savannah, and clogged drainage ditches, ponds, and creeks. Mosquito breeding in farm ponds and in applied irrigation water has not been a problem because of operation and construction methods.

Current mosquito-control programs are carried out administratively through mosquito-control districts, military-base programs, and several municipal programs. The operations involve drainage and chemical control of larvae and adult mosquitoes. Chemicals are applied from the air and the ground. The Chatham County

Mosquito Control Commission has pioneered the use of a new pelletized paris-green larvicide which is excellent for mosquito control. No toxic effect on crops, fish, wildlife, or cattle has been noted. Properly managed mosquito-control programs can enhance fish productivity and not adversely affect wildlife. Annual expenditures for mosquito control in the basin in 1960 were approximately as follows:

Control districts	$140,000
Military bases	65,000
Municipalities	9,000

Solid Waste Disposal

Fort Stewart, Savannah, and Statesboro were using sanitary landfill in 1960 for the disposal of their refuse and solid waste. Hunter Air Force Base was using a modified sanitary landfill. Claxton and Twin Cities were using open dumps but had plans under way to provide sanitary landfills. All the other communities of the basin were utilizing open dumps for the disposal of solid wastes. Solid wastes from food-processing industries of the basin were also disposed of on open dumps.

Air Pollution Monitoring

The basin area was included in a statewide survey of air pollution conditions. As of 1960, there was no definite program for air pollution monitoring in the basin.

Radiological Monitoring

There were no specific facilities or programs for radiological monitoring limited to the basin.

Needs and Opportunities

Pollution Abatement

Surface water of a quality that is suitable for reuse should be maintained throughout the basin. All industrial and municipal wastes could be adequately treated prior to discharge so that the resulting waste loading would not exceed the assimilative capacity of the receiving stream. The type of treatment required would depend upon the waste to be treated. A separate determination would be needed for each case.

The average minimum 7-day consecutive low flow expected once in 10 years has been determined and used in estimating the degree of treatment needed to prevent overloading the assimilative capacity of the streams. Where critical streamflows are not adequate to provide proper dilution of the effluent of the secondary treatment plants, either release of additional dilution water would need to be provided from water-storage structures built for such a purpose or a higher degree of treatment would be necessary to adjust the waste loading to the minimum streamflow condition.

In estimating municipal sewerage needs, all towns with a population of over 800 have been included. Also included are small towns which had sewerage systems in 1960. A minimum of primary treatment or its equivalent has been considered necessary for proper handling of all wastes. Secondary treatment with chlorination has been added wherever the assimilative capacity of the stream is inadequate to handle the effluent from a primary treatment plant.

Vector Control

Vector problems and control efforts in the basin may be subdivided into two segments—urban and rural. Most towns which have vector-control programs are primarily concerned with the control of mosquitoes and secondarily, with flies, rats, and other vectors. In the rural areas, vector problems are mostly associated with the activities of the individual farmer. Exceptions to the latter occur in the mosquito-control work in Chatham County, Georgia, and countywide rodent-control programs in Bulloch and Emanuel Counties.

About 30 percent of the homes in the urban areas do not meet minimum sanitation standards and thus have many associated fly, rat, and mosquito problems. The city of Savannah has a minimum housing program centered in the health department. Approximately 10 percent of the estimated 13,000 substandard housing units have been brought up to standard in 3 years of program operation. An additional 279 housing units were razed and 18 vacated.

Fly and rat vector problems in several of the towns are caused by inadequate storage and disposal of refuse and the keeping of farm animals in towns. Most towns have open dumps for refuse disposal. About 75 percent of the towns studied still have large numbers of animals and poultry.

Rodent problems appear to be increasing in

many of the rural areas where there are deficiencies in environmental sanitation and where there are no organized countywide control programs.

Inadequacies of general drainage construction and maintenance are conducive to mosquito breeding in the basin. This is especially true where suburban housing subdivisions are intermingled with farming land. Many small creeks, canals, and drainage ditches receive little or no maintenance. Frequently, farmers or towns cannot construct effective drainage ditches because of the lack of or the clogging of large drainage canals.

Establishment of mosquito-control districts in McIntosh, Liberty, and Bryan Counties is needed. Such a system of contiguous mosquito-control districts will be needed to efficiently and economically control salt-marsh mosquitoes and other vectors in the coastal salt-marsh areas. Major inadequacies of present drainage works are the lack of coordination between county governments, towns, and individual farmers and the general lack of maintenance measures.

Solid Waste Disposal

Sanitary landfills are the best method of waste disposal for any community having adequate land available within reasonable hauling distances. It is an effective and proven method accepted by the State Department of Public Health. The solid waste to be disposed of averages about 1 cubic yard or 650 pounds per person per year. To dispose of these wastes by sanitary landfill method requires about 1 acre per 10,000 persons per year. Cost for the land, collection, and proper disposal of these wastes varies inversely with the size of the town and ranges from $4.50 to $1.50 per person per year.

Low marshy areas can be utilized for landfill operations, and additional benefits will result from the elimination of mosquito-breeding areas. This method of disposal also affords an opportunity to reclaim land for other beneficial uses.

The adoption of sanitary landfill methods for solid-waste disposal could effectively reduce the breeding of flies and rats. When the garbage and trash are efficiently collected and properly disposed of, the appearance of the municipality would be greatly improved.

Air Pollution Monitoring

The Ogeechee basin is relatively free of air pollution problems. The only problems of significance are created by the kaolin mills in the Sandersville area and the papermills in the Savannah area adjacent to the basin.

The Sandersville area, on the edge of the basin west of Louisville, produces about three-fourths of the Nation's supply of kaolin. At periodic intervals, the dust from the mills creates a nuisance to nearby residents. There has been no active control for air pollution in the State. Each complaint received by the Georgia Department of Public Health has been investigated. Solutions to the problem have been discussed on an individual basis.

It appears that industrial development and municipal growth in the basin will introduce no major air pollution problems by the year 2000. Minor problems will continue to be handled satisfactorily by the State Health Department.

A 12- to 18-month statewide study of air pollution by the State Health Department and the U. S. Public Heath Service was inaugurated in January 1961. The State of Georgia is obtaining the factual data needed to establish a statewide air pollution control program.

Radiological Monitoring

There are no known uses of radioactive isotopes in the Ogeechee basin. Therefore, it may

TABLE 2.12

Municipal Sewerage Needs

Prior to	Population served	Number of places requiring:*		
		Primary treatment	Secondary treatment	Sewer—new or extensions
1975	136,000	0	12	16
2000	230,000	0	14	20

* Does not include Fort Stewart and Hunter Air Force Base.

be concluded that no radiological health problems occur from local sources. There are no data on radiation levels of air, water, or soil in the basin; but it is assumed that these levels are similar to those in adjacent areas for which data are available. From such data, it can be concluded that radiation levels are well below a point where concern need be expressed over their effect on land and water resources development.

Means of Meeting the Needs

Pollution Abatement

The population served by municipal sewerage systems is expected to increase to 136,000 people by 1975. Nineteen municipalities would need secondary treatment plants and new or additions to existing sewer systems to properly handle the increased liquid municipal wastes.

By the year 2000, it is expected that 230,000 persons will be served by the municipal sewerage systems. Provision of adequate facilities for handling the wastes would require the construction of new and enlarged secondary treatment plants and the extension of sewer systems. Table 2.12 entitled Municipal Sewerage Needs lists the need by population classification and summarizes the facilities needed.

Of the industries existing in 1960, the six which provided little or no treatment of their wastes should construct, prior to 1975, waste-treatment facilities designed specifically for the waste to be handled. The degree of treatment should be adequate to maintain the quality of the water suitable for reuse in the receiving streams. Waste-treatment facilities could also be installed for all new plants that are established. Prior to the year 2000, all industrial waste-treatment facilities may need to be enlarged.

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. All costs of construction and maintenance and operation should be equitably shared by industry and city.

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 would 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 benefits derived from such programs would permit the reuse of the water for other beneficial purposes such as water supply, fishing, and recreation. Clean streams would provide many other benefits which cannot be measured in dollars.

Figure 2.26 *Properly Designed Oxidation Ponds Have Proved Successful in Many Areas for Controlling Pollution.*

The polluter should assume his responsibility for providing waste treatment. The degree of treatment to be provided would be based on the volume and 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 would 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 would 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 would help municipalities and industries to recognize their responsibility and to finance necessary sewers and treatment works. Existing legislation needs to be implemented to insure the collection of good basic data. Funds could be budgeted for adequate staff and equipment to assure the development of a sound water resources program for the State.

Vector Control

The expansion of existing and the establishment of new programs could effectively be coordinated into areawide programs to minimize the cost and increase the effectiveness of vector control. Statewide legislation is needed to permit the establishment and financing of districts. The adequate financing of mosquito-abatement districts would probably require State aid that includes funds, drainage practices, supplies, services, and equipment. Such aid has proved very successful in Florida.

Solid Waste Disposal

The existing sanitary landfills could be continued and the operation increased to provide for growth of the communities. Nineteen additional sanitary landfills could be started prior to 1975. Solid wastes from industrial operations could be incorporated into the sanitary landfills. A total of 24 sanitary landfills could be in operation prior to the year 2000, handling all of the solid waste of the basin. Some of the communities may need to revise or adopt sanitary regulations to enable them to participate in an effective sanitary landfill program.

Air Pollution Monitoring

Air pollution is now a minor factor and is expected to remain so in the land and water resources development of the basin. No attempt has been made to establish needs or a suggested course of action for the basin. The basin should be included in a statewide control program.

Radiological Monitoring

There is need for radiological health surveillance in the Ogeechee basin. This could be accomplished as part of an expanded State Health Department Program in radiological health.

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

General

Preserving and restoring 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 Golden Isles fronting Georgia's Atlantic coast is one of the State's greatest undeveloped resources. The five important islands of the chain which lie partly or wholly within the boundaries of the Ogeechee basin are Wassaw, Ossabaw, St. Catherines, Blackbeard, and Sapelo. All the islands have desirable seashore recreational areas. In addition, they have a rich historical heritage. The islands coastlines that are exposed to the direct action of the sea have a total length of about 45 miles.

The islands are low and generally have firm land elevations near the shore of 10 to 14 feet above mean low water. Slightly higher elevations occur in the central areas. The ocean sides have trees and sandy beaches, and shrubbery covers most of the firm land. The lowlands to the rear are covered with marsh grass. Each island in the chain is similar in shape to the rest, and each has an axis of elongation parallel to the mainland.

The gently sloping beaches on the coastal islands are generally wide and consist of fine and medium-size quartz sand. The mean range of tides on the Georgia coast is approximately 7 feet. This is higher than the tides farther north or south. Tidal currents tend to scour and deepen existing channels and occasionally create new channels through the salt marshes. The strong ebb and flow of the tide interferes with the continuous barrier building of currents paralleling the shore. The effect of the tide is not limited to the salt-water areas. As the sea surface rises, it backs up the fresh-water flow in the streams for 10 to 20 miles beyond the reach of salt water. This causes the fresh-water zones of the streams to overflow and greatly expand the fresh-water swamps. This method of flooding, modified by artificial control, was a great economic factor when the sea islands and the ad-

HURRICANE PATHS
BEACH EROSION AND ACCRETION

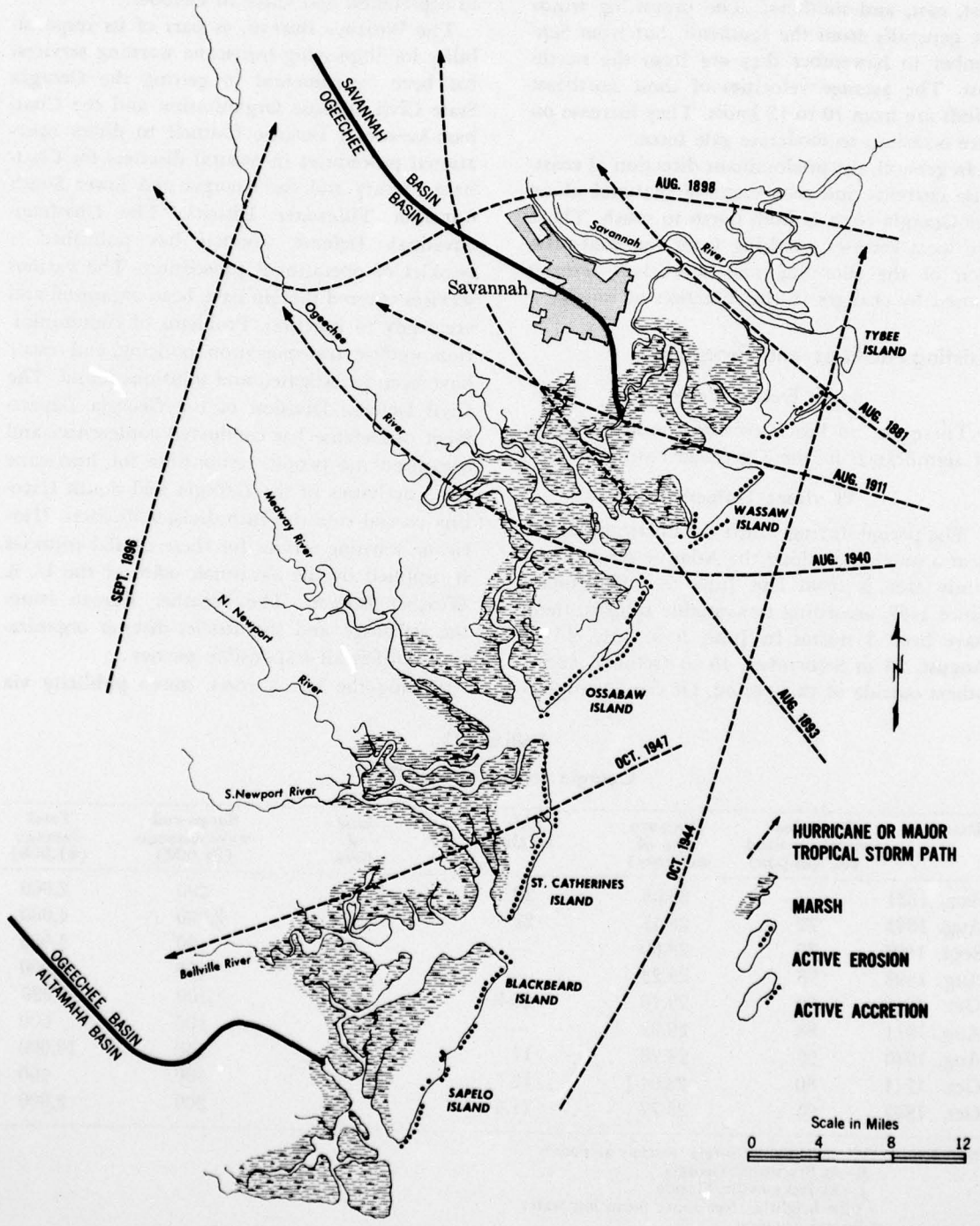


Figure 2.27

jacent mainland were the leading rice fields of the United States.

The shorelines of the islands are exposed to the maximum effects of winds from the northeast, east, and southeast. The prevailing winds are generally from the southeast, but from September to November they are from the northeast. The average velocities of these northeast winds are from 10 to 12 knots. They increase on rare occasions to moderate gale force.

In general, the predominant direction of coastwise currents and movement of material along the Georgia coast is from north to south. There are local reverses resulting from the configuration of the shoreline and short-time reverses caused by changes in the direction of waves.

Existing Facilities and Programs

Beach Erosion Control

There are no beach erosion control facilities of significance in the Ogeechee basin.

