VOLUME I

NORTHEAST GULF RIVER BASINS

FLORIDA, ALABAMA, AND GEORGIA

COOPERATIVE SURVEY

Copy 2

prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE
ECONOMIC RESEARCH SERVICE
FOREST SERVICE

in
cooperation with

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

and

STATE OF ALABAMA
ALABAMA DEVELOPMENT OFFICE

JUNE 1977

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V O L U M E   I

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NORTHEAST GULF RIVER BASINS
VOLUME I

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CHAPTER I. SUMMARY

The States of Florida and Alabama are intensely interested in their water and related land resources and have requested the Secretary of Agriculture to cooperate in a study of these resources in the Northeast Gulf River Basins. Participation in this Type 4 cooperative study by the USDA is under the authority of Section 6, Public Law 83-566 as amended. The principal participating agencies within USDA are the Soil Conservation Service, Economic Research Service, and the Forest Service. The sponsoring state agencies are the Florida Department of Environmental Regulation and the Alabama Development Office. Presentation of data for the study includes an Executive Summary, Volume I, and the Appendix to Volume I. Volume II will be published at the completion of the study.

This study is an appraisal and evaluation of the opportunities, problems and needs, and a reflection of society's preference for preservation, conservation, development, and productive use of the water and related land resources within the Basins. The major objectives are National Economic Development (NED) and Environmental Quality (EQ). The NED objective includes increasing the national income through efficient use of employed resources and increased utilization of unemployed and under-employed resources. The other major objective, EQ, includes the preservation and improvement of the visual quality of the landscape, the quality of land, air, and water resources for all uses, and the aspects of the environment that contribute to the overall well-being of man.

Specific objectives that relate to the major objectives - NED and EQ - were determined during the course of the study through public involvement. Differences in individual tastes and preferences preclude establishment of a plan which is completely satisfactory on an individual basis; however, the study will make a contribution toward accomplishing the goals set by the objectives.

The Northeast Gulf River Basins are located in north Florida, southeast Alabama and south Georgia (Figure III-1). The total area of these Basins is about 24.8 million acres. Approximately 34 percent of Florida's land and water area is located within the Basins, 22 percent of Alabama's and 13 percent of Georgia's area.

The State of Georgia is not a sponsor of the Northeast Gulf River Basins Study; however, a limited amount of data from the Georgia subarea is included in this report. These data include factors that influence the quality and quantity of water entering Florida.

The climate of the area is generally mild in winter with severe cold usually lasting for only a few days. The summers are long and hot with the afternoons frequently bringing local thundershowers that can produce heavy rainfall over small areas. The average annual rainfall varies from a low of 45 inches in Wilcox County, Georgia to a high of 64 inches in Walton County, Florida. The growing season for the Basins varies from approximately 235 days in the northern part to approximately 300 days in the area along the Gulf.

The major land resource areas of the Basins, as defined in the "Atlas of River Basins of the United States", are Southern Coastal Plain, North-Central Florida Ridge, Gulf Coast Flatwoods, Atlantic Coast Flatwoods, Southern Piedmont, and Alabama and Mississippi Blackland Prairies. Approximately 17.5 million acres are in forest land, 4.0 million in cropland, and 1.5 million in pasture.

The topography is strongly rolling in the northern Alabama portions, gently to moderately rolling in southern Alabama and west Florida, and gently rolling to flat in the Georgia and eastern Florida part. Much of the south Georgia and Florida portion is youthful karst topography.

Nearly all of the Georgia and Florida subareas as well as the southern portion of the Alabama subarea are underlain by a limestone aquifer. This aquifer produces generous amounts of water but it is sometimes highly mineralized. The Basins have an abundance of ground and surface water of good quality for most uses. The streams of the area carry large volumes of fresh water to the Gulf each year as runoff. There are several large manmade lakes in the Basins, some of the largest of which are Lakes Eufaula, Seminole, Talquin, Harding, and West Point. There are few natural lakes in the Basins of a size to be of significance except for the immediate areas in which they are located. The largest natural lakes are Miccosukee, Santa Fe, and Jackson, all in Florida.

The inventories compiled for the study are the initial appraisal of the supply or availability of resources in the Basins that can be employed and the ability of these resources to meet needs without accelerated resource development. An analysis of the capability of the resources to meet near term (1990) and long range (2020) needs without accelerated development reveals the extent of unsatisfied needs and indicates the requirements for some accelerated plan of action to assure their satisfaction.

The economy of the Northeast Gulf Basins is basically rural. Tallahassee is the largest city with a 1970 population of 71,897 and only six other cities had populations exceeding 20,000 in 1970. Total population increased from 1.44 to 1.59 million between 1960 and 1970 which was much slower than the national rate of growth (13.3%). The majority of this increase occurred in the Florida subarea which increased 16.4 percent and practically no change in population was experienced in the Georgia subarea.

Employment in 1970 totaled over 542,000. The major categories of employment were services, manufacturing, wholesale and retail trade, and agriculture and forestry.

One of the major concerns in the Basins is low per capita income. Eight of the 66 counties predominantly in the Basins had average per capita incomes in 1970 that were less than half the national average of $4,235. Only one county had an average income that exceeded the national average and only 5 counties had averages that exceeded the Southeast average income (3,643). Low income and lack of employment opportunities have contributed to the slow population growth in the area. As an example, 45 percent of the counties lost population between 1960 and 1970, 27 percent gained in population, but at a rate slower than the nation as a whole, and 27 percent gained population at a rate equal to or exceeding the national average. Total basin population increased 9.5 percent while total non-white population declined 1.8 percent during this ten-year period. This slow population growth makes it difficult to provide a tax base necessary for schools, hospitals, and other community facilities needed to reverse outmigration trends and to attract new residents. The value of farm sales in the Basins increased 43 percent during the last 10 years and reached 513 million dollars in 1969.

Farms numbers declined from 53,900 in 1959 to 35,700 in 1969. Average sales per farm increased from $6653 in 1959 to $14,366 in 1969. Livestock sales represented 40 percent of all farm sales in 1959 and increased to 52 percent in 1969. Cropland harvest declined from 2.7 million acres in 1959 to 2.1 million acres in 1969. Corn acreage in 1972 totaled 938 thousand acres and exceeded the acreage of all other crops. Soybean acreage quadrupled during the period of 1959 to 1969 and was second in acreage in 1969 with 454 thousand acres. Cotton, peanuts, and tobacco are also important cash crops.

Forest resources make a significant contribution to the economy of the basins. Salaries and wages paid to workers employed in all forest industrial firms of the basins in 1972 amounted to more than 195 million dollars. The average annual value of raw material (logs, pulpwood, naval stores) from timber stands is in excess of 165 million dollars. Most outdoor recreational enterprises use forest land as the ideal environment in which to provide their clientele with satisfying outdoor experiences.

Many avenues for improving utilization of all forest resources are open to forest land managers, especially under existing federal and state forest resource development projects.

Petroleum production is becoming increasingly important in west Florida and south Alabama. Mineral production in the remainder of the area includes mostly sands and gravels for concrete aggregate, agricultural limestone and dolomite, and moderate amounts of clays for brick and tile.

Approximately 1.2 million acres of cropland need conservation treatment to prevent erosion which reduces upland productivity and income and decreases visual quality of the landscape. Sediment resulting from soil erosion creates further problems downstream in the form of damages to bottomland timber, water quality, roads, and fishery resources, and causes flooding of agricultural and urban areas due to the filling of streambeds and channels.

Drainage problems exist on approximately 55,000 acres of cropland in tillage rotation and adversely affect farming operations through loss of production inputs and reduced yields. Additionally, excess water has detrimental effects on the non-agricultural sector of the economy in the form of unhealthy living conditions as well as to the physical damages caused by floodwaters.

The lack of flood plain zoning in urban areas has historically encouraged the development of residential and commercial property along the coast, streams, and rivers, where the hazards of flooding are greatest. This problem will continue and will increase in the future unless additional flood plain zoning regulations are imposed and proper land use planning is implemented. Flood insurance may be obtained for some existing structures.

Improper land use and uncoordinated planning contribute to erosion, flooding, poor water quality, and degradation of the visual and physical quality of the countryside. All of these problems are interrelated in that they adversely affect the lives of all the people in terms of income, health, environmental quality and attractiveness of the area as a place to live, work, and recreate.

Other problems, including inadequate quantity and quality of water supplies, underdeveloped human or natural resources, pollution of land, air and water, localized areas of low income, and the lack of recreational opportunities have been identified.

Opportunities for resolving water quantity and quality problems and meeting water needs within the study area are wide and varied. Numerous water storage sites are located throughout much of the study area. These sites could be developed to satisfy the water needs for cities and industries, and for recreation, ground water recharge, fish and wildlife, and stream flow nourishment.

Surface water reservoirs could be developed near the coastal areas of west Florida to supply municipal and industrial water for the beaches, towns, and cities. This would give some relief for the accelerating ground water demand and reduce the probability of further saltwater intrusion into the shallow aquifers.

Stream flow is generous and relatively free of pollutants. However, there are some stream reaches where pollution is a problem. On the basis of volume, sediment is the greatest contributor to pollution of the streams. State and local agencies as well as landowners should accelerate planning and implementation of conservation measures and forestry improvement practices to reduce erosion and sedimentation.

Within the Basins there are large wetland areas that are virtually untouched in regard to the natural systems. There is an opportunity to identify the most important areas and exercise appropriate regulation or control to assure their continued beneficial role.

CHAPTER II. INTRODUCTION

Study Authority and Sponsorship

The Northeast Gulf River Basins study, a type 4 cooperative survey authorized by Section 6, Public Law 83-566 as amended, was initiated in 1972 by request of the governors of Alabama and Florida. State agencies serving as study sponsors are the Alabama Development Office and Florida Department of Environmental Regulation. Within the United States Department of Agriculture, the principal participants are the Soil Conservation Service, Economic Research Service, and Forest Service.

Nature and Scope

The states of Alabama and Florida, concerned with the condition of and future demands on water and related land resources, requested the United States Department of Agriculture to study these resources in light of present and future use and the impact such uses will have on the economic, social and cultural well being of society.

Principles and Standards as published by the U. S. Water Resources Council on September 10, 1973 (see Federal Register, Volume 38, Number 174, Part III) serve to guide USDA in conducting the study to identify future water and related land resource problems. The study also provides alternative solutions that conform to the Principles and Standards.

Data collected and analyzed by the study will aid the respective states in developing their water and land use management plans. State planning agencies, county governments, multi-county planning districts and water management districts, special interest groups, and individuals are prospective users of information provided by the study.