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 tropical 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 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 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

TABLE 2.13

Georgia Tropical Storm Data[1]

Date	Recorded maximum wind vel. (m.p.h.)	Pressure (in. 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

press, radio, and television has been disseminated in Chatham County 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 each 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 of recreation and for construction of homes. In isolated areas, shoreline modifications by erosion and accretion have important effects on the associated animal and plant life. For example, the lagoons that are cut off from salt water by the formation of barrier beaches become diluted with fresh water and frequently decrease in salinity. When this occurs, plant growth changes from that characteristic of salt water to that of fresh water. This change may be economically significant to the shellfish industry and physically significant to wildlife.

The history of the erosion and accretion of the shoreline can often be read in the pattern of the beach ridges. The most recent story of the changes is available on maps and charts covering the last hundred years. Some movement of the shore has occurred on all the islands.

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 once in 300 years. The chance of its striking at or near the high-tide cycle at any one locality is about once in 900 years.

The population increase now occurring will no doubt create a demand for accelerated development of the coastal areas of the Ogeechee basin. The sea islands are subject to direct assault by hurricane wind, waves, and tidal surge. The best way to prevent the loss of human lives on these islands during a severe hurricane is to evacuate the population to safe shelters on the mainland. As the 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. Such an announcement is issued by the U. S. Weather Bureau via the press, radio, and television as a matter of public interest when a tropical storm or hurricane becomes a threat to a coastal area. The purpose of the Hurricane Watch announcement is to alert individuals in an area to the fact 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.

A model community hurricane preparedness plan has been prepared by the Weather Bureau in collaboration with the Corps of Engineers. The plan has been issued 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 can be used as a guide in setting up a hurricane preparedness committee, appraising potential danger, taking precautionary measures, preparing for emergency procedures, and in detailed planning.

Means of Meeting the Needs

Beach Erosion Control

Beach erosion protection can be accomplished by adding sand artificially, possibly augmenting this with 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 vegetative 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 materials.

The Federal Government, through the Corps of Engineers, 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 provided for the erosion problems of the Ogeechee basin beaches without such a study. Detailed studies were considered beyond the scope of the Commission studies.

The recent advent of Federal assistance in hurricane protection has posed new problems in the development of coastal engineering criteria and has stimulated further research activity. There is a trend toward multiple-purpose planning in solving coastal problems. This involves coordinating stabilization, navigation inlet channel improvement and maintenance, and hurricane protection. Coordinated projects of this type are likely to develop in the future along the Atlantic shores where barrier beaches are prevalent.

Hurricane Protection

Individual recognition of the possible hazards is the most effective protection against hurricane damage. Structures should be located and built in order to minimize the possibility of damage. During the hurricane season — June through October — persons in exposed places should be alert to the weather announcements of the press, radio, and television.

Plans for developing the sea islands into concentrated residential or resort areas should consider:

(1) Adequate hurricane warning systems and evacuation routes.

(2) Adopting and enforcing building codes that forbid construction of buildings in low areas subject to flooding.

(3) Protecting sewage disposal facilities from flooding.

(4) Providing auxiliary power supplies.

(5) Constructing protective seawalls or similar structures to reduce the danger of damage from high waves.

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 Ogeechee 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 Ogeechee basin plan, and adjustments were made to permit optimum interbasin resource uses.

Throughout the planning process, many factors such as those associated with geology, hydrology, engineering practices, and social characteristics were 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 projects and programs 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 Ogeechee 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, consumption, 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 will 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 Ogeechee basin. It was recognized in the study that the economy of the Ogeechee basin is an integral part of the regional and national economies.

National and Regional Viewpoints

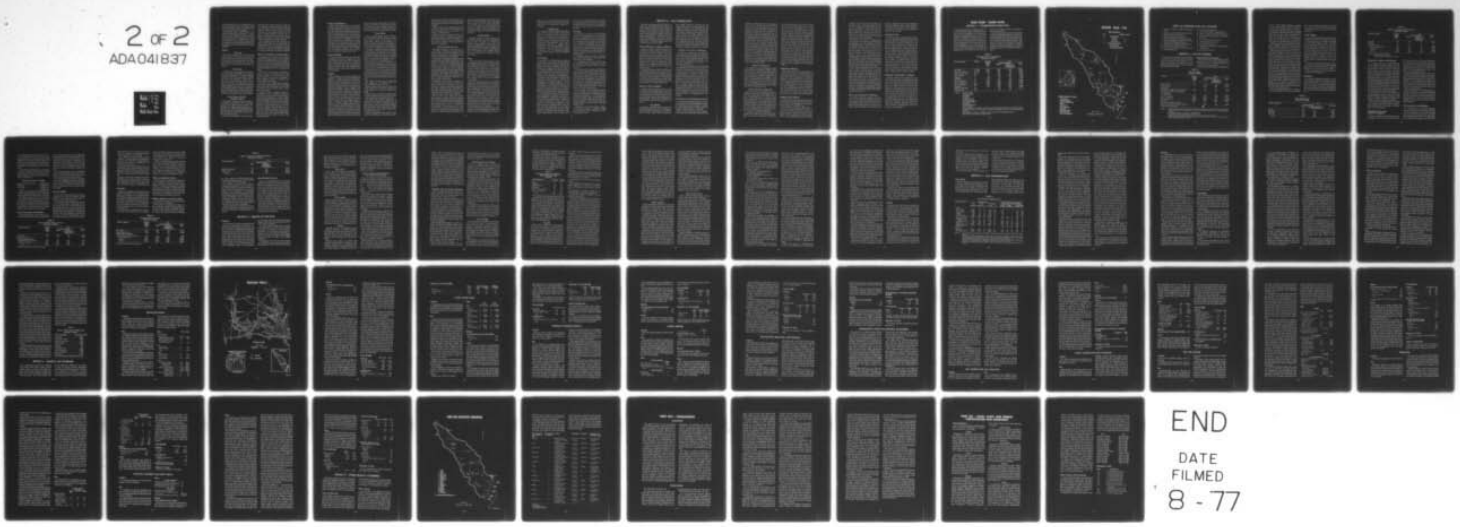
Because of the widespread effects of land and water resource development, a responsibility falls on all levels of government and on the private economy to participate in resource planning and in the execution of resource programs.

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

AD-A041 837 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)
1963

UNCLASSIFIED NL

2 OF 2
ADA041837



END

DATE
FILMED
8 - 77

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 Ogeechee 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 on 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 are 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 directly 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 projects or programs 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 of 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 is 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.

Justification of 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.

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 from the commercial fishery program are the estimated value of increased landings of commercial fish.

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

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

The benefits from 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 from 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.

Primary benefits from navigation projects that would have a direct effect on the Ogeechee basin have been assigned to projects included in Appendix 1, Savannah Basin.

Programs for vector control, solid waste collection and disposal, air pollution and radiological monitoring, and pollution abatement, except dilution storage, were not evaluated in monetary terms but were considered justified on the basis of intangibles.

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 services to sustain the processing operation. These increased activities would extend throughout the basin. Trades 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 12 out of a total of 21 counties either wholly or partially within the Ogeechee 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 were so designated because of varying reasons such as low income and persistent and substantial unemployment or underemployment. Execution of the plan for the Ogeechee 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 and resources.

Intangible Benefits

Intangible 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 value. 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. 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.

Capital 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. The procedures used are summarized in Appendix 9, Economics.

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 differences "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 additional studies 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 provision 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 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 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.

A problem repeatedly encountered in the studies was the lack of basic data. Topographic maps with a contour interval of 10 feet or less are available for about 65 percent of the basin. Many of the areas have maps with a contour interval of 50 feet. Hydrologic data are available, on at least a short-term basis, at 4 main stream points only. Practically no data are available for tributaries. Ground water information is meager and little data exist regarding 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 the 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 effort to collect basic data. However, more competition for resource use is beginning to arise, and selection between uses will be increasingly important as the demands increase. Adequate basic data are essential to making proper selections, so steps need to be taken promptly to insure that the information will be available when it is critically 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 than in those cases where the purpose would be included, with perhaps major modifications in a multiple-purpose development.

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 Ogeechee 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 interests 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 meeting 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 detail concerning the nature of the alternatives considered and the reasons for their acceptance or rejection in the final plan are 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, rather than being allocated exclusively to the basin within which the center lies. 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 Ogeechee 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 comprehensive and coordinated 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 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.

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.

TABLE 4.1

Comprehensive Plan for Development
(thousands of dollars)

Project or program	Purpose[1]	Benefits	Costs		
		Annual equivalent[2]	Annual equivalent		Investment
			Total	Operation, maintenance, and replacements	
Groveland	R, F&W	5,140	1,553	643	26,710
Water-access areas	R, F&W	3,860	997	628	10,200
Upstream watersheds	FC, D	274	136	26	3,037
Water supplies	WS	[3]	1,410	987	16,770
Irrigation	I	893	513	443	1,953
Drainage[4]	D	874	65	42	619
Soil conservation	SC	1,661	1,244	870	10,340
Forest conservation	F	3,182	1,526	706	34,730
Fish and wildlife[4]	F&W	1,802	1,091	1,070	813
Recreation[4]	R	3,407	2,272	1,303	30,700
Pollution abatement	PA	[5]	757	120	27,250
Public health	PH	[5]	412	412	---

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

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

[3] Benefits are assumed to be at least equal to the cost of the cheapest alternative, but are not assigned monetary values.

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

[5] Justification is based largely on intangible benefits.

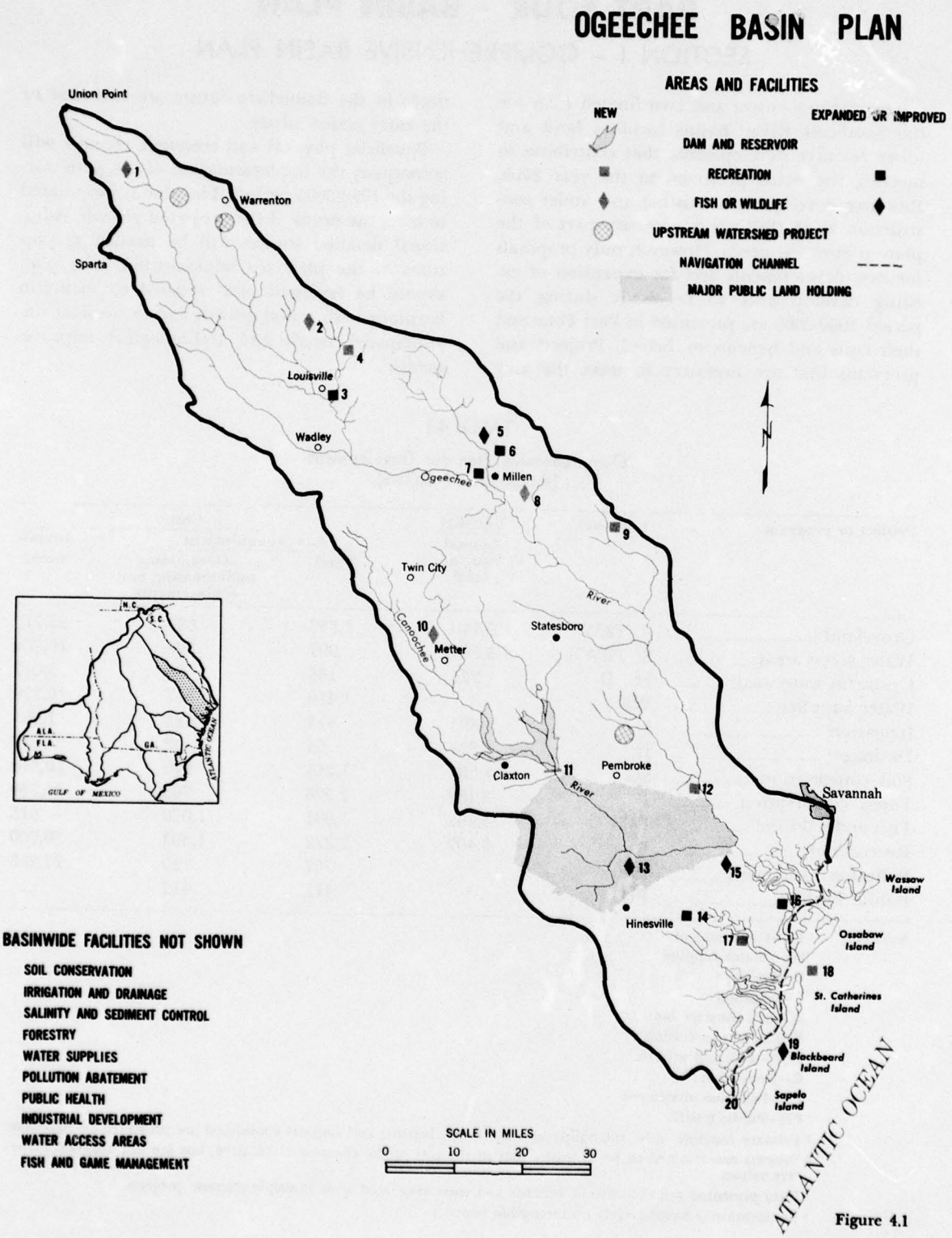

OGEECHEE BASIN PLAN
AREAS AND FACILITIES
NEW
EXPANDED OR IMPROVED
DAM AND RESERVOIR
RECREATION
FISH OR WILDLIFE
UPSTREAM WATERSHED PROJECT
NAVIGATION CHANNEL
MAJOR PUBLIC LAND HOLDING
Union Point
Warrenton
Sparta
Louisville
Wadley
Millen
Ogeechee
Twin City
Statesboro
Ogeechee River
Canoochee
Metter
Claxton
Pembroke
Savannah
Hinesville
Wassaw Island
Ossabaw Island
St. Catherines Island
Blackbeard Island
Sapelo Island
ATLANTIC OCEAN
N
SCALE IN MILES
0 10 20 30
N.C.
S.C.
ALA.
FLA.
GA.
GULF OF MEXICO
ATLANTIC OCEAN
BASINWIDE FACILITIES NOT SHOWN
SOIL CONSERVATION
IRRIGATION AND DRAINAGE
SALINITY AND SEDIMENT CONTROL
FORESTRY
WATER SUPPLIES
POLLUTION ABATEMENT
PUBLIC HEALTH
INDUSTRIAL DEVELOPMENT
WATER ACCESS AREAS
FISH AND GAME MANAGEMENT

Figure 4.1

INDEX TO OGEECHEE BASIN PLAN FEATURES

1 Taliaferro County Wildlife Mangement Area
2 Jefferson County Wildlife Management Area
3 Old Slave Market Historic Site
4 Jefferson County Recreation Area
5 Millen Fish Hatchery and Recreation Area
6 Magnolia Springs State Park Recreation Area
7 Lincoln State Park Recreation Area
8 Jenkins County Wildlife Management Area
9 Screven County Recreation Area
10 Candler County Wildlife Management Area
11 Groveland Reservoir
12 Riverside Recreation Area
13 Fort Stewart Wildlife Management Area
14 Midway Church and Museum Historic Site
15 Richmond Hill Fish Hatchery and Recreation Area
16 Fort McAllister Recreation Area
17 Fort Morris Recreation Area
18 Islands Recreation Area
19 Blackbeard Island Wildlife Refuge and Recreation Area
20 Intracoastal Waterway

SECTION II – PLAN BY PURPOSE

The projects and programs in the comprehensive plan involve costs and benefits associated with several purposes. Items pertinent to each purpose in the proposed developments are summarized and briefly discussed by the purposes listed in Public Law 85-850.

Flood Control and Prevention

Flood control values accruing from the Groveland project, the only large impoundment included in the plan, are incidental to the use of the reservoir for other purposes.

Upstream watershed projects on 278,000 acres

TABLE 4.2

Plan by Purpose
(thousands of dollars)

Purpose	Benefits	Costs		
	Annual equivalent[1]	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Flood control	181	90	17	2,007
Water supplies	[2]	1,410	987	16,770
Navigation	[3]	[3]	[3]	[3]
Reclamation, irrigation, and drainage	1,860	624	494	3,602
Hydroelectric power and industrial development[4]	---	---	---	---
Soil conservation	1,661	1,244	870	10,340
Forest conservation	3,182	1,526	706	34,730
Fish and wildlife	2,022	1,300	1,106	5,623
Recreation	12,187	4,613	2,538	62,800
Salinity and sediment control	[5]	[5]	[5]	[5]
Pollution abatement and public health	[2]	1,169	532	27,250
Other beneficial purposes[6]	---	---	---	---

NOTES:
[1] Primary tangible only; the intangible and secondary benefits and impacts considered are presented in narrative.
[2] Benefits are assumed to be at least equal to the cost of the cheapest alternative, but are not assigned monetary values.
[3] Improvements included in Appendix 1, Savannah Basin.
[4] No specific proposals in plan—narrative discussion only.
[5] Included with upstream watershed projects, soil conservation, and forest conservation.
[6] Includes beach erosion control and hurricane protection; additional studies necessary but no specific development program is included in the plan.

of land would include floodwater retarding structures, channel improvements, land stabilization, and land treatment measures. These features would provide flood prevention, drainage in combination with flood prevention, watershed protection, and water resource development for other purposes. The flood forecasting system would be continued and flood plain management would be considered prior to possible future location of improvements in the flood plains.

Drainage is discussed under heading of Reclamation, Irrigation, and Drainage. Land stabilization and land treatment are discussed under heading of Soil Conservation and Utilization.

The forecasting of streamflow is essential in the proper managment of water resources. Flood forecasting is well known for reservoir operation and for warnings in areas unprotected by physical control of floodwaters. Future use and regulation of streams will require forecasts of flow, either high or low, as far in advance as is practicable. In general, all river-related purposes such as recreational boating and fishing, navigation, hydropower operation, water supplies, 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 would be available. These benefits are not achieved automatically. A planned program which recognizes the necessary lead time for development of reporting network and other facilities is required.

The annual equivalent benefits are estimated to be about $180,800. The annual equivalent costs would be $89,500 including some $17,000 for operation, maintenance, and replacements. The investment costs are estimated to be about $2,007,000.

Water Supplies

The water supplies program includes improved and additional supplies for domestic, municipal, 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. It would serve about 31,000 people and would provide about 3.1 million gallons of water per day. The municipal water supply program includes source improvement, treatment, elevated storage, and enlarged distribution systems. It would serve 237,000 people in 27 communities and would provide about 47.3 million gallons of water per day.

The industrial water supply program includes new wells and expansion of municipal distribution systems. It would provide about 7.0 million gallons of water per day by the year 2000.

Benefits are assumed to be at least equal to the cost of the cheapest alternative.

Navigation

The Corps of Engineers maintains the Intracoastal Waterway and associated channels. Navigation improvements in the Ogeechee basin consist of a narrow cut in the Intracoastal Waterway in the vicinity of Savannah. This improvement has been included with works proposed in the Savannah basin and is discussed in Appendix 1.

TABLE 4.3

Water Supplies Costs
(thousands of dollars)

Project or program	Costs		
	Annual equivalent		Investment
	Total	Operation, maintenance, and replacements	
Domestic	175	31	4,800
Municipal	1,171	894	11,890
Industrial	64	62	80
Total	1,410	987	16,770

TABLE 4.4

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	[1]893	[2]513	[2]443	[2]1,953
Drainage				
Individual farm	[1]874	[2]65	[2]42	[2]619
Upstream watersheds[3]	93	46	9	1,030
Subtotal	967	111	51	1,649
Total	1,860	624	494	3,602

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

Reclamation, Irrigation, and Drainage

It is estimated that about 14,000 additional acres of cropland would be irrigated by individual sprinkler systems on individual farms by the year 2000. Principal crops to be irrigated include tobacco, cotton, orchards, truck, and other specialty crops. Water supply requirements would be provided by farm ponds, individual wells, and streams. It is estimated that some 39,500 additional acres of cropland and pastureland would 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, truck and other specialty crops, and pasture. 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 278,000 acres of land would include channel improvements which provide for drainage in combination with flood prevention.

Hydroelectric Power and Industrial Development

Features considered for hydroelectric power development were found not economically feasible. The power needs of the basin would continue to be met by sources outside the basin. The distribution system would be expanded as required. By the year 2000, the electric energy requirements of the basin are expected to be about 1.8 billion kilowatt-hours with a demand of some 373,800 kilowatts.

Industrial development would increase in the basin and be enhanced by the resources development plan outlined in this Report. Manufacturing employment projections for the basin show increases in all manufacturing categories by 2000 except textiles and pulp and paper. Most of these increases are small, but fairly substantial increases are projected for apparels, metals, and lumber and wood products.

Capital expenditures for manufacturing expansion are expected to average about $1,740,000 annually in the basin. An annual average of 200 new jobs would be created in manufacturing and approximately 410 new jobs would be forthcoming annually in services, trades, and professional categories.

Soil Conservation and Utilization

It is expected that about 435,000 additional acres of cropland, pasture, and range would be treated by installation of annual and enduring soil conservation measures by the year 2000. These measures would 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 4,100 additional farm ponds would 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 83,600 acres of woodland, pastureland, and other lands would be converted to cropland and that some 116,000 acres of cropland, woodland, and other lands would be converted to pastureland.

Expected Land Use in Year 2000

Cropland and pastureland	869,000 acres
Woodland	2,173,000 acres
Other land	420,000 acres
Total	3,462,000 acres

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

The annual returns to farmers are estimated to be about $1,661,000. The annual equivalent costs exclusive of technical assistance are expected to be $1,244,000 including about $870,000 for operation, maintenance, and replacements. The investment costs, also exclusive of technical assistance, are estimated to be $10,340,000.

Forest Conservation and Utilization

The program for forest conservation and utilization in the plan would include 2,173,000 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 141 million cubic feet and production of about 94,000 barrels of gum-naval stores.

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

The annual equivalent benefits are estimated to be about $3,182,000. The annual equivalent costs are about $1,526,000 including some $706,000 for operation, maintenance, and replacements. The investment costs are estimated to be $34,730,000.

Fish and Wildlife

The fish and wildlife program would extend throughout the basin. The program includes facilities in the multiple-purpose project at Groveland and at water-access areas.

The wildlife program includes improvement of two existing facilities, development of four new management areas, and extensive habitat development. The sport fisheries program includes the preservation and development of the Ogeechee River and tributaries, the renovation and more intensive management of existing and new large and small impoundments, the improvement of present access areas and develop-

TABLE 4.5

Fish and Wildlife Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Groveland*	190	180	18	4,520
Water-access areas*	30	29	18	290
Single-purpose programs				
Sport fisheries and wildlife	607	179	165	596
Commercial fisheries	1,195	912	905	217
Total	2,022	1,300	1,106	5,623

* *Fish and wildlife benefits and allocated costs only.*

ment of new access areas to the rivers and coastal waters, the expansion of existing fish hatcheries, and new separate salt-water facilities.

The commercial fisheries program includes expansion of existing operations, rehabilitation of oyster reefs, cultivation of high-quality seafoods, and acceleration and expansion of existing facilities and activities.

This plan would provide annually by the year 2000, in addition to existing programs and facilities, some 271,000 user-days of hunting, about 883,000 user-days of sport fishing, and produce about 20.4 million pounds of commercial food fish.

Programs and facilities installed in the period 1960-2000 would, by the year 2000, provide for annual increases of 83,000 user-days of hunting, some 375,000 user-days of sport fishing, and about 10.7 million pounds of commercial fish.

Recreation

The recreation program would be basinwide. Included are facilities at the multiple-purpose project at Groveland and at water-access areas. The program includes the expansion and improvement of two existing general outdoor areas, one natural environment area, and four historical and cultural sites; and the development of three new general outdoor areas, one new natural environment area, and one new historic and cultural site.

The proposed and existing facilities included in the plan would provide for the projected need of 10 million user-days by the year 2000. Development of existing and new facilities would accommodate about 3 million user-days on the coastal islands and 7 million at water-access areas, parks, and reservoirs.

Projects and programs for recreation development during the period 1960-2000 would provide for a total of 9,740,000 user-days, including 330,000 user-days from expanded facilities at existing areas and 9,410,000 user-days at new areas. These are in addition to the facilities that were available in 1960 which were considered adequate to accommodate 260,000 user-days.

Salinity and Sediment Control

Neither salinity nor sediment are major problems in the Ogeechee basin, and no specific programs or projects are proposed for their control. However, a sediment control program is needed, but this can be planned in combination with other objectives since there would be incidental control values resulting from upstream watershed projects, soil conservation, and forest conservation programs included in the plan.

Pollution Abatement and Public Health

The pollution abatement and public health programs would be basinwide.

The program for pollution abatement consists of new and extended sewerage systems for 20 communities, secondary treatment facilities at 6 places, and stabilization ponds for 14 places. It would provide adequate facilities for handling

TABLE 4.6

Recreation Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Groveland*	4,950	1,373	625	22,190
Water-access areas*	3,830	968	610	9,910
Single-purpose programs				
Improvement of existing areas	231	63	39	990
New developments	3,176	2,209	1,264	29,710
Subtotal	3,407	2,272	1,303	30,700
Total	12,187	4,613	2,538	62,800

* Recreation benefits and allocated costs only.

TABLE 4.7

Pollution Abatement and Public Health Costs
(thousands of dollars)

Project or program	Costs		
	Annual equivalent		Investment
	Total	Operation, maintenance, and replacements	
Pollution abatement	757	120	27,250
Public health	412	412	minor
Total	1,169	532	27,250

the wastes expected from 230,000 persons served by municipal sewerage systems. Annual benefits are not expressed in monetary terms.

The program for public health consists of drainage and spraying for vector control, sanitary landfill operations at 24 locations for fly and rodent control, and participation in statewide programs for air pollution and radiological monitoring. The public health program is essentially single purpose. 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. The benefits of the public health program are justified on the basis of intangibles.

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

Other Beneficial Purposes

There are no development features in the plan specifically for purposes other than those listed above. It is recognized, however, that there are beach erosion and hurricane damage problems in the basin and these would increase as coastal areas develop. The plan assumes existing hurricane warning systems will continue to be improved and recommendations are made for studies to determine beach erosion control and hurricane protection possibilities. It is also assumed that programs for obtaining topographic and geologic mapping, hydrologic data, data on water quality and water use, information concerning desirable land-use changes, and other basic data on the resources of the area will be continued or even accelerated.

SECTION III – IMPACTS OF THE PLAN

Economic

Land and water resource development creates certain far-reaching benefits not normally considered in project and program justification. This has occurred many times following development of projects such as Buford Dam and Reservoir on the Chattahoochee River which formed Lake Lanier. The primary benefits from power and flood control at Buford Dam provided project justification; however, the benefits of recreation, fish and wildlife, water supply, and the attendant values associated with land enhancement have had a tremendous impact on the immediate areas involved. A great use and value from these projects now relates to those benefits not claimed in the original justification.

The primary tangible benefits that can readily be identified have been used for the monetary evaluation of the projects in this basin plan. The greater use and greater value, however, might very well stem from the unidentified primary benefits and the tangible and intangible secondary benefits not used in the original justification.

Development of the land and water resources in the Ogeechee basin would start economic development that would reach beyond the basin

limits. Such development could affect the entire State of Georgia as well as the entire Southeast River Basins area. Certain impacts can be felt, also, in 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

There is little flood damage in the Ogeechee basin and, therefore, no major flood control projects are proposed. Some of the drainage projects, however, provide flood protection for drained land. The economic impacts from flood control relate largely to land enhancement. Lands that are presently in a flood plain and valuable for pastureland or cropland would be, after project completion, subject to greater utilization, thus increasing in value. Some of these lands are very fertile and there would be benefits from greatly increased cropland production, utilizing the uplands for less intensive purposes such as pastureland and woodland.

Water Supplies

Water availability governs all human activity. Abundant supplies of water often set the stage for rapid economic development. One should not let the 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 much greater than the cost of obtaining it today.

Navigation

Although there are no navigation projects proposed for this basin, the impacts from existing navigation facilities would continue in the Ogeechee basin. These economic impacts stem from the primary benefits of savings in transportation costs to existing traffic and potential traffic.

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 the moving of bulk materials, component parts or finished commodities at low cost. If other factors, such as raw materials, markets, land transportation, power, and suitable sites, are favorable, industrial development could very well be an outgrowth of waterway development and use. It is in this subsequent development that the real economic impacts are found.

Irrigation, Drainage, Flood Prevention and Soil Conservation and Utilization

About one fourth of the basin work force is employed in agriculture and about one fourth of the land area is utilized for the purposes of crop and livestock production. Traditionally, agriculture has been of great economic importance to the basin. Many of the communities, business establishments, financial institutions, and trading habits were founded on the basis of an agricultural economy.

Agriculture would continue to have an impact on the basin economy even though less people would 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. The net income from agriculture should be over $40 million, whereas today it totals approximately $11 million.

By 2000, annual expenditures for agricultural production would exceed $62 million as compared with $35 million in 1960. By 2000, basin farmers would be spending $7 million for feed, $2 million for livestock, $2.7 million for seed, $10 million for fertilizer and lime, $11 million for repairs and maintenance, $7.9 million for labor, 2 million for taxes, $1 million for interest, and $17 million for other purposes. Supporting retail, wholesale, service, and financial activities would be affected greatly by these expenditures.

All of these expenditures would affect trades, services, and financial activities in the communities of the basin. Herein lies the economic impact of the total agricultural program in that it affects the community activities.

Only the portion of the total agricultural program which involves soil conservation and utilization, reclamation, drainage, irrigation, and upstream watershed improvements is included in this basin plan. The benefits, primary and sec-

ondary, from these programs would create a portion of the economic impacts of the total agricultural program. They, like the impacts from other aspects of the agricultural program, would have real and lasting effects on the basin communities. Benefits would accrue through improved efficiencies of farm operations; reduction of turbidity of many streams; prolongation of the useful life of surface reservoirs; some alleviation of flood and sediment damage to roads, bridges, roadfills, livestock, and real and personal property; improved wildlife habitat and recreational facilities; and abatement of stream pollution. They also facilitate proper utilization of agricultural lands by protecting lands from erosion, permitting more intensive utilization, and contribute toward adequate agricultural and nonagricultural water supply for the people of the basin.

Hydroelectric Power and Industrial Development

There are no hydroelectric power projects proposed for installation in the basin. Most of the power needs of the area would continue to be served by sources outside the basin.

Manufacturing employment projections for the basin show increases in all manufacturing categories by 2000, except textiles and pulp and paper. Most of these increases are slight but fairly substantial increases are projected for apparel, metals, and lumber and wood products.

Capital expenditures for manufacturing expansion anticipated in the basin would average about $1.74 million annually. An annual average of 200 new jobs would be created in manufacturing and approximately 410 new jobs would be forthcoming annually in services, trades, and professional categories.

New manufacturing employees and those in supporting industries and trades would buy new homes, cars, furniture, appliances, food, drugs, and services. They would also pay taxes and demand governmental services for their tax dollar. So with economic progress comes demands for community services. This means demand for streets, water, sewerage, and protection. Communities that keep abreast or even ahead of these demands are the communities that are going to realize the fastest growth.

The economic impact of industry does not stop when it reaches the city limits or even the basin boundaries. Its effects are far reaching, with the larger trading centers such as Savannah, Statesboro, and Augusta feeling the greatest results of this activity.

Forest Conservation and Utilization

With over 2 million acres, or 64 percent of the basin, in woodland, forestry and woodland production make a major contribution to the resource base of the Ogeechee basin. This resource provides employment in the harvesting, transporting, and manufacturing of timber products. Gross sales of timber products totaled approximately $7.6 million in 1960.

Employment in manufacturing of timber products would make only small increases by 1975 and 2000 in the basin. A stepped-up woodland production program, however, would provide considerable increases in the harvesting and transporting of timber products. Additional employment would be provided by the protection, reforestation, and management of these more intensively used forest lands. The economic impacts of this increased activity would be reflected in new construction, new wages, retail trade, and increased tax evaluation. All of these activities can be of great importance to the smaller, rural communities.