The USDA Field Advisory Committee coordinates the Department's study activities and procedures including preparation and review of reports and recommendations, arranging overall schedules of work, and maintaining proper liaison with State sponsoring agencies and cooperating Federal agencies.

The Field Advisory Committee is composed of the Florida State Conservationist, Soil Conservation Service (Chairman); Leader, Southern Resource Group, Economic Research Service; and Field Representative, Southeastern Area, Forest Service. Proper liaison is maintained by the Chairman with the State Conservationists of Alabama and Georgia.

The study is being conducted in two phases for timely and efficient utilization of resources. Phase I consists primarily of setting specific objectives under the major objectives, inventory and projections of resources, general treatment of problems and needs and documentation of these items in Volume I. Inventory data is available to the Florida and Alabama sponsoring agencies as it is collected and analyzed. Much of the data is organized along basin, sub-basin, state and county lines to facilitate its usefulness. Field examinations were made and reports prepared for those areas having significant flooding, erosion, or other problems.

Phase II involves the formulation of alternative plans to solve problems and contribute to the attainment of the specific objectives. These plans will be evaluated and the components of each plan will be displayed in terms of the beneficial and adverse effects on the major study objectives. A recommended plan will be selected which will be a combination of the most desirable features of the alternative plans, and will reflect the priorities and preferences expressed by the public and the State sponsoring agencies. U.S.D.A. will have responsibility for preparing a report documenting the alternative plans that were considered, the recommended plan, and opportunities for plan implementation under U.S.D.A. and other programs.

The Northeast Gulf River Basins Suudy began in July of 1972 and is scheduled for completion June 30, 1978. The base year for the study is 1972. Projections are for 1990 (short range) and 2020 (long range).

The intensity of the study is reconnaissance in nature. More detailed investigations and analyses will be needed prior to the implementation of specific programs and projects.

Objectives

In order to appraise and evaluate opportunities, problems and needs, and to reflect society's preference for preservation, conservation, and productive use of the Basins' water and land resources, the major objectives of the study are:

1. National Economic Development (NED)

    a. Increase national income
    b. More fully utilize unemployed or underemployed resources

2. Environmental Quality - (EQ)

   a. Preserve and improve the visual quality of the landscape.
   b. Preserve and improve the quality of land, air, and water resources for all uses.
   c. Preserve and improve the aspects of the environment that relate to human use and interest.
   d. Preserve and utilize important ecosystems to maintain and improve environmental quality.

In formulating plans to accomplish the major objectives, beneficial and adverse effects of study proposals will be evaluated and displayed under four accounts - National Economic Development, Regional Development, Environmental Quality, and Social Well-Being.

Neither major objective has any greater inherent claim on how water and land resources will be used than the other objective.

Specific objectives as listed below are tentative and are subject to revision and refinement as the study progresses. These objectives were determined by the USDA study team in cooperation with state agencies, regional planning agencies, and individuals. The USDA River Basin Study is not expected to satisfy all the objectives; however, the study will make a contribution toward accomplishing the goals set by the objectives. The specific objectives are to:

1. Improve per capita income by reducing underemployment and unemployment in the planning area.

2. Provide information on sources of air and water pollution and determine probable solutions.

3. Determine the needs for preservation and management of wetlands.

4. Manage fish and wildlife resources and habitat, and provide information on rare and endangered species.

5. Identify ways to protect the bays, estuaries, and coastal areas from environmental degradation.

6. Reduce sediment and erosion and assess conservation land treatment needs.

7. Manage agricultural resources so as to meet projected need for food and fiber.

8. Manage soil resources and recommend adjustments in land use to meet urban, agricultural, environmental, and recreational needs.

9. Identify and analyze potential water storage sites to meet projected municipal, industrial, agricultural, and recreational needs.

10. Provide information on the mineral resources of the area.

11. Provide outdoor recreational opportunities.

12. Improve management of all forest resources - wood, water, wildlife, recreation, and forage - to achieve production consistent with multiple-use practices; and specifically to:

    a. Identify problems in marketing primary forest products and recommend solutions;

    b. Improve wood utilization practices, both in the forest and at the mill; and

    c. Minimize timber volume losses caused by major insects and diseases and by forest fires.

Public Involvement

Successful multiple objective planning is predicated on the basis of public participation and involvement. Study objectives reflect the interest of local people as well as those of state and national organizations. A series of public meetings were held throughout the study area. Active public participation in Phase I was mostly by agencies, organized groups, and elected representatives of the people.

Public involvement and decision-making will be extremely important during Phase II of this study. Alternative ways and means of handling problems and opportunities will be clearly displayed and trade-offs evaluated for the decision-makers. Selection of a recommended plan is to be made by the interested and relevant public or private groups consistent with the location, nature, and expected impact of the plan.

Acknowledgements

The USDA Field Advisory Committee gratefully acknowledges the assistance and cooperation of other Federal, state and local agencies, other groups, and individuals, that supplied data. Their efforts represent a substantial contribution to the study and this interim report. Such a study cannot be successfully concluded without their support and cooperation.

CHAPTER III. ENVIRONMENTAL SETTING AND NATURAL RESOURCES

Description of the Basins

The Northeast Gulf River Basins comprise an area of approximately 38,700 square miles, or 24,800,000 acres of land and water in southeast Alabama, north Florida and south Georgia. Forty-five counties are totally within the Basins and 32 are partially within. Of the total 77 counties represented, 31 are in Florida, 22 are in Alabama, and 24 are in Georgia (Figure III-1). Cities in the area include Pensacola, Ft. Walton Beach, Panama City, Tallahassee and Lake City in Florida; Dothan, Phenix City, Enterprise, and Ozark in Alabama; Moultrie, Thomasville, Tifton, and Valdosta in Georgia.

Principal rivers in the study area are St. Marys, Suwannee, Aucilla, St. Marks, Ochlockonee, Apalachicola (downstream from Jim Woodruff Dam), Chattahoochee (Alabama portion only), Choctawhatchee, Yellow, Blackwater, Escambia, and Perdido. The St. Marys River flows into the Atlantic. All other rivers flow into the Gulf of Mexico.

The Northeast Gulf Basins have been divided into sub-basin groups to facilitate the study and to make the data more useful (Figure III-2). The Florida subarea was also delineated by water management districts.

Climate

General

The climate in the Basin is mild and humid. The summers are long and hot while winters are usually short and mild. The climate is influenced by large cold air masses moving down from Canada and the Arctic that can cause temperatures to change rapidly. The passage of the leading edge of one of these air masses is called a cold front. In general, these air masses move from northwest to southeast and usually influence the weather conditions over the entire Basin in a short time. Rainfall usually occurs in advance of the leading edge of the front and precipitation is generally widespread and fairly uniform in amount. Summer weather is influenced more by local thunderstorms than by frontal type storms even though fronts may pass through the area at any time of year. These thunderstorms may bring intense rainfall in a short time over a relatively small area.

Temperature

The average annual temperature varies from 65°F in the north to 70°F in the southern part of the Basins (Figure III-3). The mean minimum January temperature varies from 34°F in the north to approximately 48°F along the Gulf Coast (Figure III-4). The mean maximum temperature in July is fairly uniform over the Basins, varying between 88°F and 92° (Figure III-4). Most areas in the Basins can expect approximately 90 days per year when the temperature will equal or exceed 90°F except for a small area along the Gulf Coast where temperatures of 90°F or above are experienced about 30 days per year. Areas near the Gulf Coast are not as subject to frost or freezing as are areas further inland. The mean length of freeze-free periods between the last 32°F reading in spring and the first 32°F reading in autumn varies from 240 days in the northern part of the Basins to 300 days along the Gulf Coast (Figure III-5).

Precipitation

Average annual rainfall is about 54 inches in the Basins and varies from a low of approximately 45 inches in Georgia to over 64 inches in the panhandle area of Florida (Figure III-6). Rainfall varies greatly from year to year at any particular location. The annual rainfall at Pensacola in a 70-year period has ranged from 35 inches to over 90 inches. Seasonal variation of rainfall is not extreme, but the spring and summer months are usually the wettest with the fall being the driest. The nearness of the Gulf of Mexico is a major reason for the plentiful rainfall especially during the summer months. Tropical storms and hurricanes have been known to release 8 to 12 inches or more rainfall in a single day over large areas of the Basins.

Wind

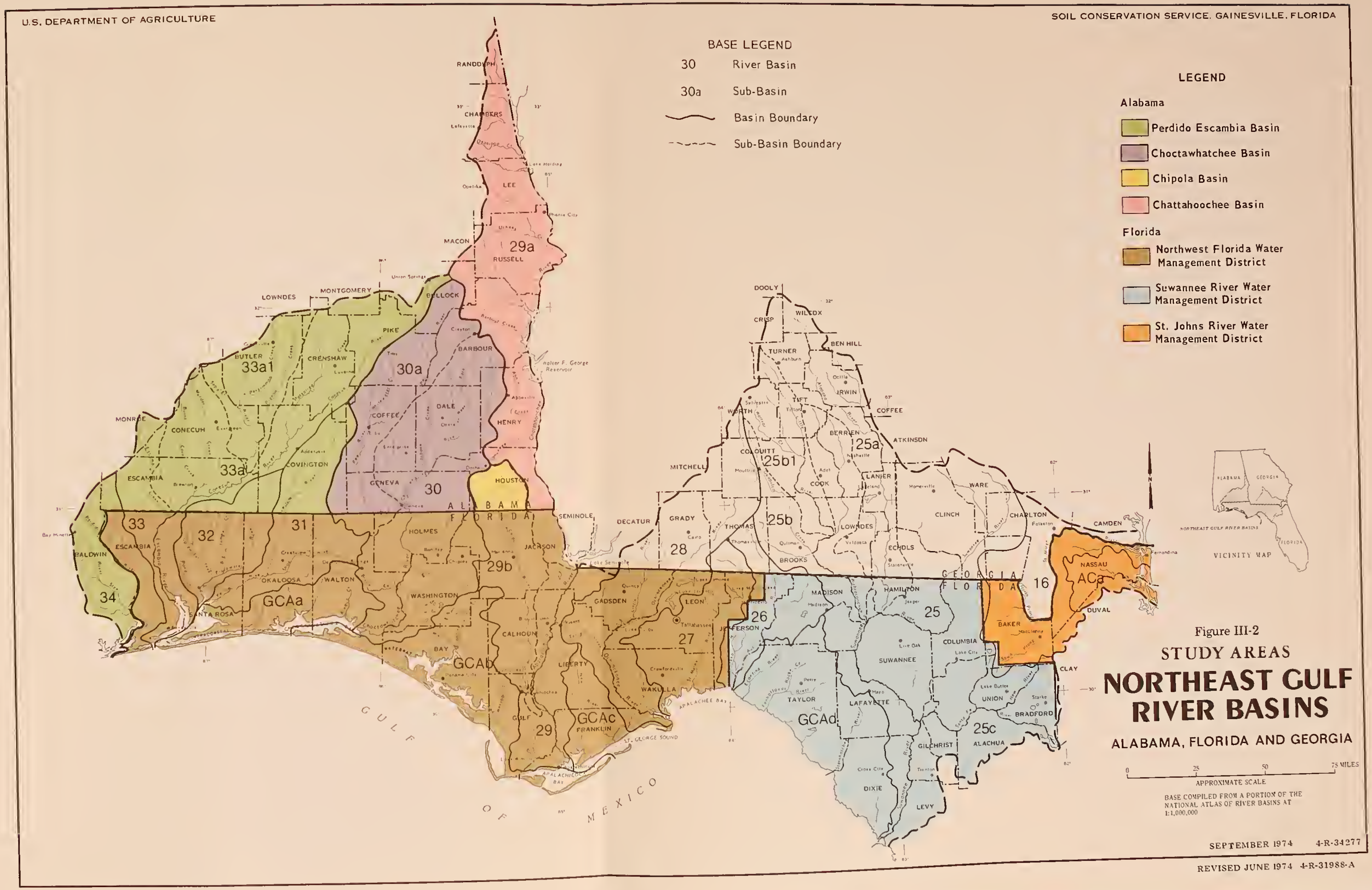
Wind in the Basins is normally less than ten miles per hour but during the passage of a storm can exceed 50 miles per hour (Table III-1). Tornadoes occur rather frequently and winds over a small area can exceed 200 miles per hour during the passage of a storm of this type. Tornadoes, funnel clouds, and waterspouts are all similar and average 10 to 15 per year for the State of Florida according to the National Oceanic and Atmospheric Administration[1/]. Tornadoes are the most destructive storms that occur in the Basins, but they do not cause the widespread damages that accompany hurricanes. Tornadoes can occur at any time during the year but are most frequent during the spring.