An increased forestry program would improve the condition of the soil and reduce erosion and storm runoff. It would enhance the recreation and fish and wildlife programs in the basin. More intensive forest use would dictate greater land utilization of remaining areas and would generally increase land values in the basin.

Fish and Wildlife

The expenditures of sportsmen in the project area as well as in the towns or cities where they reside would add much to the basin economy. Additional employment opportunity 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 tangible 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 would depend to some extent on their attractiveness and proximity to lands and waters affording good hunting and fishing.

Summarized in Table 4.8 are some of the expenditures which could be expected from hunters and fishermen in the basin. In 1960, the total average expenditure per person was $79.34 for hunting, and $106.24 for fishing, or average expenditures per user-day of $6.00 and $5.75, respectively. These are compiled from national averages and are only illustrative.

TABLE 4.8

Percentage Distribution of Expenditures Hunting and Fishing—1960 (percent)

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 potential of the basin is excellent, with the extensive frontage of the Ogeechee basin on the Atlantic Ocean and its many bays and tidal tributaries. The program of development of this resource would create an increase in production of fish, crabs, oysters, and shrimp. Not only would this new production be utilized in food-processing industries, creating an increase in employment, but other elements of the industry would be affected, too, such as boat building and supplies. Indeed, there is no reason why the commercial fishing industry could not again become of considerable importance to the Ogeechee basin.

Recreation

Public outdoor recreation is a big business. Areas and States compete with one another for the tourist or recreationist dollar. Recreation activities create economic stability of many areas including some of the coastal areas of the Ogeechee basin and the offshore islands. Several segments of industry, such as boat building, recreation equipment, 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 trend would continue.

Outdoor recreation produces many primary benefits. Some of these benefits are not of a pure economic nature. Recreation provides the healthful exercise necessary for physical fitness. It promotes mental health and offers spiritual values. It is valuable for nature education. It is with this philosophy in mind that these benefits have been estimated on the basis of value to the user.

Recreation produces secondary benefits and general impacts, too. These benefits are reflected in the economy of the area, the community, and the Nation and are as follows:

(1) Stimulation of travel and travel expenditures.

(2) Development of business activity in areas within, adjacent to, or enroute to recreation areas, increasing retail trade, and new construction.

(3) Stimulation of business activity and related manufacture of recreation equipment.

(4) Increased property valuations in and around recreation areas.

(5) Increased miscellaneous net tax revenue.

A monetary calculation of these impacts and benefits is difficult. Surveys have been made in many areas but the effectiveness of these surveys is dependent upon how they were developed and for what purpose. Some of the surveys give individual expenditure estimates running from $4.00 to $7.00 per day and breakdowns of expenditures for food, lodging, and transportation. A recent Georgia survey determined that $4.00 is spent daily by the recreationist. These expenditures are reflected in the economic activities mentioned above. Even if this rate does not increase in the next 40 years, the 10 million recreationists, more than half from outside, expected to use the Ogeechee basin annually by 2000 would be spending over $40 million. This is nearly comparable to the total annual expenditures in the agricultural production program.

Water recreation is of special importance to outdoor recreation today. Reservoirs, lakes, coastal areas, and unpolluted streams generate more recreational activity than any other recreation factor. A recent study was made in the Arkansas-White-Red River Basins of the economy in se-

lected counties with significant reservoir shorelines in contrast with selected counties in the same vicinity without reservoir shorelines. The 10-year study showed an increase in per capita income of 57 percent in the reservoir counties as compared with only 23 percent in the nonreservoir counties. Bank deposits increased 57 percent in the reservoir counties and 40 percent in the nonreservoir counties. Tax levies were up 64 percent in the reservoir counties and 3.8 percent in the nonreservoir counties. Also, significant in the reservoir counties was an increase in investment in overnight lodging facilities, annual expenditures on private home construction, and new school construction. Nonreservoir counties showed little increase in these activities.

While all of the economic gains in these reservoir counties cannot be directly attributed to the presence of new lakes, it is evident that the new recreational activities had a pronounced effect. The reservoir counties are better off by nearly all economic yardsticks. These counties were comparatively depressed prior to the construction of the reservoirs so that the impact of the recreation dollar was somewhat more dramatic in this situation than it would be in an area of greater economic activity.

Pollution Abatement

Pollution abatement enhances the well being of people as to their choice of place of residence, employment, and recreation. Thus, this is important in two primary ways: (1) It is necessary for sustaining a healthy environment, and (2) it is necessary for 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 pollution problems can be handled effectively.

There is very little pollution in the streams of the Ogeechee basin. The existing pollution is primarily from municipal and industrial wastes and is not serious except in some of the headwater streams and the upper reaches of the small tributaries. To treat properly all of the wastes in the basin would require only $12 million in treatment systems and sewer lines by 1975 in 12 communities in the basin. Other expenditures of over $15 million would be required between 1975 and 2000 to keep abreast of the population growth throughout the basin.

It is difficult to assess the impact of a pollution abatement program. There are intangible economic 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, sand flies, and deer flies, are also important. The coastal areas of the basin with tidal marshland offer breeding places for mosquitoes. Much of this can be eliminated by better drainage. Control of these undesirable vectors could well mean the differences in some places between success or failure in the efforts to improve the area economy.

Other Economic Impacts

Other noteworthy economic impacts relate to several or all of the functional 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 lakeshore 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. Reconnais-

sance 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.

This is not to claim that all land enhancement values of projects outlined in the comprehensive plan will be of the same magnitude. Several factors influence land enhancement and are listed as follows:

(1) Proximity to urban population,
(2) shoreline topography,
(3) minor fluctuation in water level,
(4) water quality,
(5) accessibility and shoreline ownership, and
(6) size of water body.

In the future, as waterfront property becomes scarce as a result of increases in population and leisure time, the enhancement of land would 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 envisioned in the comprehensive plan would do much toward alleviating this situation. Increased economic activity would follow as a result of the implementation of the projects and programs. The forestry program would result in increased forest productivity. The soil conservation, reclamation, irrigation, and drainage programs would mean increased farm productivity. Increased economic activity would result in more residential and business construction. All of these effects coupled with judicious tax equalization, mapping and platting, and governmental administration would 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 would practically always soon outweigh the losses. In the previously mentioned 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 would 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. Whether or not this would be spent mostly locally would vary with the individual projects and their proximity to urbanized areas. The remaining 40 percent is for materials, equipment, maintenance, and service, and most of these costs would affect a larger area, even the national economy, being less impressive to any individual locality. It should be remembered that 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 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 a little by the economic gains from in-migration.

A migration study was made for the Southeast River Basins area as a whole. The results of that study did not provide basin data to show the economic effect of migration on the Ogeechee basin. However, the trends indicated by the study are assumed to be applicable to the Ogeechee 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 an 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.

Another comparison was made of the personal income of the migrants and anticipated migrants. Under this comparison, the period of 1960-75 should show an economic loss but certainly not nearly as great as that evident during the 1930-60 period. However, during the period of 1975-2000, the area should start to gain economically in this comparison of personal income.

Impacts to redevelopment areas — Of the 21 counties falling wholly or partially in the Ogeechee basin, 12 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. For instance, 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 and other legislation. This assistance is in the form of loans for industrial and commercial projects, loans and grants for public facilities, technical assistance, occupational training, and retraining subsistence payments.

Physical

In general, the land and water resources of the basin are more than adequate both in quantity 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.

The planned program would not change the stream regime appreciably, except for improvement downstream from the storage structure. The improvement would consist of evening out the flow, storage of floods, and augmentation of low flows. Very little consumptive use of surface water is planned so average flows would not be changed materially. A slight gain might be possible because of ground water diversions exceeding consumptive use.

Regulation at Groveland reservoir would provide minimum flows of about 95 cubic feet per second in the lower Canoochee, in contrast with historical median low flows of 4 cubic feet per

second and a record minimum of 1 cubic foot per second.

Effects of drainage, land management, and even urbanization would be evident in some localities, but in the aggregate would tend to compensate, and over most of the basin would have little effect on streamflow. Ground water aquifers extend far beyond the basin boundaries, and the small projected withdrawals would be spread over a large area and have negligible effect on ground water availability.

Water quality would 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 would affect the other. However, the total management of water is expected to be so small a fraction of the available natural quantities that the balance between ground water and surface water would not be disturbed.

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 undesirable waste, unwarranted windfall gains, and destructive competition; (5) encouraging desirable types and sizes of enterprises; (6) securing consistency between the various purposes of resource development; and (7) promoting public under-

TABLE 4.9

Cost Sharing—Comprehensive Plan

Purpose or project	Investment costs					Annual operation, maintenance, and replacements costs at year 2000				
	Total	Federal		Non-Federal		Total	Federal		Non-Federal	
	($1,000)	($1,000)	(pct.)	($1,000)	(pct.)	($1,000)	($1,000)	(pct.)	($1,000)	(pct.)
Purpose[1]										
Flood control	2,007	1,305	65	702	35	17	–	–	17	100
Water supplies	16,770	–	–	16,770	100	1,812	–	–	1,812	100
Irrigation	1,953	488	25	1,465	75	443	–	–	443	100
Drainage	1,649	412	25	1,237	75	51	–	–	51	100
Soil conservation	10,340	1,461	30	8,879	70	870	–	–	870	100
Forest conservation[2]	34,730	12,155	35	22,575	65	893	268	30	625	70
Sport fisheries and wildlife[3]	5,406	3,744	69	1,662	31	375	41	11	334	89
Commercial fisheries	217	130	60	87	40	1,606	964	60	642	40
Recreation[4]	62,800	30,063	48	32,737	52	3,020	917	30	2,103	70
Pollution abatement[5]	27,250	8,175	30	19,075	70	203	20	10	183	90
Public health	–	–	–	–	–	412	82	20	330	80
Project[1]										
Groveland	26,710	16,704	63	10,006	37	784	157	20	627	80
Water-access areas	10,200	4,080	40	6,120	60	628	95	15	523	85

NOTES:
[1] Costs for purposes and projects are not additive. Costs of projects are included as a part of the costs by purpose.
[2] Ten percent of the basin timberland is in Fort Stewart, increasing the Federal share of costs in this function.
[3] Federal share of fish and wildlife costs is higher than normal because of Blackbeard Island, Fort Stewart, and recommendation of Groveland project as a demonstration in fish and wildlife.
[4] Federal share of recreation costs is higher than normal because of Blackbeard Island, Millen National Fish Hatchery, and recommendation of Groveland project as a demonstration in recreation.
[5] There are three Federal installations involved in pollution abatement, increasing the Federal share in this function.

standing 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.

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 is 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.

Of the total investment costs, about 35 percent is estimated to be borne by the Federal Government and about 65 percent by the non-Federal interests. For operation, maintenance, and replacements costs, approximately 21 percent would become the responsibility of the Federal Government and 79 percent would be borne by the non-Federal groups involved in land and water developments.

Recreation costs are the largest item in the Ogeechee basin plan, accounting for about 39 percent of the total investment costs. Over $62 million in investment costs and an annual operation and maintenance cost of about $3 million would be required for full development of the Ogeechee recreation plan. Under suggested cost-sharing policies, the intial investment cost of the recreational program would be divided approximately equally between Federal and non-Federal interests and the Federal Government would bear about 30 percent of the operation, maintenance, and replacements costs. The Federal interest in recreation in the Ogeechee basin is substantially increased by the recommendation to use Groveland reservoir as a recreation demonstration project and by the substantial cost of the island properties needed for recreation of national significance. Steps should be taken to prevent the island properties from being preempted by other uses. The Groveland project, if developed early, could show what might be accomplished in underdeveloped areas to increase employment opportunity and raise per capita income, and also to develop a procedure with the ultimate objective of having the project beneficiaries of heretofore nonreimbursable purposes pay a proper share of the project costs.

Programs relating to agriculture and forestry are the second largest items of cost in the Ogeechee plan, totaling over $50 million for initial investment cost with annual cost for operation, maintenance, and replacements of about $2.3 million. By far the largest of the agricultural programs is that for forest conservation and utilization, where the initial investment cost is about $35 million. The soil conservation and utilization program for the Ogeechee basin would require an investment cost of approximately $10 million. The cost of the forestry program would be about 35 percent Federal and 65 percent non-Federal for investment cost and 30 percent Federal and 70 percent non-Federal for operation, maintenance, and replacements. As there is a considerable amount of forest land in Federal ownership in this basin, the Federal share of operation, maintenance, and replacements costs for forest conservation would be greater than average. The operation, maintenance, and replacements costs of the soil conservation and utilization program would be entirely the responsibility of non-Federal interests.

The pollution abatement problem in the Ogeechee basin would require $27 million in initial investment cost to carry out the plan to the year 2000. It is proposed that the Federal Government share 30 percent of the investment cost for pollution abatement and 10 percent of the operation, maintenance, and replacements costs.

The investment cost and the annual operation, maintenance, and replacements costs for each purpose in the plan and for Groveland reservoir and the water-access areas are listed in Table 4.9.

Financing

In 1960, Federal, State, county, local and private expenditures for resource development in the Ogeechee basin totaled about $8.4 million. This was equivalent to about 3.2 percent of the basin total personal income of $262 million. An estimated 15 percent of this expenditure was for training, technical aid, and other items not included in the comprehensive plan. Thus, the equivalent of 2.7 percent of the personal income was expended for types of endeavor similar to those in the plan.

The projects and programs covered by this Appendix 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 be about $391 million by the year 1975 and about $867 million by the year 2000. If the 1960 rate of resource expenditures in relation to personal income is continued to the year 2000, such funds would be more than adequate to accomplish the plan.

The annual rate of expenditure needed to accomplish the developments of the plan, in relation to personal income, is higher than the previous or current rate during the first 10 to 15 years and diminishes 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 would 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 resources needs was not carried beyond the year 2000.

During the first 10 to 15 years of plan implementation, there would be, therefore, need for additional financing at a rate higher than that prevailing in and prior to 1960 in order to provide for an adequate level of improvements consistent with the needs and opportunities within the basin expected to prevail during the next 40 years.

As an example, studies indicate that the Commission's plan to expedite developments now in demand involves capital outlay and operation, maintenance, and replacements costs during the period 1960-75 which would exceed the normal increase of these expenditures at all levels of private and governmental activity by raising the annual expenditures about $3 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 Ogeechee basin is expected to be increased, thus providing part of the needed funds. The remaining funds for this acceleration period would have to come from non-Federal sources such as State and local governments and private individuals and enterprises. In the case of State and local government, the additional funds should come from bond issues, development funds, and authority financing 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.

Responsibility

The responsibility for initiating the plan basically must rest 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 Ogeechee 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 plans 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 a later part of this Section 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) Historical patterns are observed in the case of flood control. If the project involved 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.

(5) 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.

(6) 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 was made on the basis of the agency usually associated with the purpose having the largest portion of the total allocated costs. An attempt was made to indicate only the Federal agency with the major interest. The designation is not intended to reflect, by omission, any lack of interest by the other land and water Federal agencies in any of the programs.

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.

The Groveland project is designated for the non-Federal interests having major responsibility for accomplishment, including coordinating the preauthorization planning, obtaining final approval of authorization of specific works or facilities, budgeting for appropriations or other funding, design of structure, administration of construction, and other matters pertinent to planning and construction. The designation of non-Federal responsibility is not intended to prejudice joint non-Federal and Federal development of the project and other features when and if such a proposal is presented to Congress for final resolution.

The Bureau of Outdoor Recreation or National Park Service, depending upon the established division of responsibility between these agencies, would have the major responsibility for the Federal aspects of the Groveland project. This designation is not intended to reflect any lack of interest by other Federal agencies in the project; in fact, most of the Federal land and water agencies have some interest in such projects.

In the general programs and projects, other than the Groveland project mentioned previously, 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 on 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

While action to achieve the comprehensive plan must be continued for the entire period covered in order to meet immediate requirements for developing the basin resources in an orderly manner 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.

Action for implementing these programs 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.

The following projects and programs should be initiated at an early date for the reasons listed.

The Groveland project is earmarked for early development. The land area should be acquired, shoreline planning carried out, the dam and reservoir constructed, and minimum basic facilities for recreation and fishing installed to satisfy existing needs for recreation and fish and wildlife use and to meet expanding needs to 1975. The early action phase of the project would accommodate some 1.7 million user-days annually for recreation and some 87,000 user-days annually for fishing. It is estimated that about 84 percent of the total investment costs for the project would be required in the early action phase.

Land should be acquired for 18 water-access areas and facilities installed to accommodate about 520,000 user-days annually for recreation and about 36,000 user-days annually for fishing to meet the needs of the population associated with the early action levels of development. It is estimated that about 50 percent of the investment cost for the total access area projects would be required in the early action phase.

The upstream watershed projects should be installed in the early action phase to alleviate existing problems and provide watershed protection, flood prevention, drainage, and water resources development for the improvement of agricultural lands and other areas. All installation costs would be incurred in the early action phase.

Increments of the water supplies program for domestic, municipal, and industrial uses should be installed to keep current with the needs of the population. Unless this is done, detrimental shortages and possible competition between users could occur, and economic growth would be hampered. It is estimated that about 60 percent of the total investment costs for the water supplies program would be expended in the early action phase.

The installation of irrigation and drainage programs would 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 40 percent of the total investment costs for these programs would be required in the early action phase.

While the utilization of soil resources would be largely controlled by current requirements, all reasonable effort would be expended to apply adequate soil conservation practices as quickly as possible on all land not now protected. All possible permanent conservation measures re-

maining to be applied would be installed in the early action phase. It is estimated that about 40 percent of the total investment costs for this program would be required in the early action phase.

To protect and conserve forests for future use, the major parts of tree planting and fire, insect, and disease control facilities would be installed in the early action phase. To facilitate the present and future operation of the forestry program, forestry education and additional studies would be given early emphasis, and drainage and road facilities would be installed. It is estimated that about 47 percent of the investment costs for total forest conservation and utilization program would be expended in the early action phase.

The improvement of existing wildlife facilities, extensive development, and supporting programs of additional studies, education, and enforcement activities would be initiated in the early action phase. Likewise, for sport fisheries, improvement of existing facilities on the rivers and small and large impoundments, new facilities on salt water, and supporting activities would be initiated in the early action phase. It is estimated that about 62 percent of the investment costs of the total fish and wildlife program would be expended in the early action phase. The commercial fisheries program would be initiated and all investment costs expended in the early action phase to restore this basic local industry.

Some features of the recreation program would 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 56 percent of the total investment costs would be expended in the early action phase.

Immediate action would 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 would increase in direct proportion to growth and development. Unless long-range pollution abatement plans are prepared, water resources would be damaged and beneficial uses impaired. It is estimated that about 45 percent of the total investment costs for pollution abatement would be required in the early action phase.

The public health programs of vector control, solid-waste collection and disposal, and air pollution and radiation monitoring would 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 annual operation and maintenance base.

TABLE 4.10

Summary of Early Action Investment Costs (thousands of dollars)

Project or program	Investment to 1975
Groveland	22,460
Water-access areas	5,080
Upstream watersheds	3,037
Water supplies	10,090
Irrigation	753
Drainage	275
Soil conservation	3,900
Forest conservation	16,220
Fish and wildlife	503
Recreation	17,150
Pollution abatement—public health	12,170

SECTION V – PROJECTS AND PROGRAMS

The comprehensive plan for the Ogeechee 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

development 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, each project and single-purpose development is 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.

Project design, quantity estimates, and areas required were taken from earlier reports or were based on observations made on reconnaissance field surveys, topographic maps that have contour intervals of 10 to 50 feet, and available hydrographic data. Instrumental surveys were limited to one cross section taken at the damsite for each of the proposed water storage projects where previous surveys had not been made.

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. The spillway discharge shown was estimated for a reservoir water surface at maximum pool elevation.

GROVELAND PROJECT

Location

The project would be located on the Canoochee River below the mouth of Lotts Creek in Bryan, Bulloch, and Evans Counties, Georgia, about 7 miles east of Claxton. The reservoir would extend about 15 miles up the Canoochee River and 11 miles up Lotts Creek.

Plan

The primary purpose of this project is recreation. Benefits would also accrue to fish and wildlife. The dam, with top elevation of 121 feet, would consist of a central uncontrolled concrete spillway, flanked by earth embankments on each side. An outlet structure containing a 4- by 4-foot sluice gate for release of minimum flows would be near a spillway wing wall. One Federal highway crossing and several local roads would have to be raised or relocated.

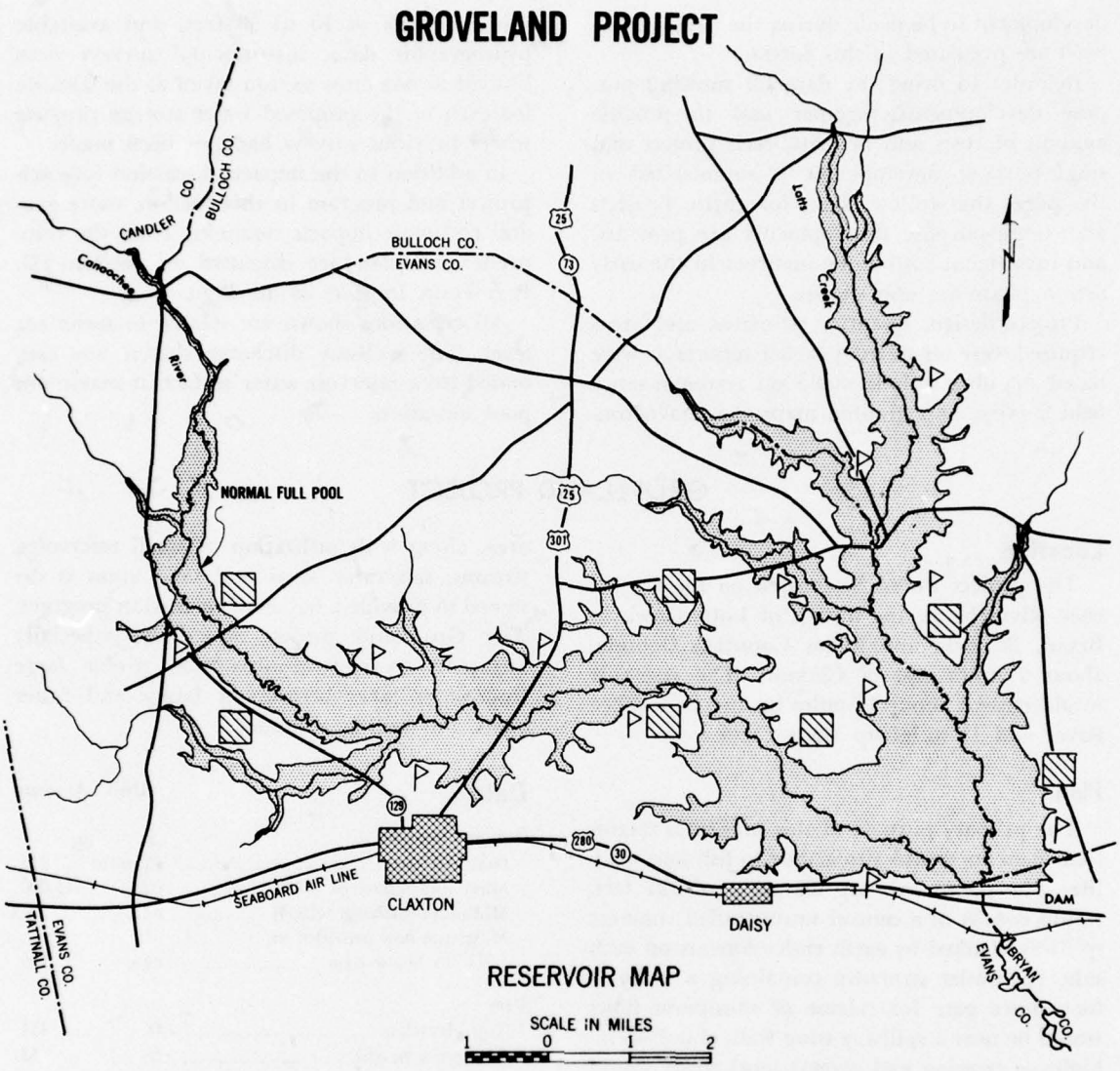
The reservoir would be operated to maintain as nearly as possible the normal full pool elevation of 110 feet. A minimum flow of about 95 cubic feet per second would be provided at all times for downstream uses.

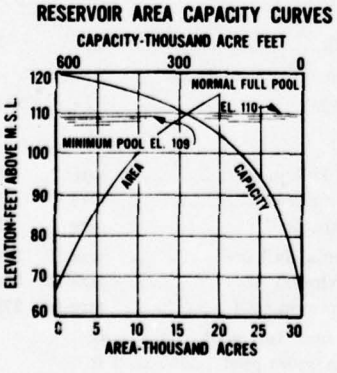
Recreation and fishing areas and facilities would be provided at locations around the reservoir to accommodate 3.1 million user-days annually of recreation and 157,000 user-days annually of fishing by the year 2000.

Recreation opportunities would be provided for a wide range of activities. The inclusion of large reservoirs in the overall plan of the study area, along with utilization of small reservoirs, streams, salt-water areas and land areas is designed to provide a balanced recreation program. The Groveland project would be especially attractive to recreationists who prefer large fresh-water lakes because of larger and faster boats and sailing activities.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	845
Maximum discharge (1948)	c.f.s.	15,000
Minimum discharge (1954)	c.f.s.	1.3
Minimum flow provided in stream below dam	c.f.s.	109
Dam		
Top elevation	ft.	121
Maximum height	ft.	53
Length	ft.	8,500
Spillway		
Effective length	ft.	1,270
Crest elevation	ft.	110
Design discharge	c.f.s.	114,000
Reservoir		
Area—Normal full pool	acre	16,750
—Maximum pool	acre	23,000
—Minimum pool	acre	15,000
Capacity—Normal full pool	acre-ft.	320,000
—Maximum pool	acre-ft.	550,000
—Minimum pool	acre-ft.	275,000
Elevation—Normal full pool	ft.	110
—Maximum pool	ft.	118
—Minimum pool	ft.	109





ACCESS AREA

RECREATION AREA

Figure 4.2

Benefits

Annual Equivalent Primary Tangible ($1,000)

Recreation	4,950
Fish and wildlife	190
Total	5,140

Impacts

While it is recognized that the creation of a large fresh-water lake in this area, where none now exists, would result in considerable home-site development around the lakeshore, no additional land has been included in the project for this purpose. Neither have the enhancement-type benefits been included for the project. It would be safely estimated that land values would increase at least 1,000 percent within 10 years following completion of the project. Tax values would also increase.

The local developing agency may find it desirable to increase the size of the project to provide building lots as a part of the project. This can be carried out insofar as the necessary legislation setting up the sponsoring local agency is provided. In any event, taxes or lease revenues from the benfitted lands should be made available to help pay the local share of the project costs. Good examples of this type of cost sharing exist on the Pearl River in the metropolitan Jackson, Mississippi, area and on the Beech River in the rural area of west Tennessee adjacent to the large Kentucky Reservoir. The Pearl River project, approximate cost of $23 million, was developed as a five-county undertaking authorized by State enabling legislation. The Beech River project is being undertaken jointly by the TVA and the Beech River Watershed Development Authority. The 87th Congress approved the latter project and appropriated funds. Local interests will pay $2 million of the total cost of $6 million.

After construction of the dam and filling of the reservoir, many new opportunities for employment would occur in new trades and services, such as boat building, rental, and repair; swimming and water-skiing equipment and supplies; food services; and automobile services. Increased wages and new business would have a tremendous effect on the counties involved, especially since two counties are designated as eligible for assistance under provisions of the Area Redevelopment Act.

While the creation of the reservoir would result in loss of valley storage for floodwaters, the river flood plain would be in effect narrowed down at the uncontrolled spillway and surcharge storage of some 230,000 acre-feet to elevation 118 would be provided. The effect of this surcharge storage is expected to compensate for the valley storage lost. To the extent that detailed studies make it necessary, reasonable zoning and flood plain management of the downstream undeveloped bottom lands, primarily all in the Fort Stewart military reservation, would minimize future flood damages.

Proper planning of shoreline developments and realistic tax revenues would more than compensade for the value of timber production lost in the reservoir area to be inundated.

The location, although some 50 miles from the center of metropolitan Savannah, its main source of visitation, has excellent access from all directions. U. S. Interstate Highway No. 16 extending northwest from Savannah would shorten travel time, while the north-south U. S. Interstate Highway No. 95 to the west of Savannah would bring additional vacationists within easily accessible proximity. The location of the project, astride the existing main north-south tourist route, U. S. Highway No. 301, also would provide easy access to the out-of-the-basin recreationist. Impacts of the project would include increased employment opportunities in motels, restaurants, auto and boat sales and services, and souvenir manufacture and sales. The reservoir would serve as a unique recreational area for Armed Forces personnel of Fort Stewart and Hunter Air Force Base.

Costs ($1,000)

	Early action	Total
Investment		
Dam and reservoir	15,520	15,520
Recreation facilities	6,320	10,540
Fish and wildlife facilities	30	60
Subtotal construction	21,870	26,120
Interest during construction	590	590
Total	22,460	26,710
Annual Equivalent		
Investment		910
Operation, maintenance, and replacements		643
Total		1,553

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Recreation	22,190	1,373	625	766
Fish and wildlife	4,520	180	18	18
Total	26,710	1,553	643	784

WATER ACCESS AREAS

Location

The water-access areas would be located along the Ogeechee and Canoochee Rivers and along the coastal waters of the basin. Not included are the access areas adjacent to the proposed Groveland project.

Plan

A total of 34 access areas would be acquired and developed in the basin and would be spaced about 5 to 10 miles apart at readily available locations. Ten of these are along the coast and 24 on streams. A limited number of these could be adjacent to small projects in the upstream watersheds. All of the coastal areas and 19 of the stream accesses would be used jointly by recreation and fish and wildlife. The other five stream areas would be for recreation. The development of these areas would include roads; water supply and sanitary facilities; and sightseeing, picnicking, swimming, camping, and boating facilities. Three different size areas would be developed: Type A would have about 75 acres; Type B, 40 acres; and Type C, 10 acres.

The 10 sites on the coast would consist of 7 Type A, 1 Type B, and 2 Type C. The 24 sites on the streams would consist of 5 Type A, 8 Type B, and 11 Type C.

Eighteen areas would be developed by 1975, including 6 joint-use sites on the coast, 6 joint-use sites on streams, and 6 sites on streams for fish and wildlife.

The developments by 1975 would include 4 Type A, 1 Type B, and 1 Type C on the coast and 2 Type A, 1 Type B, and 9 Type C on the streams.

Expected use would be as follows:

Data

Area	1975		2000	
	No.	User-days	No.	User-days
Type A				
Recreation	6	300,000	12	1,200,000
Fish and wildlife	6	12,000	10	20,000
Type B				
Recreation	2	60,000	9	540,000
Fish and wildlife	2	4,000	6	12,000
Type C				
Recreation	4	160,000	13	520,000
Fish and wildlife	10	20,000	13	26,000
Totals				
Recreation	12	520,000	34	2,260,000
Fish and wildlife	18	36,000	29	58,000

Benefits

Annual Equivalent Primary Tangible ($1,000)

Recreation	3,830
Fish and wildlife	30
Total	3,860

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 lower reaches of the Canoochee River would be improved for fishing and other recreational uses when the upstream storage is provided; and with release of a minimum flow of about 95 cubic feet per second at

all feasible times, no access area benefits have been assigned to the water-storage project.