1/ Climate of Florida, National Oceanic and Atmospheric Administration Environmental Data Service

Figure III-1
NORTHEAST GULF RIVER BASINS
ALABAMA, FLORIDA AND GEORGIA

USDA-SCS-FORT WORTH, TEXAS 1977

REVISED JUNE 1974 4-R-31988-A



USDA-SCS-FORT WORTH, TEXAS 1977

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SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA

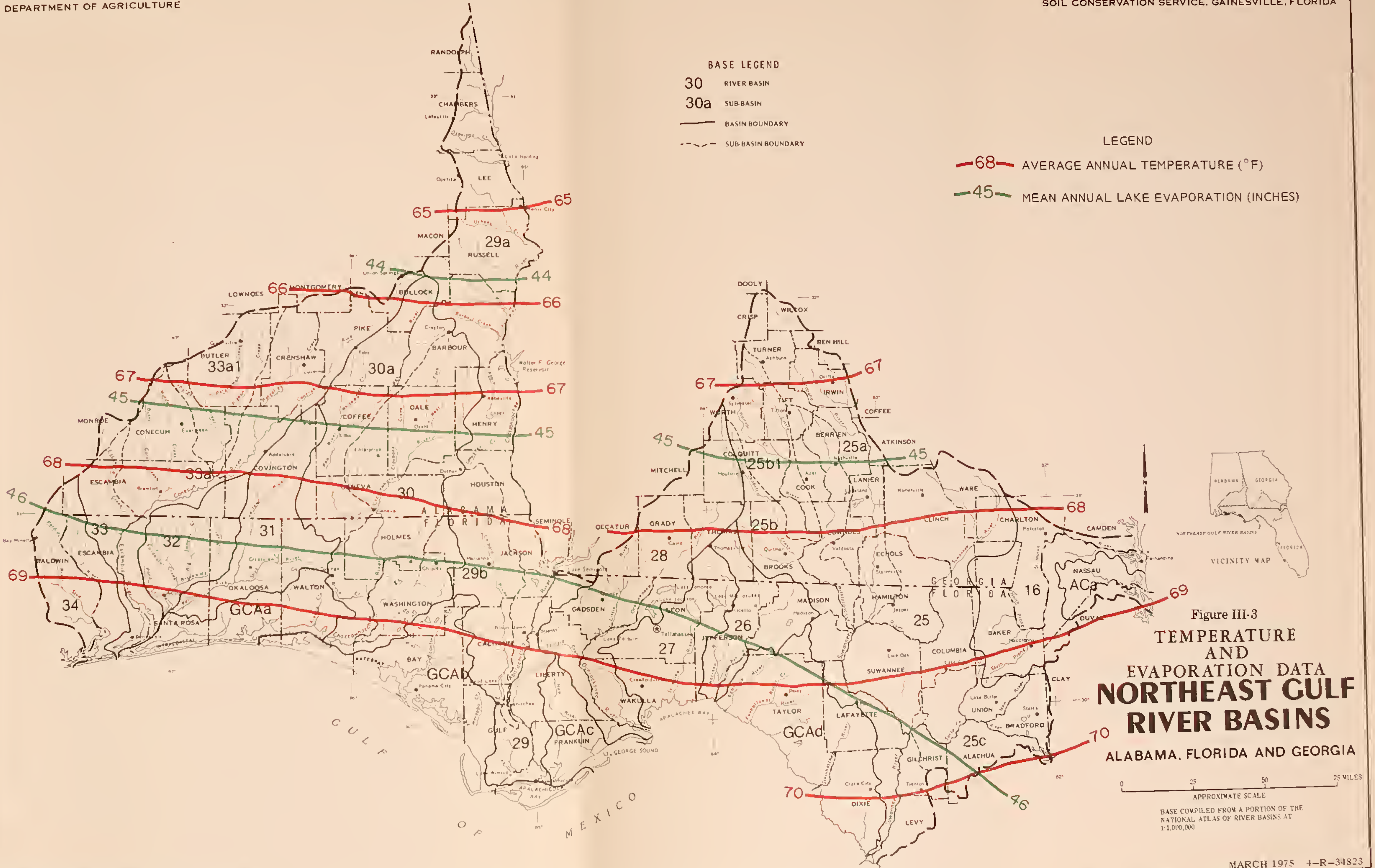


Figure III-3

TEMPERATURE AND EVAPORATION DATA
NORTHEAST GULF RIVER BASINS
ALABAMA, FLORIDA AND GEORGIA

BASE COMPILED FROM A PORTION OF THE NATIONAL ATLAS OF RIVER BASINS AT 1:1,000,000

MARCH 1975 4-R-34823

REVISED JUNE 1974 4-R-31955-A

Temperature lines from unpublished Weather Bureau Maps
Evaporation Data from U.S. Dept. of Commerce, ESSA, Environmental Data Service.