The access sites would 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 tangible benefits evaluated, local benefits would result from sales and services of equipment and supplies to the users.

Costs ($1,000)

	Early action	Total
Investment		
Recreation facilities	4,905	9,910
Fish and wildlife facilities	175	290
Total	5,080	10,200
Annual Equivalent		
Investment		369
Operation, maintenance, and replacements		628
Total		997

Allocation of Costs ($1,000)

	Investment	Annual equivalent	
		Total	OM&R*
Recreation	9,910	968	610
Fish and wildlife	290	29	18
Total	10,200	997	628

*Operation, maintenance, and replacements costs at year 2000 are assumed to be equal to the annual equivalent operation, maintenance, and replacements costs.

Special Considerations

No attempt has been made to locate the proposed access areas precisely. They could be located at or near highway crossings, in upstream watershed projects, or other suitable sites readily available.

The access sites would utilize the existing natural, scenic, and habitat conditions by making them available to the public and adding facilities for the fisherman and recreationist.

UPSTREAM WATERSHED PROJECTS

Location

While no specific locations are selected for final development, watershed areas in the Piedmont province and Upper Coastal Plain were analyzed as typical projects.

Plan

It is estimated that multiple-purpose flood prevention and drainage projects would be developed on tributary streams draining some 278,000 acres between 1960 and 2000 in the Ogeechee basin. 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.

Upstream watershed projects would provide watershed protection, flood prevention, and water resources development for other purposes in the upstream areas. The structural works of improvement included would result in reducing the average floodwater and sediment damages occurring under existing conditions on a substantial area of flood plains in the upstream watersheds. Protection provided for these flood plain areas would 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 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 these and additional reservoirs are made available to and managed for public use, they would provide substantial portions of the projected needs for recreation and fish and wildlife as well as other purposes.

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 comprehensive plan up to date.

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 individual upstream watershed proposals in the plan could and should be made as appropriate to maximize all of the benefits and to reflect costs allocated to each purpose served.

Benefits

Annual Equivalent Primary Tangible ($1,000)

Flood prevention	181
Drainage	93
Total	274

Impacts

Corrective measures to prevent soil erosion together with utilization of sediment storage capacities provided in upstream structures would reduce sediment storage requirements in downstream reservoirs.

Costs ($1,000)

Investment	Early action	Total
Flood prevention	2,007	2,007
Drainage	1,030	1,030
Total	3,037	3,037

Annual Equivalent	
Investment	110
Operation, maintenance, and replacements	26
Total	136

Allocation of Costs ($1,000)

	Investment	Annual equivalent	
		Total	OM&R*
Flood prevention	2,007	90	17
Drainage	1,030	46	9
Total	3,037	136	26

*Operation, maintenance, and replacements costs at year 2000 are assumed to be equal to the annual equivalent operation, maintenance, and replacements costs.

WATER SUPPLIES

Location

The water supplies programs would be basinwide.

Plan

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 needs for 3.1 million gallons per day, municipal needs for 47.3 million gallons per day, and industrial needs for 7.0 million gallons per day by the year 2000.

Data

Domestic Supplies

	Number
New drilled wells	2,200
Wells to be sealed and covered	2,000
Wells needing power pumps and pressure systems	1,800 to 6,800

Municipal Supplies

	Number
Municipalities	27
Systems needing	
Source improvement	14
Water treatment	27
Elevated storage tanks needed	27
Distribution systems or extensions required	27

The industrial water supply program would consist of the installation of new wells or expansion of municipal distribution systems for any new industrial plants located in the basin.

Benefits

Annual Equivalent Primary Tangible

Tangible benefits are assumed to be at least equal to the cost of the cheapest alternative.

Impacts

The construction and installation of the facilities to supply water would provide employment and income for many basin residents, as well as sales of construction equipment and supplies. Some employment and sales and services of supplies and equipment during the operation and maintenance of the projects would result in local benefits.

The availability of good quality water determines to a considerable extent the degree of community and industrial development. Industry considers an ample supply of good water a major factor influencing the location of its plants. It is attracted to areas where, in addition to other considerations, high-quality water is available in sufficient volumes to meet its requirements.

A properly designed and operated water supply protects the health of the community and strengthens its fire defenses. It contributes to recreational activities by providing water for swimming pools, parks, playgrounds, golf courses, and gardens and lawns.

The value of water to the users is the measurement of benefits from water supply. These benefits are measured by assuming that the value of water in adequate quantity and quality to the users is equal to the cost of obtaining water of similar quality from the most likely alternative source. In the Ogeechee basin, in general, ground water sources are the most likely alternative because of adequately yielding aquifers. Therefore, benefits from additional ground water sources are generally considered to be equal to the cost of obtaining water from ground water. This results in a low estimate of the value of water supply benefits.

Costs ($1,000)

Investment

	Early action	Total
Domestic	4,800	4,800
Municipal	5,230	11,890
Industrial	60	80
Total	10,090	16,770

Annual Equivalent

	Investment	OM&R	Total
Domestic	144	31	175
Municipal	277	894	1,171
Industrial	2	62	64
Total	423	987	1,410

Operation, Maintenance, and Replacements at Year 2000

Domestic	80
Municipal	1,640
Industrial	92
Total	1,812

Allocation of Costs

All costs are allocated to water supplies as shown.

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

Summarized below are only those parts of the reclamation, irrigation, and drainage programs not included elsewhere in this Report. The upstream watershed projects include the drainage program of these projects.

The features of the irrigation program include individual sprinkler systems on individual farm basis to irrigate an estimated 14,000 additional acres of cropland. 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. About 75 percent of the water supply requirement would be provided by farm ponds and the remaining 25 percent from individual wells and streams. Crops expected to be irrigated include tobacco, cotton, orchards, and truck and other specialty crops.

The features of the drainage program includes onfarm and small group open ditch drainage systems on an estimated 39,500 additional acres of cropland and pastureland. Princi-

pal crops to be grown on drained land include tobacco, cotton, peanuts, truck and other specialty crops.

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)

Irrigation	893
Drainage	874
Total	1,767

Impacts

Irrigation provides insurance against drought conditions in some years; assists in prompt germination, continuous plant growth of new seedings, the survival of transplanted material, and the maturing of crops; helps in establishing vegetative cover on eroded areas; and provides for better use of land in accordance with capability. Drainage also provides for better use of land in accordance with its capability, and also provides for improved land preparation, seeding, cultivation, management, and harvesting. Both irrigation and drainage provide opportunity for increased production.

Costs (exclusive of technical assistance) ($1,000)

Investment

	Early action	Total
Irrigation	753	1,953
Drainage	275	619
Total	1,028	2,572

Annual Equivalent

	Investment	OM&R*	Total
Irrigation	70	443	513
Drainage	23	42	65
Total	93	485	578

*Operation, maintenance, and replacements costs by the year 2000 are assumed to be equal to the annual equivalent operation, maintenance, and replacements costs.

Allocation of Costs

All costs are allocated to irrigation and drainage as shown.

HYDROELECTRIC POWER AND INDUSTRIAL DEVELOPMENT

The basin area is entirely within the State of Georgia and, excepting metropolitan Savannah, the electric power requirements are imported from the surrounding area over the integrated transmission grid of the Georgia Power Company. Hydroelectric power developments in the basin do not appear economically feasible, and future needs would continue to be met from sources outside the basin. By the year 2000, the basin electric energy requirements are projected to be about 1.8 billion kilowatt-hours with a demand of about 373,800 kilowatts.

As the electric load increases, the high-voltage grid system would be expanded and the present 115,000-volt lines would be increased to 230,000 volts where possible. Additional substations and subtransmission lines would be constructed to deliver energy to the ultimate customer as the need arises.

The Ogeechee basin has a very high percentage of agricultural employment and a corresponding low percentage of manufacturing employment. There would be a gradual shifting of this emphasis with increased agricultural production, fewer but larger farms, and less agricultural employment. This does not mean, however, that there would be a large increase in manufacturing employment.

The largest gains in manufacturing employment would be in the apparel industries. The other industrial categories would make small gains in relation to population or market growth except textiles, which would remain static.

With a concerted effort on the part of the basin people, it is quite possible to improve these employment projections. Vocational training programs, for instance, would make the basin more attractive to industry. But if the vocational training programs are not geared to a corresponding industrial-promotion program, the basin would find itself training people for employment elsewhere, thus creating continued out-migration.

The above does not paint a very bright picture for the industrial future of the Ogeechee basin. Expansion in industrial development in the basin, however, depends on many factors. Raw materials, markets, labor, power, and trans-

portation are among the most important ones. Others are climate, taxes, governmental cooperation, land availability, financing, community facilities including particularly those for education, good living environment, and community attitude. When all other factors are considered and balanced, community attitude is possibly the most important deciding factor.

Community attitude is best expressed through local organization for industrial development. There are many types of local organization: Chambers of commerce, county development authorities, development committees, and development corporations are the most popular. To say that one organization is more workable than another is presumptuous. The success of any organization depends upon the people making up the organization; and their resourcefulness, energy, goals, enthusiasm, attitudes, tools, leadership, and judgment.

The attainment of the desired industrial development to accomplish the basin economic goals would depend largely upon the resourcefulness and initiative of the people. Working through local development organizations or planning commissions, the basin people can determine the potentials, the assets, and the liabilities of their individual areas and devise programs and plans to accomplish their aims.

Assistance to help solve problems of economic development is available from many sources, including private consultants, universities, and many State and Federal agencies.

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, loans can be made to local development companies to finance the construction, conversion, or expansion of industrial plants, and shipping centers for ownership or tenancy by small business concerns. These loans are made for 10 years at an interest rate of 5½ percent or lower and are repaid through receipts from lease of the buildings. The local agency is required to put up 20 cents 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. Also, the University of Georgia and the Georgia Institute of Technology lend technical assistance to eligible areas under this program.

A forerunner of the Area Redevelopment Act was the Rural Development Program established in 1955. Now renamed the Rural Areas Development Program, it 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.

Also, there is increased opportunity under the Federal Housing Act to rehabilitate blighted industrial, residential, and commercial areas and to obtain technical assistance and planning aid in cities, small towns, and counties. This program is coordinated through State, area, and local planning agencies or commissions.

Under 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 would 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 community interests and initiate action toward obtaining these objectives.

SOIL CONSERVATION AND UTILIZATION

Location

The soil conservation and utilization program would be carried out on the cropland, pastureland and rangeland areas throughout the basin.

Plan

It is estimated that about 435,000 acres of cropland, pastureland, and rangeland would be treated by the installation of annual and en-

during soil conservation measures and practices. The major measures to be installed include the establishment or reestablishment of vegetative cover, the improvement of vegetative cover, erosion control practices, management of grazing, and protection from fire.

About 4,100 additional farm ponds would be installed to provide for livestock water, irrigation water supply, some small impoundment fishing, and some unclassified recreation use.

An estimated 83,600 acres of woodland, pastureland, and other lands are expected to be converted to cropland; and 116,000 acres of cropland, woodland, and other lands are expected to be converted to pastureland.

Landowners and operators would install the above measures on an individual farm basis and in upstream watershed projects with technical and financial assistance from private concerns and State and Federal programs.

Pressure is being applied to competitive land uses in the basin by expanding nonagricultural uses such as urban and industrial areas and highways. It is estimated that some 38,000 acres now in cropland and pastureland would be diverted to such nonagricultural uses by the year 2000. The erosion control and water management problems on these lands would require similar treatment measures as for cropland and pastureland and would be applied by private individuals, industries, and local and State entities. At the time these areas move into nonagricultural use, the specific problems and solutions would need to be determined and means established to carry out the control measures.

Data

Land Use—2000	Acres
Cropland and pastureland	869,000
Woodland	2,173,000
Other	420,000
Total	3,462,000

Benefits

Annual Returns to Farmers ($1,000)	1,661

Impacts

Installation of soil conservation measures and practices on the areas of cropland, pastureland, and rangeland needing conservation treatment is a basic principle in protecting the soil resources and in providing sustained agricultural production in the basin and region. The application of these practices and measures contributes to extending the life of floodwater retarding structures, major reservoirs, and drainage ditches by reducing sediment. By improving water quality, they reduce the cost of treatment for municipal and industrial use and enhance the value of the reservoirs for fish.

Costs (exclusive of technical assistance) ($1,000)

	Early action	Total
Investment	3,900	10,340
Annual Equivalent		
Investment		374
Operation, maintenance, and replacements		870
Total		1,244

Allocation of Costs

All costs are allocated to soil conservation and utilization.

FOREST CONSERVATION AND UTILIZATION

Location

The forest conservation and utilization program would be carried out on woodland areas throughtout the basin.

Plan

Major features 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 more 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 spoil banks where possible; (9) intensified education and information programs; and (10) accelerated forest research.

Data

Item	Unit	Amount
Fire protection (new)	acre	46,000
Fencing for woodland grazing control	mile	1,000
Erosion control tree planting	acre	44,000
Woodland drainage	acre	260,000
Forest roads	mile	1,000
Timber-stand improvement (commercial and noncommercial)	acre	1,880,000
Other tree planting shelterbelts and site preparation for natural regeneration	acre	1,341,000
Annual production—2000		
Timber cut (million)	cu. ft.	141
Gum-naval stores	bbl.	94,000

Benefits

Annual Equivalent Primary Tangible ($1,000) 3,182

Impacts

The increased timber and naval-stores production would have a stabilizing effect on the local economy. The local citizens can gain additional income if they harvest the timber and gum crops and haul them to local distribution points. Further processing of the material locally would mean increased manufacturing employment and additional services and would create a need for satellite industries. The multiplier effect of production on the local economy could include increased tax returns, town development, and social improvements.

In addition, the forestry program would improve the condition of the forest soil and thereby reduce erosion and storm runoff. It would enhance the recreation possibilities in the basin and provide better fish and wildlife habitat.

Costs ($1,000)

Investment	Early action	Total
Fire protection (new)	120	120
Fencing for woodland and grazing control	300	300
Erosion control tree planting	1,100	1,100
Woodland drainage and forest roads	3,920	3,920
Timber-stand improvement (commercial and noncommercial)	1,600	6,640
Other tree planting shelterbelts and site preparation for natural regeneration	9,180	22,650
Total	16,220	34,730

Annual Equivalent	
Investment	820
Operation, maintenance, and replacements	706
Total	1,526

Operation, Maintenance, and Replacements at Year 2000 893

Allocation of Costs

All costs are allocated to forestry.

FISH AND WILDLIFE

Location

The fish and wildlife program would be basinwide.

Commercial fisheries improvement would extend throughout the coastal waters of the basin.

Plan

Summarized below are only those parts of the fish and wildlife program not included elsewhere in this Report. The multiple-purpose project at Groveland and the water-access areas also include features of the fish and wildlife program.

The features of the wildlife program are: (1) Further improvement of wildlife habitat within Blackbeard Island National Wildlife Refuge and Camp Stewart military reservation; (2) establishment and development of four new wildlife management areas for administration by the Georgia Game and Fish Commission in conjunction with local interests; (3) extensive management of wildlife habitat throughout the basin by interested landowners in cooperation

with State and Federal conservation agencies; and (4) the expansion and acceleration of current activities in additional studies, planning, education and information, and management and enforcement.

The features of the sport fisheries program are: (1) Preservation and development of the Ogeechee River for stream fishing; (2) renovation and more intensive management of existing and prospective large and small impoundments; (3) improvement of present access areas on the Ogeechee River and its tributaries; (4) expansion of existing Federal and State hatcheries as will be required to meet the needs for stocking of new lakes and renovation of existing ones; and (5) the expansion and acceleration of current activities in additional studies, planning, education, protection, and management.

The marine waters of the basin are capable of producing several times the amount of game fish which would be needed to meet projected requirements provided the inshore waters are protected against pollution, landfills, dredging, and other activities which are detrimental to fish production and utilization. The salt-water sport fisheries program thus would emphasize those measures which would bring fish and fisherman together: (1) Seventeen submerged fishing reefs, 3 to 4 feet high, would be placed in water with depths varying from 20 to 60 feet; (2) three fishing piers would be constructed; (3) bridges which cross the bays and tidal streams would be equipped with catwalks to provide convenient and readily available fishing opportunities to the public; (4) jetties and breakwater structures constructed in the future would be equipped with walkways and handrails to promote safe use; (5) navigational aids would be erected to guide sport fishermen to the most productive drops or reefs; and (6) maps and information concerning available facilities and fishing opportunity would be prepared and disseminated.

The commercial fisheries improvement would consist of: (1) Expansion of existing operation; (2) rehabilitation of oyster-producing reefs; (3) cultivation of shrimp, pompano, and other high-quality seafoods under controlled conditions; and (4) acceleration and expansion of existing facilities and activities with a view toward more efficient harvest, better methods of handling and processing the catch, new sources of supply, sound regulations and enforcement, and increasing demand for domestic products. With this program in effect, and considering the advantages of improved equipment and technology, it is anticipated that the total production of food fish would be increased to 12.6 million pounds annually by 1975 and 20.4 million pounds by 2000.

Data

Wildlife

	Unit	Amount
Improvement of existing facilities		
Blackbeard Island National Wildlife Refuge	acre	6,000
Fort Stewart	acre	280,000
Development of new wildlife management areas		
Taliaferro County	acre	20,000
Jefferson County	acre	20,000
Jenkins County	acre	20,000
Candler County	acre	20,000
Extensive habitat development	Basinwide	
Supporting programs (research, investigation, education, enforcement, services)	Basinwide	

Sport Fisheries

Improvement of existing facilities		
Ogeechee River and tributaries	acre	4,000
Large impoundments	acre	3,000
Small impoundments	acre	17,000
Fish culture stations	acre	1,000
New separate facilities		
Artificial reefs and piers (salt water)	number	20
Supporting programs		
Fresh water	Basinwide	
Salt water	Coastwide	

Commercial Fisheries

Expansion of fishing operations	Coastwide	
Seafood culture		
Oyster	acre	250
Shrimp	acre	160
Supporting fishery activities		
Exploratory fishing and gear development	Basinwide	
Market development	Basinwide	
Technological services	Basinwide	
Biological studies	Basinwide	
Protection and enforcement	Basinwide	
Increased production	lb.	10,700,000

Benefits

Annual Equivalent Primary Tangible ($1,000)

Wildlife (83,000 user-days)	238
Sport fisheries (218,000 user-days)*	369
Subtotal	607
Commercial fisheries	1,195
Total	1,802

*Includes 58,000 user-days of fishing assigned to water-access areas.

Impacts

In addition to the tangible benefits, other benefits would result from these developments such as employment in the fishing industry, processing of seafood, boat building and boat supplies, fishing and hunting camps, and also in services such as food, gasoline and oil, and fishing and hunting supplies which have not been evaluated in dollar terms.

The benefits which could be realized by improving seafood culture and harvests would be enough to justify a vigorous effort to expand the industry. Improved seafood culture would greatly eliminate the seasonal fluctuations of supply and would encourage new fish processing plants to locate in the basin. Stabilization of supply and market conditions would attract energetic young men into the field of commercial fishing. Secondary benefits include increased employment in the fish and other seafood processing industries, in boat building, boat maintenance, and boat-supply enterprises. More services would be required and sales of food, gasoline, oil, fishing supplies, and other equipment would increase.

Costs ($1,000)

Investment	Early action	Total
Wildlife	100	316
Sport fisheries	186	280
Subtotal	286	596
Commercial fisheries	217	217
Total	503	813

Annual Equivalent

Investment	
Wildlife	7
Sport fisheries	7
Commercial fisheries	7
Subtotal	21
Operation, maintenance, and replacements	
Wildlife	48
Sport fisheries	117
Commercial fisheries	905
Subtotal	1,070
Total	1,091

Operation, Maintenance, and Replacements at Year 2000

Wildlife	161
Sport fisheries	178
Subtotal	339
Commercial fisheries	1,606
Total	1,945

Allocation of Costs

All costs are allocated to fish and wildlife as shown.

Special Considerations

Many oysterbed areas now closed due to pollution could be restored when an adequate pollution abatement program is installed.

RECREATION

Location

The recreation program would be basinwide.

Plan

Summarized below are only those parts of the recreation program not included elsewhere in this Part. For example, fish and wildlife programs summarize hunting and sport fishing; and multiple-purpose projects include those parts of the recreation program which are accounted for at each project.

Two areas now in existence lend themselves to expansion of facilities for general outdoor recreation. Three new areas are proposed. These areas are illustrative of the kind of development which would reasonably be carried out to help meet the increasing needs for outdoor recreation opportunity.

Magnolia Springs State Park, located in Jenkins County, Georgia, about 4 miles north of Millen, includes about 1,200 acres of land, of which some 50 acres have been developed. Facilities would be increased to accommodate 150,000

user-days by the year 1975 and 260,000 user-days by 2000.

Lincoln State Park, 1 mile west of Millen, Jenkins County, Georgia, is a 54-acre area with facilities for boating and picnicking. Facilities would be increased to accommodate 50,000 user-days by the year 2000 as part of the long-range program.

Three new general outdoor recreation areas would be developed. The largest of these would be located in Jefferson County and would provide for recreation activities like picnicking, swimming, cultural pursuits, camping, boating, and group camping. Approximately 500 acres would be acquired. A small pond or a swimming pool would provide for swimming. Two smaller areas would be located in lower parts of the basin, the first an area in Screven County with a 500-acre lake and the second a riverside park on the Ogeechee River north of Richmond Hill. These three areas would provide for 270,000 user-days in 1975 and for 750,000 user-days in the year 2000. Roads, parking, water supply, and sanitary provisions would be installed.

There are many historic and cultural sites in the Ogeechee basin, some presently developed, and others undeveloped for recreation use. Additional facilities are being studied for expansion of four existing areas. One new site, Fort Morris, has been identified as an area to be developed to meet future needs. These sites are illustrative of costs and benefits which would accrue from development, and subsequent studies may show similar areas which could be developed.

Fort McAllister, on the south bank of the Ogeechee River near its mouth, has only recently been restored. With the fort as a nucleus for general recreation activities, facilities would accommodate 100,000 user-days by 2000.

The Old Slave Market in Louisville, Georgia, represents an important period in Georgia history and, as such, is a focal point for recreationists. Such an area would satisfy the sightseer and tourist, and facilities would be developed to accommodate 40,000 user-days in 1975 and 74,000 user-days by the year 2000.

Midway Church and Museum in Liberty County, Georgia, would be part of the long-range program of development. Facilities would be provided to accommodate 25,000 user-days in 1975 and 90,000 user-days by the year 2000.

Richmond Hill Fish Hatchery and Millen National Fish Hatchery would jointly be developed to provide greater opportunity for the sightseer as part of the long-range program. Facilities would accommodate 5,000 user-days by 1975 and 10,000 user-days by the year 2000.

A development at Fort Morris, Liberty County, Georgia, on the south bank of the Medway River, would consist of acquisition of about 40 acres of land and restoration. Interpretive facilities and general development of this historic site would accommodate 50,000 user-days by 1975 and 300,000 user-days by the year 2000.

Four of the Golden Isles offshore from this basin area, Wassaw, Ossabaw, St. Catherines, and Sapelo, are now in private ownership. They offer opportunity for public recreation on the seacoast. Two of these islands would be acquired or otherwise made available to the public before they are developed for other purposes. The island area program would include acquisition and development of two islands as recreational areas by 1975. Facilities would be provided for 1 million user-days by 1975 and for 3 million user-days by 2000. It is expected that access to one of the islands would be provided by causeways and bridges to the mainland and to the other by boat.

Blackbeard Island National Wildlife Refuge would have minimum facilities to provide for 6,000 user-days by 2000.

Data

The proposed level of development at single-purpose recreation areas included in the plan would provide an opportunity for the following estimated use of facilities:

	User-days annually (thousands)		
	1960 Base	By 1975	By 2000
Existing developments			
Magnolia Springs State Park	110	150	260
Lincoln State Park	25	25	50
Blackbeard Island	5	5	6
Midway Church and Museum	25	25	90
Louisville Slave Market	40	40	74

	User-days annually (thousands)		
	1960 Base	By 1975	By 2000
Fish hatcheries, Millen and Richmond Hill	5	5	10
Fort McAllister	50	50	100
Subtotal	260	300	590
New developments			
Jefferson County recreation area	....	200	500
Screven County recreation area	....	....	150
Riverside recreation area	....	70	100
Offshore islands (2)	....	1,500	3,000
Fort Morris	....	50	300
Subtotal	....	1,820	4,050
Total	260	2,120	4,640

Benefits

Annual Equivalent Primary Tangible ($1,000)

Expansion of existing facilities	231
New developments	3,176
Total	3,407

Impacts

These outdoor recreation areas would enhance the basin recreation opportunities in areas now deficient. Development of these readily accessible areas would bring benefits associated with providing foods, services, and equipment. The number of people expected to use these recreation areas would contribute to the basin economy. To the extent that these recreation developments induce people to live, work, and establish businesses in the basin, they would be a factor in expansion of the economy.

The value added to the local economy by expenditures made by recreationists is generally recognized. Less tangible are the benefits derived from general enhancement of the recreational opportunities in a given locality. The growth of many cities and towns in the basin would depend to a great extent on their attractiveness and proximity to lands and waters affording good opportunities for recreation, fishing, and hunting.

Costs ($1,000)

	Early action	Total
Investment		
Existing areas	250	990
New areas	16,900	29,710
Total	17,150	30,700
Annual Equivalent		
Investment		969
Operation, maintenance, and replacements		1,303
Total		2,272
Operation, Maintenance, and Replacements at Year 2000		1,644

Allocation of Costs

All costs are allocated to recreation.

POLLUTION ABATEMENT AND PUBLIC HEALTH

Location

The pollution abatement and public health programs 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.

The public health program includes drainage and spraying measures for vector control, collection and disposal of solid waste for fly and rodent control, air pollution and radiological monitoring.

Data

Pollution Abatement

Municipal sewerage systems needed	20
Secondary plants required, number of places	6
Stabilization ponds, number of places	14
Sewer extensions, number of places	20

Public Health

Solid-waste collection and disposal	
Number of sanitary landfill operations	24
Vector control	Basinwide
Air pollution and radiological monitoring	Basinwide

Benefits

Annual Equivalent Primary Tangible

Benefits were not evaluated in monetary terms. Each proposal was checked to make sure that there was no more economical alternative.

Impacts

The construction and installation of facilities for pollution abatement would provide employment and income for many local residents, as well as sales and services of equipment and supplies. Operation and maintenance of the facilities would also provide employment and sales and service opportunities.

The Nation and its communities, as well as business and private operations and individuals, incur losses or damages because of water pollution. The larger share of the total damages is not directly accounted for. The impairment to health, the loss or diminution of fishing and recreational uses, and depreciated property values caused by polluted waters have an adverse economic impact that is diffused throughout society. This reduces the utility of the water resources and restricts economic growth rather than causing a direct dollar loss for corrective devices. Unfortunately, these indirect consequences of pollution are not readily expressed in dollar terms because they are diffused and because they are not recorded by direct open-market transactions. Nevertheless, such adverse consequences are real and constitute a handicap to the fulfillment of economic and social goods.

Pollution control measures alleviate these adverse conditions and produce economic benefits associated with the improved waters. However, these benefits often are not apparent because they constitute insurance for future usefulness, as well as for immediate purposes, or they may be indirect or intangible. Many of the benefits from pollution control are in this nonmarket realm; i.e., enhancement of fishing and recreational opportunity, protection of health, scenic improvement, and assurance of the future utility of water resources for various other purposes. The private market price system, therefore, cannot be relied upon chiefly or solely to provide the measurement. New devices for taking into account the social or public values would need to be devised.

The effects of the impacts of pollution on the economy of the Ogeechee basin have not been evaluated because the data are lacking. With the exception of the headwater area, pollution has had no discernible impact on the basin. According to the Georgia Game and Fish Commission, wastes from a textile mill and from a municipal sewage treatment plant have caused damage to fishing in a 10-mile reach of the Ogeechee River in the headwaters of the basin. This pollution detracts from the value of the water and adjacent land area for recreational and other use. The extent to which development of recreational facilities has been discouraged in this reach of the river has not been determined.

Vector control would not only guard against the spread of vector-borne diseases but also, as in the case of mosquitoes and other swarming and biting insects, it would reduce the mental and physical discomforts caused by these pests. Insect pest control deserves high priority in recreation planning. One vector problem that appears to be on the rise in areas along the eastern seaboard and could be significant in the basin in 1975 or 2000 is mosquito-borne encephalitis. At present, the only feasible approach to the control of encephalitis is a program of prevention through mosquito control. The construction and installation of facilities for vector control would provide employment and income for local residents, as well as sales and services of equipment and supplies. Operation and maintenance of the facilities would also provide direct employment, sales and service employment, and sales and service opportunities.

The construction and installation of the facilities for solid-waste disposal would provide employment and income for many basin residents, as well as increased sales of construction equipment and supplies. Some employment and sales and services of supplies and equipment during the operation and maintenance of the projects would result in local benefits.

Improper handling of solid waste creates conditions favorable for breeding flies and rodents which cause diarrhea, dysentery, typhus, and other less common diseases. Good sanitation practices, such as proper storage, collection, and disposal of wastes, help control these diseases. Improper disposal also facilitates mosquito breeding and creates odor nuisances. Open dumps often catch or are set on fire and become nuisances and air pollution problems. The proper storage, collection, and disposal of solid wastes would prevent such nuisances and benefit the community. The measures for solid-waste

collection and disposal would also have effects far beyond these important public health aspects. The general desirability of the area as a place to live and visit would be enhanced by preventing haphazard or uncontrolled waste dumping or burning which spoils the countryside. In addition, land created by fill generally has a value in excess of the original land involved.

Costs

For vector control and air pollution and radiological monitoring, the plan assumes investment costs incurred are reflected in the annual equivalent manner. The investment in the land and equipment required for collection and disposal of solid wastes and for landfill operation are accounted for only in annual equivalent costs. Annual costs shown are those considered necessary to carry out effective basinwide programs.

Investment ($1,000)

	Early action	Total
Pollution abatement		
Municipal	11,820	26,730
Industrial	350	520
Subtotal	12,170	27,250
Public health		
Solid waste	---	---
Vector control	---	---
Air pollution and radiological monitoring	---	---
Subtotal	---	---
Total	12,170	27,250

Annual Equivalent ($1,000)

	Investment	OM&R	Total
Pollution abatement			
Municipal	623	102	725
Industrial	14	18	32
Subtotal	637	120	757
Public health			
Solid waste	---	256	256
Vector control	---	151	151
Air pollution and radiological monitoring	---	5	5
Subtotal	---	412	412
Total	637	532	1,169

Operation, Maintenance, and Replacements at Year 2000

Pollution abatement	
Municipal	171
Industrial	32
Subtotal	203
Public health	
Solid waste	256
Vector control	151
Air pollution and radiological monitoring	5
Subtotal	412
Total	615

Allocation of Costs

All costs are allocated to pollution abatement and public health as shown.

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.

Dams and Reservoirs

Few studies of potential dam and reservoir sites had been made in the Ogeechee basin. Many sites were studied and discarded early. Alternative locations of sites within reaches of the rivers with various storage capacities are possible. Some 15 sites were studied as indicated on map, Dam and Reservoir Sites, Figure 4.3. The following tabulation lists the more significant sites considered and gives a brief statement on location, description, purposes considered, and reason for not including in the plan.