USDA-SCS-FORT WORTH, TEXAS 1977

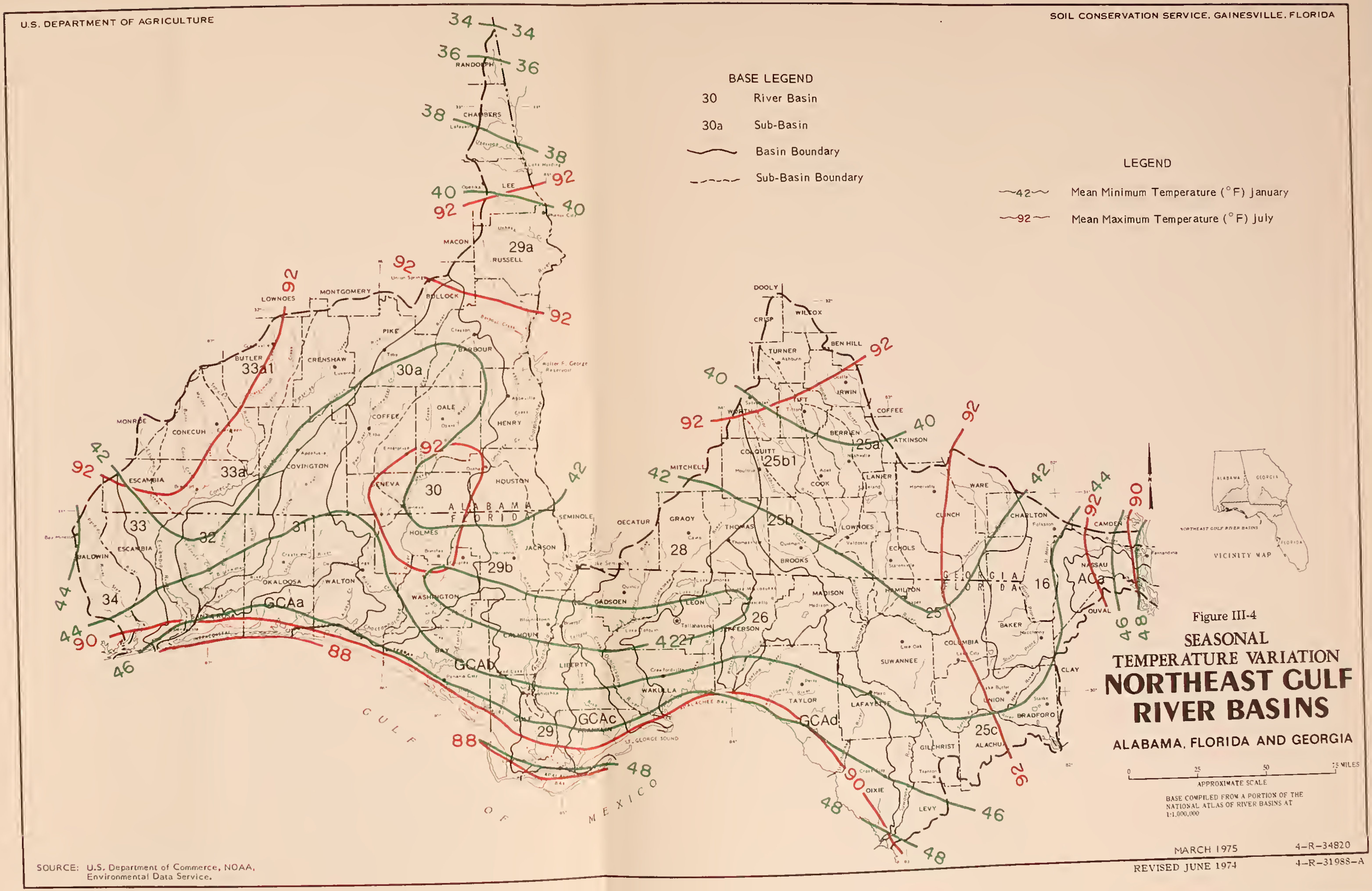


Figure III-4
SEASONAL TEMPERATURE VARIATION
NORTHEAST GULF RIVER BASINS
ALABAMA, FLORIDA AND GEORGIA

USDA-SCS-FORT WORTH, TEXAS 1977

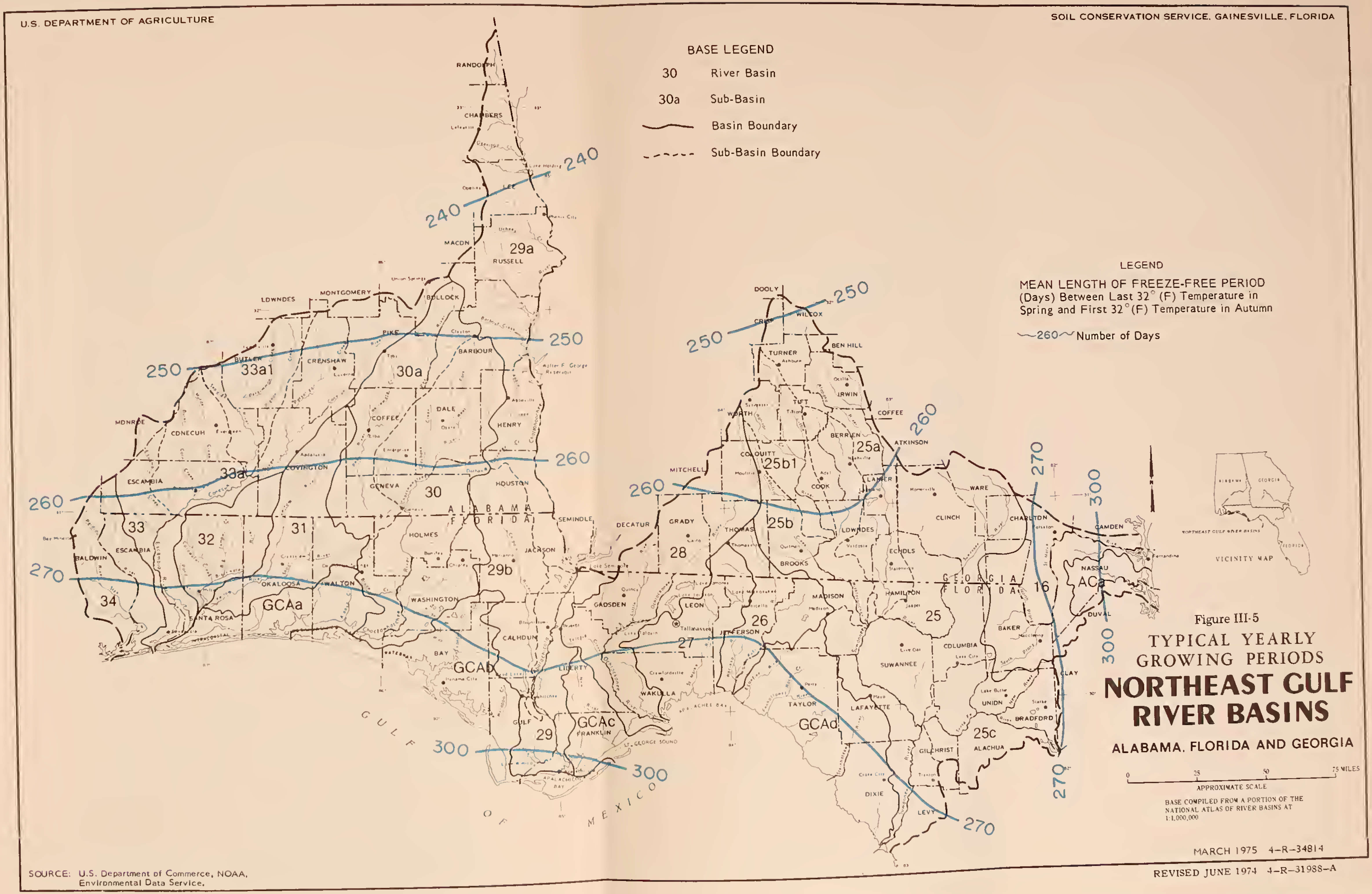
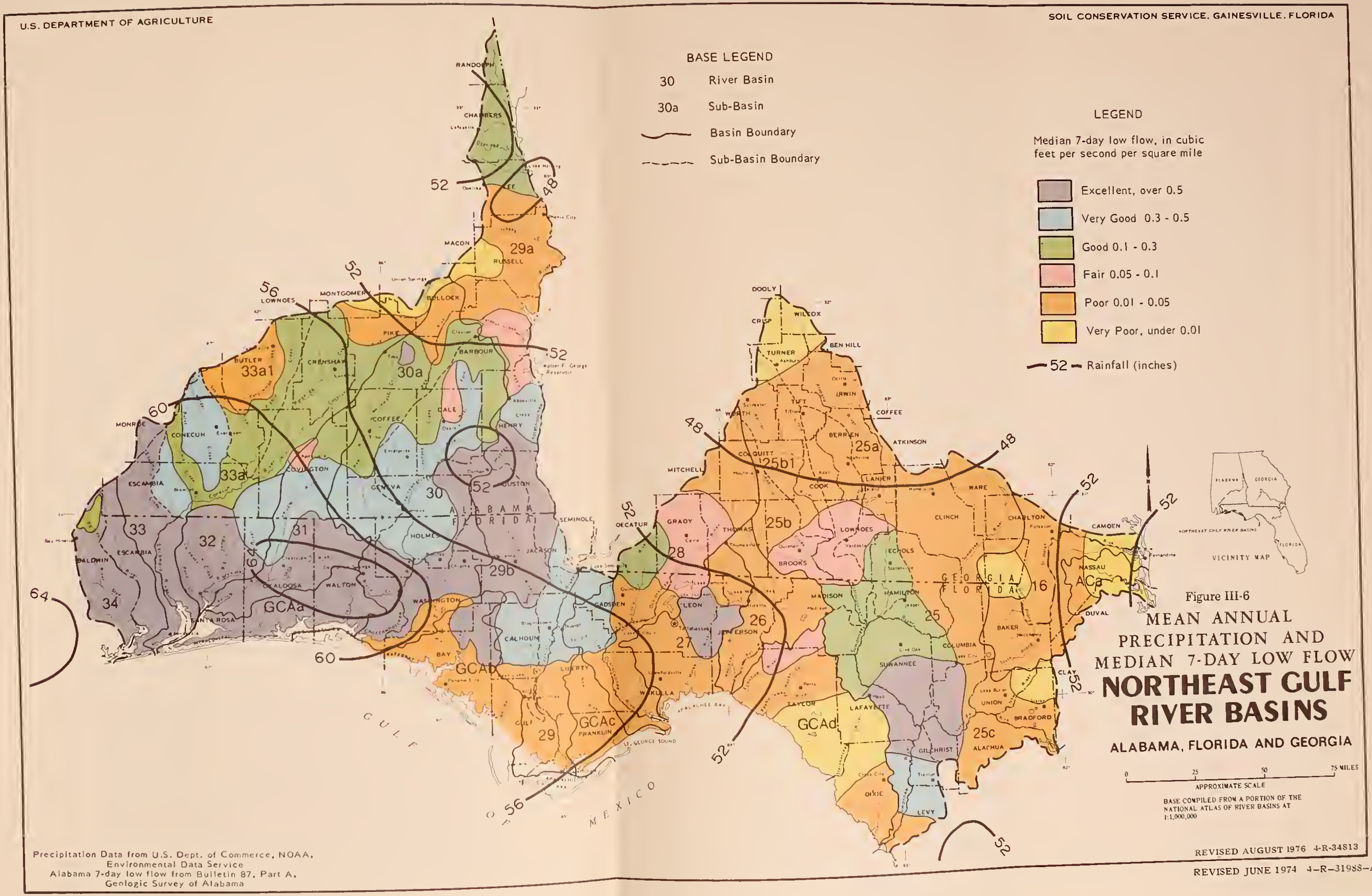


Figure III-5
TYPICAL YEARLY GROWING PERIODS
NORTHEAST GULF RIVER BASINS
ALABAMA, FLORIDA AND GEORGIA

USDA-SCS-FORT WORTH, TEXAS 1977



USDA-SCS-FORT WORTH, TEXAS 1977

Hurricanes are large tropical storms with sustained winds of over 74 miles per hour that form over warm water usually during the summer or fall. The National Oceanic and Atmospheric Administration has determined that the probability of hurricanes hitting Pensacola is one in every eight years; at Apalachicola-St. Marks it is one in every seventeen years. Tornadoes often occur in conjunction with hurricanes or other tropical storms.

Table III-1. Average annual and maximum recorded wind velocities representative of the Northeast Gulf Basins

Station	Years of Record	Average Annual MPH	Prevailing Direction	Maximum		
				Velocity MPH	Direction	Date
Apalachicola	29	8.0	N	67	E	Sept 1947
Jacksonville	90	8.8	NW	82	N	Sept 1964
Mobile	39	9.2	N	98	E	July 1916
Montgomery	49	6.8	S	60	SW	March 1952
Pensacola	22	8.8	S	114	E	Sept 1926
Tallahassee	30	7.3	N	58	NNE	Aug 1962

Geology & Physiography

General Geology

Formations which crop out in the Basins range from the Paleozoic or older crystalline rocks of the Piedmont to the unconsolidated Recent sands along the coasts.

The Coastal Plain sediments crop out in bands paralleling the contact with the Piedmont Crystalline rocks. These outcrops trend northeast to southwest in Georgia and east-west in eastern Alabama, becoming northwest to southeast in central and west Alabama and in the west Florida Panhandle. In the Florida Peninsular part of the Basins, the outcrop pattern generally follows the coasts.

The surface of the crystalline rocks dips under the Coastal Plain formations, generally at a right angle to the contact. These crystalline rocks underlie the sediments throughout the Basins at depths ranging from zero at the contact to more than 19,000 feet just outside the western boundary of the Basins in northern Mobile County, Alabama and 7500 feet in southeastern Houston County, Alabama. The southeastward dip in Georgia is more gentle. The crystalline rocks are at a depth of 5000 feet or more at the north Florida and south Georgia Atlantic Coast. These crystalline rocks are about 3500 feet below sea level on the crest of the peninsular arch in north central Florida, and dip east and west toward both coasts.

The sediments were deposited in a transgressing sea up to Upper Cretaceous times, then the younger sediments were deposited in a regressing sea. Thus, the sediments older than Upper Cretaceous occur only in the sub-surface and are covered by younger formations. The Upper Cretaceous formations dip under the younger sediments and are nowhere present on the surface outside the outcrop band adjacent to the Piedmont. The surface formations become progressively younger toward the coasts, and dip under the younger formations so that a well drilled on the coasts would penetrate all the outcropping sediments plus the pre-Upper Cretaceous sediments. These formations thicken downdip, as well as changing lithologically. The usual lithologic change is from course-grained sand and gravel updip to progressively fine-grained sand into silts and clays into limestone which become progressively more pure downdip.

Physiography

The physiographic divisions are delineated on the Physiographic Divisions Map (Fig. III-7). Divisions in Alabama are from "Report for Development of Water Resources in Non-Appalachia Alabama", Appendix G. The following descriptions of the Alabama divisions are modified from the above report. The divisions in Florida are from "Artesian Water in Tertiary Limestone in the Southeastern States", Geological Survey Professional Paper 517. Descriptions of these divisions are adapted from that publication.

Alabama - This portion of the Basins is almost entirely within the Coastal Plain Province with the exception of parts of Lee, Chambers, and Randolph counties which are in the Piedmont Province.

The Piedmont Upland section of the Piedmont Province is a sub-maturely dissected surface developed upon igneous and metamorphic rocks. The portion of the Piedmont area in the Basins is in the Opelika Plateau sub-division, an area that is without striking topographic features except in the vicinity of the Chattahoochee River. Elevations range from 500 to 800 feet above sea level (Fig. III-8). The Opelika Plateau is bounded on the south by the Fall Line Hills physiographic division of the East Gulf Coastal Plain section.

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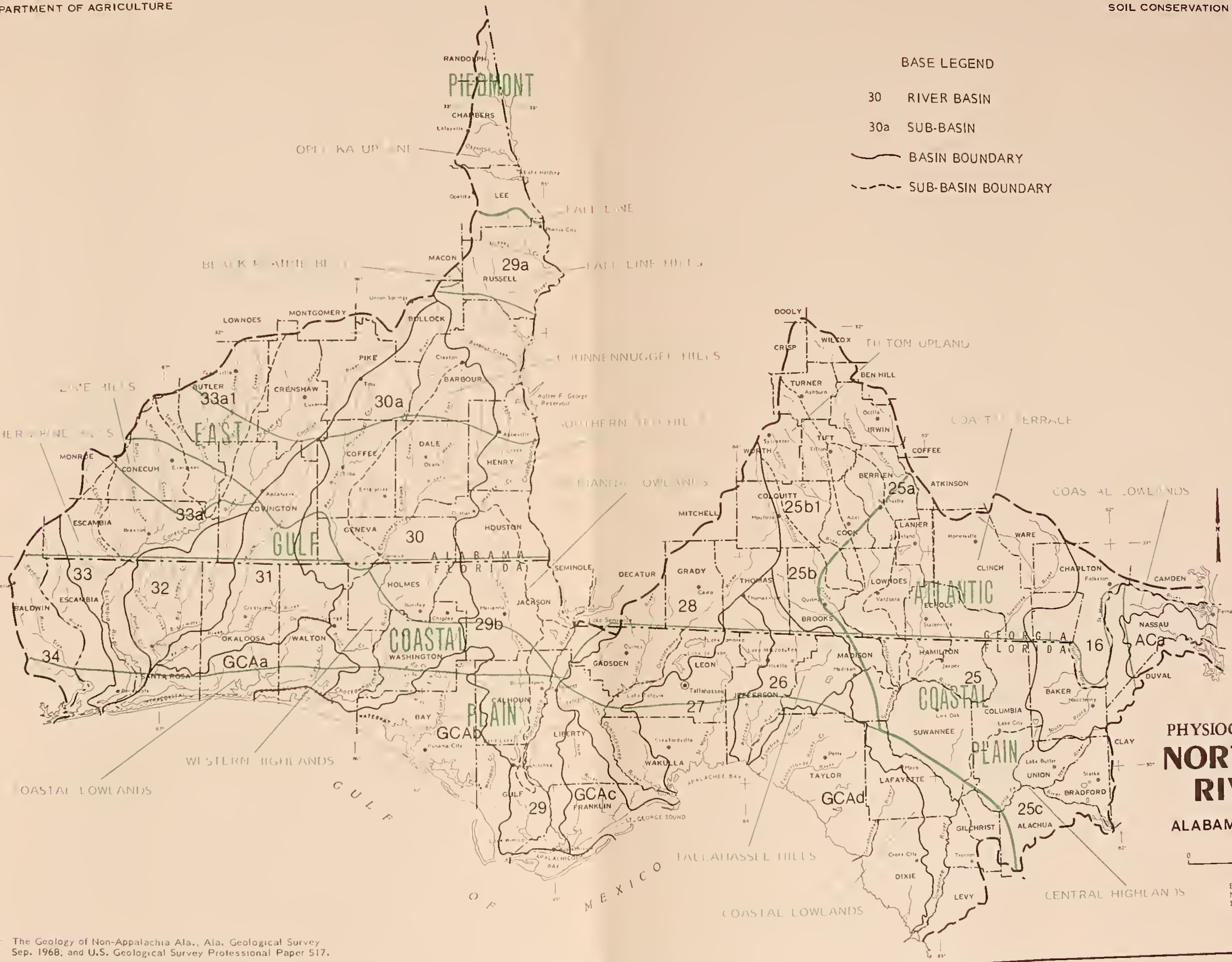


Figure III-7

PHYSIOGRAPHIC DIVISIONS MAP

NORTHEAST GULF RIVER BASINS

ALABAMA, FLORIDA AND GEORGIA

0 25 50 75 MILES

APPROXIMATE SCALE

BASE COMPILED FROM A PORTION OF THE NATIONAL ATLAS OF RIVER BASINS AT 1:1,000,000

SOURCE: The Geology of Non-Appalachia Ala., Ala. Geological Survey Sep. 1968; and U.S. Geological Survey Professional Paper 517.

REVISED APRIL 1977 4-R-34903

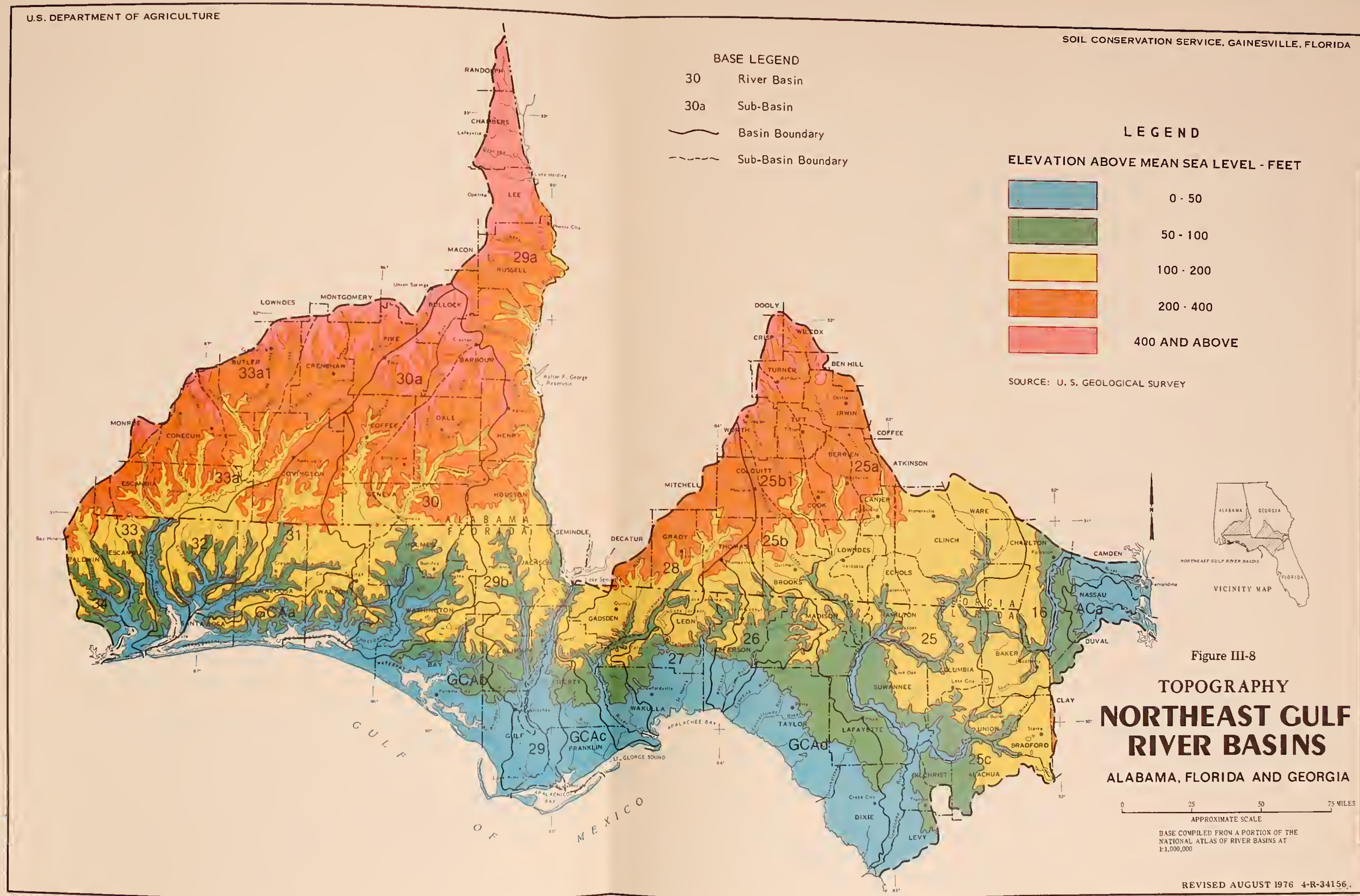


Figure III-8

TOPOGRAPHY

NORTHEAST GULF RIVER BASINS

ALABAMA, FLORIDA AND GEORGIA

USDA-SCS-FORT WORTH, TEXAS 1976 REVISED JUNE 1974

The East Gulf Coastal Plain section of the Coastal Plain Province is underlain by Mesozoic and Cenozoic sedimentary rocks which dip gently southward at 10 to 45 feet per mile. The resistant beds form cuestas that gently slope southward forming a series of arcuate, southeasterly to easterly trending hilly belts across the state. In Alabama, the section is divided into the Fall Line Hills, Black Prairie Belt, Chunnennuggee Hills, Southern Red Hills, Lime Hills, and Southern Pine Hills.