Other Features

Local fresh-water sport fishermen expressed interest in clearing and snagging of the streams and rivers to provide better access. Such improvement would also provide accessibility to the speedboater and water skier. This conflict of interest was resolved by providing public access areas at selected locations along the rivers and streams for greater net benefits to both fisherman and recreationist and retaining the natural attractive setting of the water resource.

DAMS AND RESERVOIRS CONSIDERED

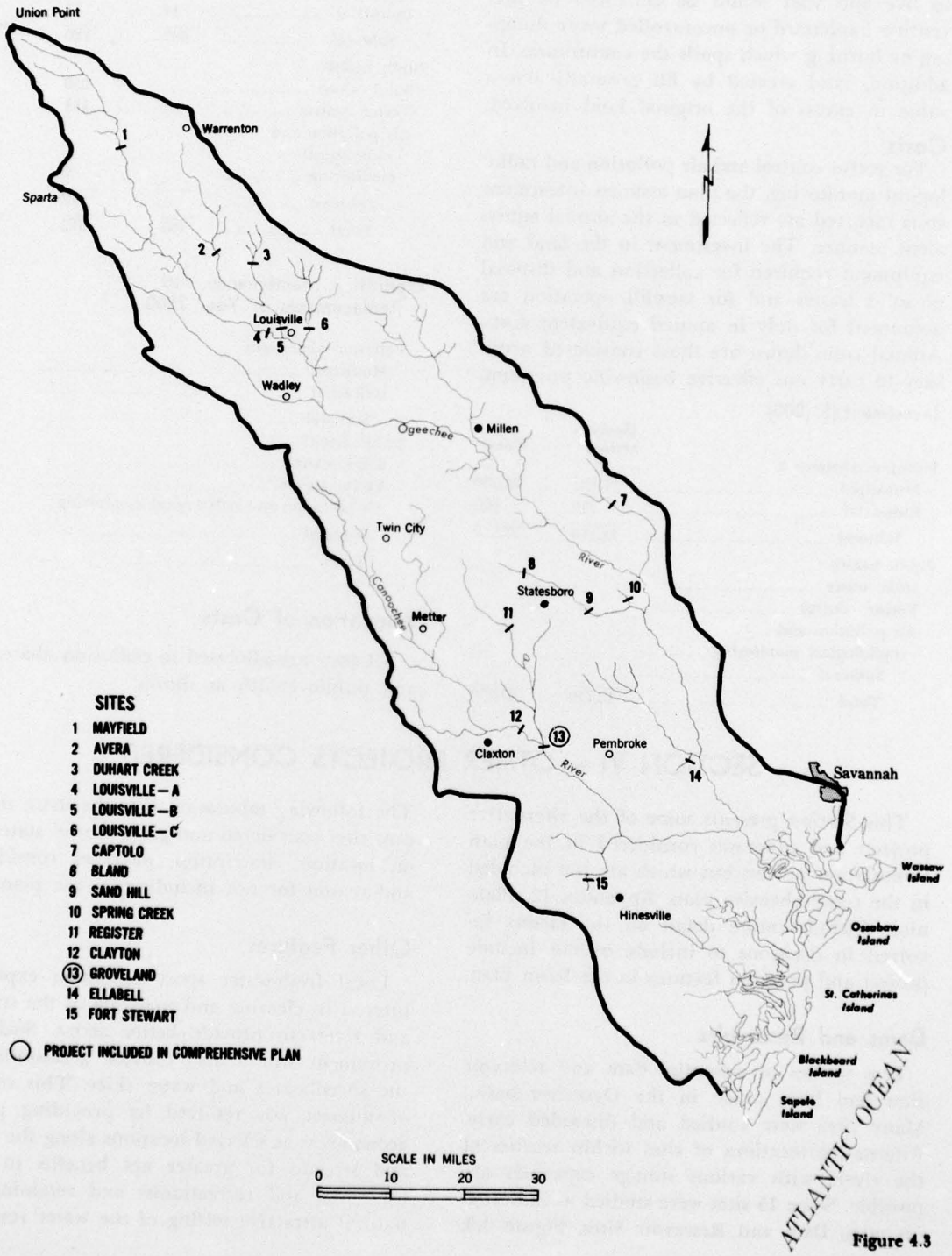


Figure 4.3

The lower reaches of the rivers are clear of obstructions and are available to the speedboater, water skier, and other recreationists.

Preliminary studies were made of storage sites in the Piedmont province to determine feasibility of providing municipal water for towns in that area. For one location, the results indicated that, while reservoirs could be developed for surface water supply, the costs would appear unreasonable when compared to further development of the limited ground water supply. For another location, the studies indicated that the recorded 7-day minimum flow at the surface stream at supply point would meet projected needs to the year 2000. Storage at this location would provide water in excess of projected municipal water needs.

Name of project not included in plan	Key number on Figure 4.3	Location	Description	Purpose*	Reason for not including in plan
Mayfield	1	On Ogeechee River, 9 miles W. of Warrenton, Georgia	Dam and reservoir	P,R,F&W	Not economically justified
Avera	2	On Rocky Comfort Creek, 15 miles NW. of Louisville, Georgia	Dam and reservoir	F&W,R,PA	Not economically justified
Duhart Creek	3	On Duhart Creek, 11 miles NW. of Louisville, Georgia	Dam and reservoir	F&W,R,PA	Not economically justified
Louisville-A	4	On Ogeechee River, 3 miles W. of Louisville, Georgia	Dam and reservoir	P,R,F&W	Not economically justified
Louisville-B	5	On Rocky Comfort Creek, NW. city limits Louisville, Georgia	Dam and reservoir	F&W,R,PA	Not economically justified
Louisville-C	6	On Big Creek, 3 miles E. of Louisville, Georgia	Dam and reservoir	F&W,R,PA	Not economically justified
Captolo	7	On Ogeechee Creek, 23 miles SE. of Millen, Georgia	Dam and reservoir	R,F&W	Park in Jenkins County better alternative
Bland	8	On Mill Creek, 7 miles NW. of Statesboro, Georgia	Dam and reservoir	PA	Not economically justified
Sand Hill	9	On Mill Creek, 3 miles E. of Statesboro, Georgia	Dam and reservoir	PA	Not economically justified
Spring Creek	10	On Spring Creek, 8 miles E. of Statesboro, Georgia	Dam and reservoir	R,F&W	Not economically justified
Register	11	On Lotts Creek, 8 miles SW. of Statesboro, Georgia	Dam and reservoir	R,F&W	Not economically justified
Claxton	12	On Canoochee River, 4 miles NE. of Claxton, Georgia	Dam and reservoir	R,F&W,P	Groveland better alternative
Ellabell	14	On Little Creek, 12 miles E. of Pembroke, Georgia	Dam and reservoir	R,F&W	Riverside park better alternative
Fort Stewart	15	On Taylor Creek, 5 miles NW. of Hinesville, Georgia	Dam and reservoir	R,F&W	Not economically justified

*P--Power
R--Recreation
F&W--Fish and wildlife
PA--Pollution abatement

PART FIVE – CONCLUSIONS

DISCUSSION

The Ogeechee basin area has the potential for continued population and personal income growth through the year 2000. Realization of the projected levels of income depends upon a continuing rise in the productivity of the basin workers. Increased productivity will require substantial improvements in the level of education and training afforded the individuals in the basin labor force. The well-established trend toward urbanization will be a major influence on future needs for land and water resources.

Land and water resources development is one of a series of interrelated, economic, and social developments or adjustments required to attain levels of growth projected for the area as part of the highly competitive national economy. The plan of development set forth in Part Four of this Report reflects efficient use of the basin resources to meet the basin share of the projected area and national needs to the year 2000.

The plan for land and water resource use, conservation, and development presented herein can contribute much to increasing the income and general well-being of the people in the Ogeechee basin. This plan could also contribute to national, regional, and State economies and provide an attractive vacation and leisure-time area for thousands of people. It is expected that some facilities would be developed in the natural course of events, but greater returns at less costs can be accomplished through planned development. The Ogeechee basin, aided by this plan of resource development, can be expected to produce $102 million worth of agricultural products, $14.1 million worth of timber products, and about $750,000 worth of gum-naval-stores products annually by the year 2000. It will accommodate 10 million user-days annually of public outdoor recreation, 883,000 user-days of sport fishing, and 279,000 user-days of hunting. The population is expected to total 267,700 by the year 2000 and have 73,700 persons employed. The per capita income, in 1960 dollars, is expected to reach $3,240 by the year 2000.

The plan as a combined non-Federal and Federal effort would meet projected needs to the year 2000 for land and water resource development. However, the plan, to be effective, must be transformed into actual programs and projects. Those projects which appear to make the most economical use of available resources and are needed to serve immediate needs or must be installed or initiated early to meet ultimate needs, have been included in the plan for early development. In a number of instances, more detailed evaluations will be necessary before project initiation. Since the plan is based on long-term assumptions and projections, it needs continuous review and periodic revisions to insure that it is properly responsive to changing times and conditions.

CONCLUSIONS

The Commission concludes that:

(1) The basin lands have the potential for production of food and fiber at several times the present rate, which will be more than adequate to supply the needs of the basin and its share of regional and national requirements. The nonagricultural requirements for land will cause no serious restriction on agricultural production, and there is adequate land for the projected growth of urban areas with the accompanying industrial and service activities.

(2) If wisely developed and used, sufficient water is available to meet all foreseeable requirements for human comfort and health and for needed expansion of industry and recreation, agriculture, forestry, and for fish and wildlife. Water is favorably distributed in relation to development possibilities and seasonal demands,

except in a few localities. Water quality is generally suitable for most needs and, when desirable, can be improved to satisfactory quality for all uses by conventional treatment methods.

(3) Flood damages are locally significant; however, for the basin area as a whole, flood damages are not a major problem. Expansion of activities in flood plains will worsen this condition if preventive measures are not taken. Projects and programs in the comprehensive plan will alleviate some of the more concentrated flood problems existing or likely to develop. Proper flood plain management can obviate the need for structural improvements in some areas. This is particularly desirable and more practicable of accomplishment where pressure for building on flood plains has not yet developed. Also, there is a need for continuation and expansion of flood forecasting and warning systems in the basin.

(4) There are no major water supply deficiencies in the basin. Substantial quantities of ground water are available in the Coastal Plain. In the Piedmont province, where subsurface formations have little capacity for ground water storage, the ground water supply is limited, but there are numerous opportunities for storage of surface runoff.

(5) The traffic handled on intracoastal and inland waterways will continue to play a significant role in the basin economy.

(6) Projected requirements for food and fiber can be met through a continuation and acceleration of current practices and programs with some land use changes. Individual operators are expected to install both drainage and irrigation facilities for crop insurance and improved uniformity in agricultural products as well as increased production.

(7) No improvements are included in the plan for the development of hydroelectric power in the basin. Electricity generated in or near the basin area can serve the basin needs at reasonable costs.

(8) Industrial expansion is a key factor in supporting the projected income growth in the basin area. The levels of industrial growth reflected by projections are practical of attainment, but a concerted effort is required of all concerned to establish a suitable environment including favorable financing, education and training, and a suitable legal, institutional, social, and political climate. Much has been done along these lines in recent years. Much more remains to be done.

(9) Conservation treatment has been applied to about half of the cropland, pastureland, and rangeland of the basin. However, soil erosion continues to be a problem. The application of erosion control measures and other conservation treatment measures will contribute to the attainment of production goals, and they are especially important in the conservation of soil and water resources for the future.

(10) Improved woodland management and protection practices have resulted in a substantial improvement in the timber supply and naval stores production outlook in the area. Annual merchantable wood growth now exceeds the annual harvest and mortality. Projected levels of production can be met with accelerated forestry programs.

(11) The commercial fishing industries whose sustained development has been hindered by many obstacles in recent years requires a broader scope of operations to reach their potential contribution to the economic growth of the region. Despite the natural productivity of the seas, it will become increasingly difficult to harvest the wild crops at costs permitting these fishing industries to compete with imports and the mass production and marketing methods of related food industries. New programs are needed to demonstrate the feasibility of producing certain fishes for food and industrial purposes in waters where the environment may be regulated and to study ways and means of reducing costs.

(12) The projected wildlife and sport fishery developments can meet the needs for hunting and fishing opportunity with more intensive management of existing habitat and development of new management areas at strategic locations except for desired levels of waterfowl. Adjustments will have to be made, however, in response to changing needs and in recognition of the fact that the prospects are better for increasing the supply of some forms of wildlife and fish than for others.

(13) Resident and nonresident demands for outdoor recreation are rapidly exceeding the

capacity of developed facilities in the area, particularly in the vicinity of Savannah and adjacent to the principal north-south transportation routes. Lack of public access to water areas looms as a major problem. The inclusion of large reservoirs in the overall plan of the study area, along with utilization of small reservoirs, streams, salt-water areas, and land areas is designed to provide a balanced recreation program. The Ogeechee basin has the natural advantages to increase its share of the growing national business and to meet the needs of the resident population.

(14) Soil salinity does not constitute a major problem in the basin. The problem of salt-water intrusion of fresh-water aquifers, while a threat in some coastal areas of heavy ground water withdrawals, such as in metropolitan Savannah, can be obviated by judicious control of withdrawals or by storage of surface water. Sedimentation problems are not serious and satisfactory sediment control can be achieved largely through soil conservation practices.

(15) Although waste water from many sources is adequately treated, much raw or inadequately treated sewage and industrial waste is still discharged directly into basin area streams. As population grows and industry expands, the pollution problems will intensify if proper control measures are not taken.

(16) Beach erosion and hurricane damage are problems in coastal reaches of the basin area and additional studies are required to evaluate these problems and to find solutions.

(17) The future development and conservation of the basin land and water resources will be largely a product of non-Federal initiative, financing, and follow through, but cooperation between Federal and non-Federal entities is required for implementation of the comprehensive plan. Cooperation among the several counties and the State of Georgia in resource developments of mutual interest is essential. It follows that resources development projects and programs in the basin area are in large measure the financial responsibility of non-Federal interests, but Federal assistance would be required for part, or all, of some of the proposals in the compresensive plan.

(18) Because the intiative of the non-Federal interests is vital to successful implementation of a plan for land and water resources development, and because the benefits from some of these developments, notably fish and wildlife and recreation, are often not readily apparent, it is deemed necessary to make provision in the plan for projects to demonstrate these impacts. Special cost-sharing arrangements appear warranted in connection with the Groveland project, if it were developed early to demonstrate what might be accomplished on this type of project both as to benefits and also as to ways and means of collection from the beneficiaries portions of the cost of the facilities.

(19) There are several important considerations which would facilititate the implementation of the comprehensive plan and provide for orderly review and adjustment of it. Basic data and interpretations of basic data are now insufficient for many detailed planning purposes. Programs are needed at an early date to obtain suitable topographic maps and data on geology, runoff, streamflow, water quality, water use, and economic responses to land and water resource development.

(20) In the course of implementing the comprehensive plan and keeping it responsive to changing conditions, it will be necessary to recognize the existing water laws in relation to the development contemplated in the plan.

(21) The projects and programs described in Part Four are elements of a basic, integrated, and comprehensive plan of development of the land and water resources of the basin. The basin and its people have the physical, economic, and institutional abilities for the resources development needed to support the basin economy at satisfactory levels. Development of the basin resources as planned herein would assist greatly in obtaining optimum public benefits from use of the area resources.

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 Commerce—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

Photograph Credits

Figure	Furnished by
1.3	U. S. Soil Conservation Service
1.6	U. S. Soil Conservation Service
1.15	U. S. Soil Conservation Service
2.6	U. S. Soil Conservation Service
2.7	U. S. Soil Conservation Service
2.11	U. S. Soil Conservation Service
2.12	U. S. Soil Conservation Service
2.14	Georgia Forestry Commission
2.15	Georgia Forestry Commission
2.19	Florida Game and Fresh Water Fish Commission
2.21	Georgia Department of State Parks
2.22	Georgia Department of State Parks
2.26	Georgia Department of Public Health
All other	U. S. Study Commission Staff