The Fall Line Hills is a dissected upland with a few broad, flat ridges separated by valleys ranging from 100 to 200 feet deep. The Fall Line Hills occupies a zone where streams descend from resistant Paleozoic sedimentary and Piedmont crystalline rocks to the less resistant sand and clay of pre-Selma age in the Coastal Plain. It has a maximum width in the Basins area of about 25 miles, and elevations range from about 700 feet at the northern edge to about 250 feet along the southern edge of the division.

The Black Prairie Belt lies to the south of the Fall Line Hills and occupies a narrow crescent-shaped area encompassing approximately 8,000 square miles, extending from western Tennessee and northern Mississippi into central Alabama. Only a very small part is in the Basins area. The area is characterized by an undulating deeply weathered plain of low relief, developed mainly on chalk and marl of the Selma Group. Because of the chalk and marl impurities and other factors, typical karst features that are generally formed in carbonate-rock terrains are missing. In central Alabama, the surfaces between the stream valleys lie at elevations of about 250 feet. The belt is not present in eastern Alabama because the formation changes from the dominant chalk of western and central Alabama to clays, silts and sands to the east.

The Arcola cuesta, supported by the resistant Arcola Limestone member of the Mooreville Chalk, occurs near the middle of the belt and trends eastward to southeast of Montgomery. The Arcola cuesta is characterized by a line of hills rising 50 to 75 feet above the surrounding prairie floor.

The Chunnennuggee Hills is a series of pine forested sand hills and cuestas developed on the Ripley formation and Prairie Bluff Chalk in western Alabama and the Blufftown Formation, Ripley Formation and Providence Sand in eastern Alabama. The hilly belt extends across most of the state. It widens in eastern Alabama as the chalk of the Black Prairie Belt intertongues with the more resistant clay, siltstone and sandstone of the Blufftown and Ripley Formations and Providence Sand. In western Alabama, the Chunnennuggee Hills are bounded on the north by the Black Prairie belt and in easternmost Alabama by the Fall Line Hills.

In eastern Alabama, four linear, roughly parallel, northward facing cuestas are present. The basal sand of the Blufftown Formation forms the Sand Fort cuesta, separating the Chunnennuggee Hills from the Fall Line Hills. The scarp of the Sand Fort cuesta is most prominent in Russell County, where it is about 200 feet high. The back slope of the cuesta is cut into low rounded sandy hills composed of the upper part of the Blufftown Formation.

The Enon cuesta occurs near the southeastern boundary of the Black Prairie Belt and is supported by the basal Cusseta Sand Member of the Ripley Formation. The Enon cuesta is 200 feet high in Central Bullock County and is traceable eastward to the floodplain of the Chattahoochee River.

The Ripley cuesta south of the Enon cuesta is by far the most continuous and distinctive topographic feature in the Chunnennuggee Hills. In southern Bullock County, the cuesta rises from 120 to 150 feet above the area to the north.

The Lapine cuesta, southernmost cuesta in the area, is formed on resistant beds of sand and gravel in the Providence Sand. The cuesta is 150 to 200 feet high in Barbour County; is less prominent to the west, but is traceable to western Lowndes County.

The Southern Red Hills are south of the Chunnennuggee Hills. The boundary is marked by a ridge on the gravelly, coarse grained sand of the Clayton Formation. The northern edge of the Southern Red Hills is at an altitude of about 500 feet, and local relief in excess of 100 feet is common. The topography becomes more subdued to the south. The exposed formations, from the north to the south are Clayton Formation, Nanafalia Formation, Tuscahoma Sand, Tallahatta and Hatchetigbee formations undifferentiated, Lisbon Formation, Jackson Group, and Eocene and Miocene Residuum. This residuum is the remains of the Eocene and Oligocene limestones after the calcium carbonate was dissolved.

The Lime Hills extend eastward from near the Alabama-Mississippi boundary into Conecuh County. The topography is rugged, with local relief of 200 to 250 feet. The Upper Eocene and Oligocene deposits have been almost entirely replaced by more resistant limestones.

The Southern Pine Hills, a cuesta-like, elevated, southward sloping, dissected plain, is developed on estuarine depositions of Miocene Age to the north and on sand and gravel of the Citronelle Formation of Pliocene Age to the south. The plain ranges in altitude from about 400 feet to the north to about 300 feet at the Alabama-Florida line.

Florida - Florida has been divided into five divisions: (1) Coastal Lowlands, extending northward to Georgia and South Carolina on the Atlantic Coast and to Alabama on the Gulf Coast; (2) Central Highlands extending from southern Florida to southern Georgia, where the division merges with the high coastal terraces; (3) Tallahassee Hills, a strip about 25 miles wide and 100 miles long bordering Georgia between the Withlacoochee River on the east and the Apalachicola River on the west and extending northward into the Tifton Upland in southern Georgia; (4) Marianna Lowlands in Jackson, Holmes, and Washington counties in western Florida and in Georgia merging with the Dougherty Plain; (5) Western Highlands extending westward from the Apalachicola River to the Perdido River. The westernmost part of the Western Highlands extends northward to the Alabama line, and the easternmost part forms a narrow belt between the Marianna Lowlands and the Coastal Lowlands.

The altitude of Coastal Lowlands bordering the Atlantic and Gulf Coasts ranges from sea level to about 100 feet above sea level. The area consists chiefly of nearly level plains or terraces formed during Pleistocene times by invasions of the sea which left shorelines at 100, 70, 42, 25, and about 6 feet above the present sea level. The marine terraces corresponding to these shorelines are named, from highest to lowest, the Wicomico, Penholoway, Talbot, Pamlico, and Silver Bluff. The Pamlico terrace is the most extensive and the least dissected. The Coastal Lowlands are narrowest in the Basins area to the west of Choctawhatchee Bay. They are only 10 to 12 miles wide in the Pensacola area.

The Central Highlands extend from the Florida peninsula to the Okefenokee Swamp in southern Georgia. The altitude ranges from less than 40 feet in some major stream valleys to about 200 feet. The division includes high hills, swampy plains, lakes and sinkholes.

The most extensive plain in the Central Highlands is the Sunderland Terrace formed when the sea stood approximately 170 feet above its present level. The terrace covers several counties in northern Florida and adjacent parts of Georgia and includes the Okefenokee Swamp. The Sunderland sea covered Florida except for a few islands in the Central Highlands and part of western Florida adjacent to the Georgia and Alabama state lines. The largest of these islands, in the northwestern part of Putnam County, Florida, east of the Northeast Gulf Basins, extended as a sandy peninsula and bar into Georgia. The remnant of this sandy peninsula is now known as Trail Ridge.

The Tallahassee Hills ranges in altitude from less than 70 to about 340 feet above sea level. The highest point near Dog Town in the northern part of Gadsden County seems to be remnants of a plain, about 330 to 240 feet above sea level, underlain by red sand, mapped by Cooke as the Citronelle Formation. The rest of the area generally consists of rolling hills cut into the Citronelle and the underlying clayey sand and Fuller's earth of the Hawthorn. Some large lake basins formed by solution in the limestone are near Tallahassee. The Tallahassee Hills merges at the Georgia line with the Tifton Upland.

The Marianna Lowlands is underlain by the Ocala and other limestones of the principal artesian aquifer. The division in Florida is bounded by the Alabama state line on the north, by the Apalachicola River on the east, and by the Western Highlands on the south and west. The Ocala Limestone crops out in several areas, the largest of which is north of Marianna, where many springs flow into the Chipola River. A large part of the Marianna Lowlands is underlain by the Suwannee Limestone. The Tampa Limestone is present in a narrow band around the south margin. Limestone solution accounts for the low rolling hills and hollows. There are many shallow sinkholes and depressions, some of which contain ponds or small lakes. Altitudes range from less than 50 feet along the Apalachicola River to 209 feet near Marianna.

The Western Highlands, between the Perdido and Apalachicola Rivers, extends inland from the Coastal Lowlands to the Alabama state line, except in a narrow belt south of the Marianna Lowlands. The division includes the valleys of the Escambia and Yellow Rivers and several other streams. The altitudes range from sea level to more than 300 feet above sea level. One of the highest points (a few miles south-southeast of Chipley in Washington County) is 340 feet above sea level. This area is believed to be a part of the same plain represented in a small area near Dog Town in the Tallahassee Hills. The northern part is hilly, the altitude being about 300 feet; the southern part is a broad, gently rolling upland ranging in altitude from approximately 100 to 270 feet above sea level. The plateau is deeply trenched by narrow, steep-walled valleys which cut down almost to sea level.

The areas below 270 feet include remnants of three marine terraces - Hazlehurst (Brandywine), Coharie, and Sunderland, The heads of several streams in the northern part of the DeFuniak Springs quadrangle are circular depressions that seem to have formed as sinkholes or lakes; they were later captured by headward growth of surface streams. Cooke lists Lake Sylvia, 4 miles west of DeFuniak Springs, as a example of a sinkhole lake on the verge of being captured by Fish Pond Branch. Lake Sylvia is about 60 feet below the upland in a funnel-shaped sink. There are many sinkhole lakes ranging from about 75 feet above sea level in the Coastal Lowlands to more than 100 feet above sea level in the Western Highlands.

Youthful tributaries of the Yellow River and young streams flowing southward to the Coastal Lowlands in Santa Rosa and Okaloosa counties have valleys with steep walls at their heads which are known as steepheads. These features have given rise to such geographic names as Mossy Head, Bear Head, Deer Head, White Head, and Deep Head. Steepheads form in areas underlain by permeable sand overlying a clay bed or less permeable zone. Precipitation on the surface moves downward instead of flowing over the surface of the ground. After reaching the less permeable zone, the water moves laterally and forms a spring where the less permeable beds crop out. The flow of the spring causes the permeable sand at the head of the spring to slump into the spring, and the flow carries it downstream. The headward movement of the spring forms the steephead. A waterfall may form in an area where the less permeable beds have sufficient resistance and are far above the zone of saturation in the underlying sand.

Many reports pertaining to the geology of the Basins have been published by the Florida Department of Natural Resources Bureau of Geology, the Geological Survey of Alabama, and the United States Geological Survey. For more detailed discussion of an area of interest, these publications should be consulted.

Minerals

Mineral production data in the Alabama and Florida subareas was compiled by counties for the years 1970 and 1971 (Table III-2). This information is from the 1971 MINERALS YEARBOOK published by the U. S. Bureau of Mines and is the latest data available. There are known mineral deposits in the Alabama and Florida portions of the Basins which are not now being mined (Figure III-9).

All the mineral extraction within the Basins is from surface mining, with the exception of petroleum and natural gas from wells.

Minerals which are known to occur in the Basins are listed below with their present uses.

ANTHOPHYLLITE (Magnesium iron silicate) used in the production of asbestos cement and insulating and filtering materials.

BAUXITE (aluminum oxide) used as ore of aluminum, in artificial abrasives, and in the manufacture of alum and refractory brick.

DOLOMITE (magnesium calcium carbonate) used for agricultural lime, flux in steel production, and aggregate.

IRON ORE (limonite) used in iron and steel production.

KAOLIN (hydrous aluminum silicate) used in the manufacture of fire brick, mortar and cement, porcelain, and as a filler in paper, paint, plastic, and rubber.

LIGNITE (brown coal)a potential source of fuel, wax, and organic chemicals.

LIMESTONE (calcium carbonate) used for cement, lime and agricultural lime, and the harder limestone for concrete aggregate.

MONAZITE (a rare phosphate) contains thorium and other rare metals.

PETROLEUM AND NATURAL GAS (Hydrocarbons) primarily used for fuel and in the manufacture of plastics and chemicals.

PHOSPHATE - used in fertilizers, detergents, water softeners, animal food supplements, pharmaceuticals, ceramics, dental cements, sugar refining, and military ordinance.

SAND AND GRAVEL - used in concrete, roofing, and road material.

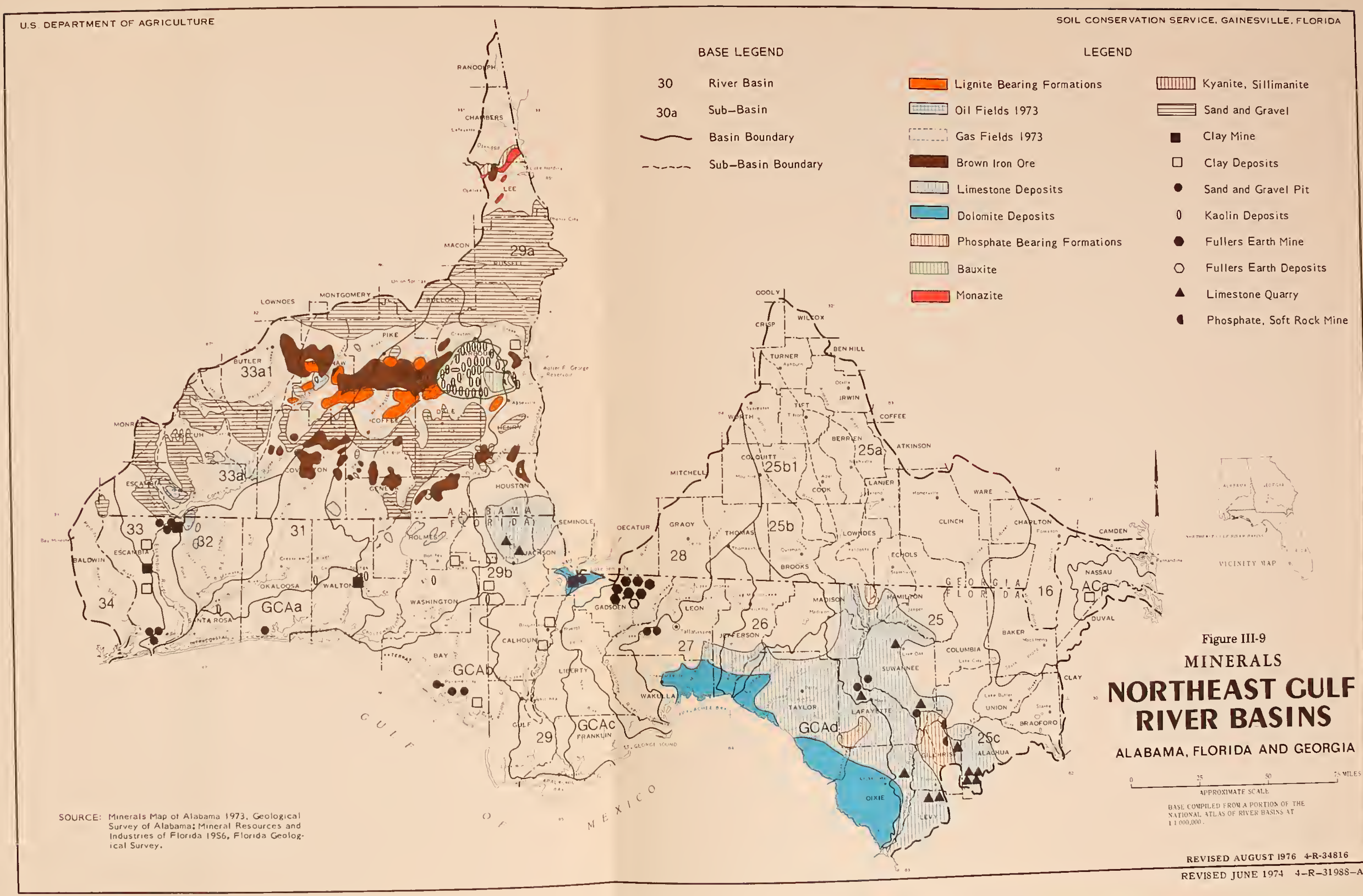
STRUCTURAL CLAY - used for the manufacture of brick, tile, clay pipe, pottery, and lightweight aggregate.

FULLER'S EARTH (hydrous aluminum silicate) used in drilling mud, as an absorbent for grease and oil spills, a filler for insecticides and fungicides, and as a filtering and decolorizing agent.

KYANITE AND SILLIMANITE (aluminum silicates) used in the manufacture of refractory and ceramic materials that are resistant to thermal shock.

There are probably mineral deposits within the basins that have not been discovered, and others that are not commercially mineable at this time. Advances in prospecting techniques may lead to more mineral discoveries and the changing demands for minerals may make presently unmined deposits commercially valuable in the future.

More detailed and later information may be obtained from the State Geologist of the area of interest.



REVISED JUNE 1974 4–R–31988–A

USDA-SCS-FORT WORTH, TEXAS 1977

Table III-2. Mineral production in the Northeast Gulf River Basins by counties

	Alabama	Florida	
County 1/	Minerals Produced in Order of Value	County	Minerals Produced in Order of Value
Baldwin	Clays, Petroleum	Alachua	Stone
Barbour	Bauxite, Clays, Sand & Gravel	Bay	Sand & Gravel
Coffee	Sand and Gravel	Bradford	Natural Gas Liquids
Covington	Stone	Calhoun	Sand and Gravel
Crenshaw	Iron Ore, Sand & Gravel	Escambia	Petroleum, Natural Gas, Sand & Gravel, Clays
Dale	Sand and Gravel		
Escambia	Petroleum, Natural Gas, Sand and Gravel, Clays	Franklin	Peat, Sand & Gravel
		Gadsden	Clays, Sand & Gravel
Geneva	Sand & Gravel	Gilchrist	Phosphate Rock
Henry	Bauxite, Clays	Gulf	Magnesium Compounds, Lime
Houston	Sand & Gravel	Hamilton	Phosphate Rock
Lee	Stone	Jackson	Stone, Sand & Gravel
Lowndes	Clays, Sand and Gravel	Leon	Sand & Gravel
Macon	Sand and Gravel	Levy	Stone
Monroe	Petroleum, Natural Gas, Sand and Gravel	Okaloosa	Sand & Gravel
		Santa Rosa	Petroleum, Natural Gas
Montgomery	Sand and Gravel, Clays	Suwannee	Stone
Randolph	Mica (Scrap)	Taylor	Stone
Russell	Clays, Sand and Gravel	Walton	Sand & Gravel

1/ Alabama counties partly within Basin not separated. Production reported is for whole county.

Source: Minerals Yearbook, Volume II, 1971, U. S. Department of Interior, Bureau of Mines

Land Resources

Major Land Resource Areas

The Northeast Gulf River Basins is comprised of portions of seven Major Land Resource Areas[1/] (Figure III-10). A Major Land Resource Area is a geographically located area of land characterized by particular patterns of soil (including slope and erosion), climate, water resources, land use and type of farming. A partial description of those resource areas located in the Basins follows:

Southern Coastal Plain - This land resource area comprises 60 per cent of the Northeast Gulf Basins and a large majority of the cropland and pasture. Principal agricultural crops are peanuts, soybeans, corn, cotton, small grains, and pasture. Commercial vegetable farms are located throughout the area. Forest products - pulpwood, lumber and plywood - are important sources of income for large corporate and individually owned holdings as well as from farm woodlands. Forestland occupies over one-half of this Land Resource Area.

Elevations generally vary from 100 to 600 feet above mean sea level. Most of the floodplains are narrow and forested. The gently to strongly sloping coastal plain is underlain by unconsolidated sands, clays, and gravels in the upper portions, and sands, clays, shales and limestone in the lower coastal plain.

Rainfall, streams, impoundments and groundwater provide adequate supplies of water to meet most present demands. Poor rainfall distribution often causes alternate periods of drought and excess. The west Florida, southeast Alabama, and southwest Georgia portions of the resource area usually experience excessive rains during spring and summer months. In the portion of the area further to the east - mainly in Florida - the heaviest rainfall is generally limited to the summer months.

Gulf Coast Flatwoods - This narrow band of land adjacent to the Gulf of Mexico has 17 percent of the total area of the Basins. Forestland accounts for 90 percent of the land use. Principal timber products harvested in this area are lumber, veneer logs (pine plywood), and pulpwood. Ownership of forestland occurs in large holdings. Included in this group are forest industry, a military reservation, a National Forest, and several wildlife management areas.

1/ "Land Resource Regions and Major Land Resource Areas of the United States", Agriculture Handbook 296, USDA-SCS, December, 1965

Figure III-10

MAJOR LAND RESOURCE AREAS

NORTHEAST GULF RIVER BASINS

ALABAMA, FLORIDA AND GEORGIA

USDA-SCS-FORT WORTH, TEXAS 1977

Elevations range mostly from sea level to 50 feet above sea level, with some reaching 100 feet. The area is generally level and is crossed by many large streams.

Midsummer is normally the period of heaviest rainfall; autumn and winter are the driest seasons. Water sources are adequate for most present demands. Since most of the area is in forestland, irrigation water requirements are very minor. The many streams, rainfall and groundwater are important sources of fresh water for municipalities and industry. Paper mills are among the larger users of industrial water.

A large part of the area has soils with restricted drainage. Other portions are made up of soils on old sand dunes and beach ridges. Narrow bands of beaches and dunes are located along the coast. Tidal marsh, freshwater marsh and swamps border the dunes on the landward side.

North Central Florida Ridge - About five percent of the Northeast Gulf Basins is in this resource area. Most of the land is in farms, but some large timber holdings are located in the area. Corn, peanuts, tobacco, watermelons, pasture and vegetables are the principal crops. About one-half of the area is in forestland.

Elevations range from 50 to 200 feet mean sea level, but they are mostly between 75 and 150. The sand-mantled limestone upland has irregular gently rolling topography. Many limestone sinks dot the area. Some of these are filled with water and provide good sources of irrigation water for tobacco and other crops. There are a few streams in the area, and some of these enter the ground through sinks, reappearing further downstream.

Rainfall and groundwater provide adequate sources of water for present uses. Deep and shallow wells provide water for domestic and livestock use and for irrigation, in addition to the water supplied from surface sinks.

The dominant soils in this resource area are deep, well drained sands with relatively high infiltration rates. Much of the surface drainage is vertically through these soils and sinkholes.

Atlantic Coast Flatwoods - This land resource area occupies about 16 percent of the Northeast Gulf Basins, and is predominantly in forestland. A large portion of the area is in the Okefenokee Swamp-headwaters of the Suwannee River. Some farming operations are located in this resource area, but they are mostly small in scale, and timber production is by far the major agricultural source of income. Much of the land is in large holdings.

Elevations over much of the area vary from sea level to 100 feet above sea level, but in some locations elevations reach 250 feet. The nearly level coastal area is crossed by many shallow valleys with meandering stream channels. Most of these valleys terminate in estuaries along the coast.

Rainfall, perennial streams, and ground water provide sufficient water to meet present needs. Water for domestic, municipal, and industrial uses is obtained mainly from wells.

The majority of soils in this resource area have restricted drainage and must be artificially drained before they can be used for crops. Some soils are situated on old beach ridges and dunes. Along the coast and extending up the estuaries of most of the major streams, are large areas of tidal marsh of organic and mineral soils. Fresh-water swamps such as the Okefenokee, occupy large partions of the area.

Southern Piedmont - Approximately two percent of the Basins is in this land resource area. About 75 percent of the area is in forest land, utilized for pulpwood, plywood, and lumber. Corn, cotton, small grains, and pasture are the principal crops grown. The trend in recent years has been to more forest land and pasture.

Elevations range from about 300 to 1000 feet mean sea level; however, most elevations are between 500 and 800 feet. Topography is gently rolling to hilly and stream valleys are narrow. Most of the area is underlain by schists, gneisses and granites, and by some crystalline rocks, sandstones, and slates. Dominant soils are those formed from acid crystalline rocks, slates, shales and sandstone.

Rainfall and perennial streams are the major sources of water. Ground water supplies are limited, but shallow and deep wells are the principal sources for domestic use. Streams. springs, and ponds are important sources of livestock water.

Alabama and Mississippi Blackland Prairies - This resource area is represented in the Basins by a very small area northeast of Union Springs. This is the eastern tip of the resource area. It is commonly called the Black Belt since most of the soils are fertile, black soils, Much of the area is in crops and pasture. Elevations are mostly about 300 feet mean sea level.

Soils

Soils of the Northeast Gulf Basins range from strongly sloping well-drained soils of the Piedmont Plateau to very poorly drained soils of freshwater and saltwater swamps and marshes along the Gulf and Atlantic Coasts. Some have thick sandy layers over clayey or loamy subsoils, while others have thin, sandy surfaces over more clayey subsoils. Near the coasts are nearly level and gently sloping, moderately well-drained to poorly drained soils over sandy or loamy subsoils (Figure III-11).

Most of the Alabama portion of the Basins is comprised of well-drained sloping soils with the exception of stream bottoms which are made up of narrow strips of poorly drained soils.

In Georgia, the poorly drained, nearly level soils are found over the eastern one-third of the state, while the western two-thirds is made up of well-drained, sloping soils with the exception of the stream bottoms.

In Florida, the soils are about evenly divided between well-drained and poorly drained. Generally, the well-drained soils are adjacent to Alabama and Georgia, and the poorly drained soils are nearer the coasts and in the east Florida portion.

Some of the soils are well suited to a wide variety of uses without special treatment. Others have severe limitations and require intensive treatment and management when used for any purpose. All land use and management programs must ultimately deal with this diversity of soil conditions. Soils information that tells the limitations the soils have for certain specific uses is essential to the Basins study.

Soils have been mapped in detail on many individual farms and urban areas throughout the Basins. However, detailed mapping on a county-wide basis is limited. This program is being accelerated in Florida. Soil surveys have been published for Escambia, Gadsden, Suwannee, Holmes, and Washington Counties, Florida, and for Chambers, Randolph, Montgomery, Escambia, Dale, Houston, Geneva, and Baldwin in Alabama.

The General Soil Map of the Basins (inside back cover) shows the major soil association areas. Each soil association represents a group of several different kinds of soils that occur together in distinctive and repeating patterns. With a knowledge of the relative proportion of important soils in the associations and the area covered by each, it is possible to make reliable estimates for general planning purposes. Each soil association delineation may contain soils having ratings which differ from those shown on the map. The general nature and scale of the map make it difficult to delineate each included soil which may have different properties. More detailed soils information for localized areas is available in most counties.

The many kinds of soils can be grouped into a relatively small number of groups for various kinds of interpretations.

Interpretations for agricultural uses - Land capability classification is one of a number of interpretive groupings made primarily for cropland and pastureland. This classification is made on the basis of the capability of the soils to produce common cultivated crops and pasture plants without deterioration over a long period of time. Soil classes range from Class I soils that have no important soils limitations, to Class VIII soils with very little agricultural capability. The capability classes defined briefly are as follows:

Class I - Soils have few limitations that restrict their use.

Class II - Soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.

Class III - Soils have severe limitations that reduce the choice of plants, require special conservation practice, or both.

Class IV - Soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V - Soils are not likely to erode, but have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture, woodland, or wildlife.

Class VI - Soils have severe limitations that make them generally unsuited for cultivation and that limit their use largely to pasture, woodland, or wildlife.

Class VII - Soils have very severe limitations that make them unsuited for cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII - Soils and land forms have limitations that preclude their use for commercial plants and that restrict their use to recreation, wildlife, water supply, or aesthetic purposes.

Soil capability subclasses are groups of capability units within classes that have the same kinds of dominant limitations for agricultural use (Figure III-12). Some soils are subject to erosion if they are not protected, while others are naturally wet and must be drained if crops are to be grown. Some soils are shallow or droughty, or have other soil deficiencies. The three kinds of limitations recognized at the subclass level are risks of erosion, designated by the symbol (e); wetness, poor drainage, or overflow (w); and rootzone limitations (s).

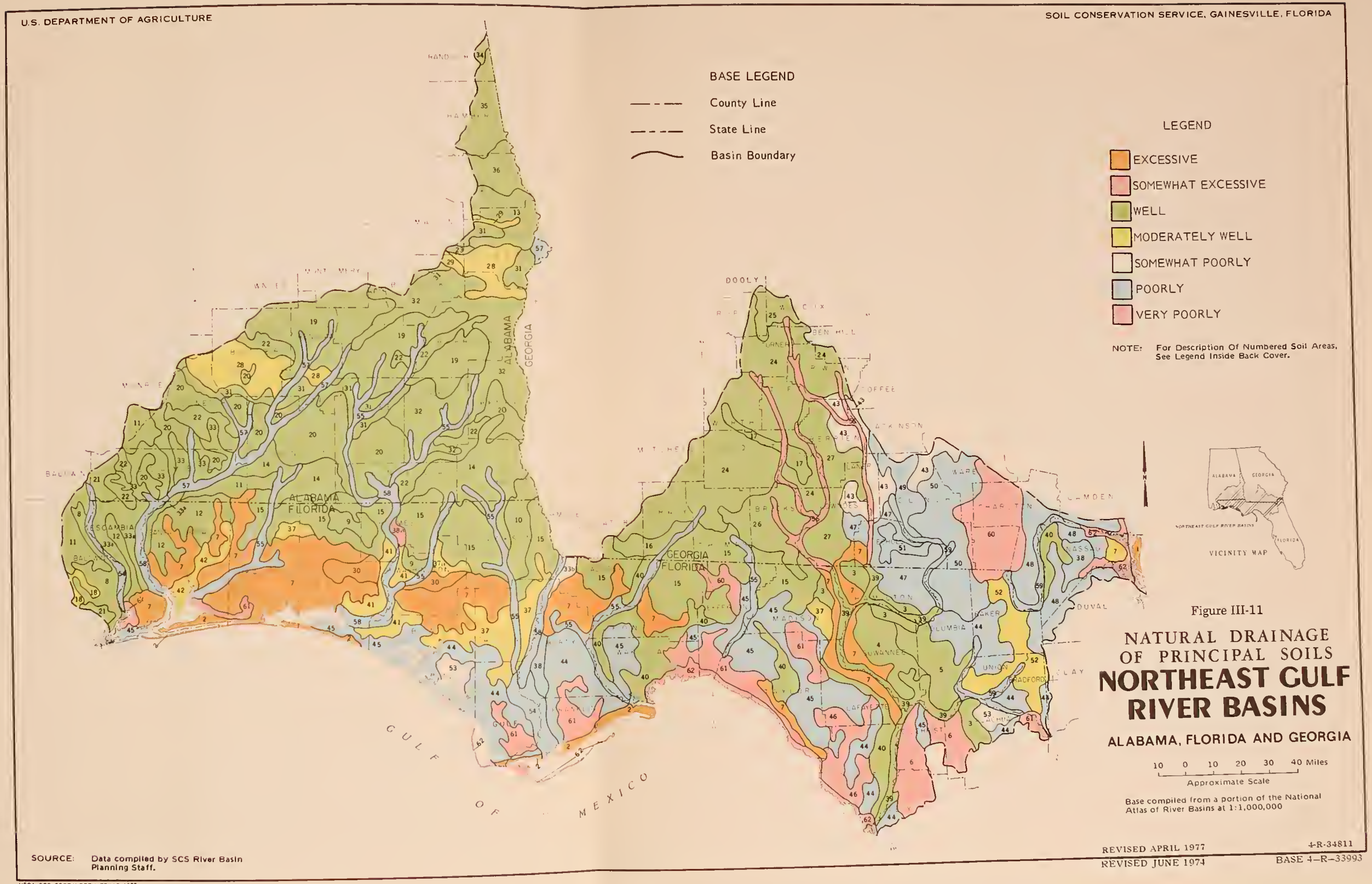


Figure III-11

NATURAL DRAINAGE OF PRINCIPAL SOILS

NORTHEAST GULF RIVER BASINS

ALABAMA, FLORIDA AND GEORGIA

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA

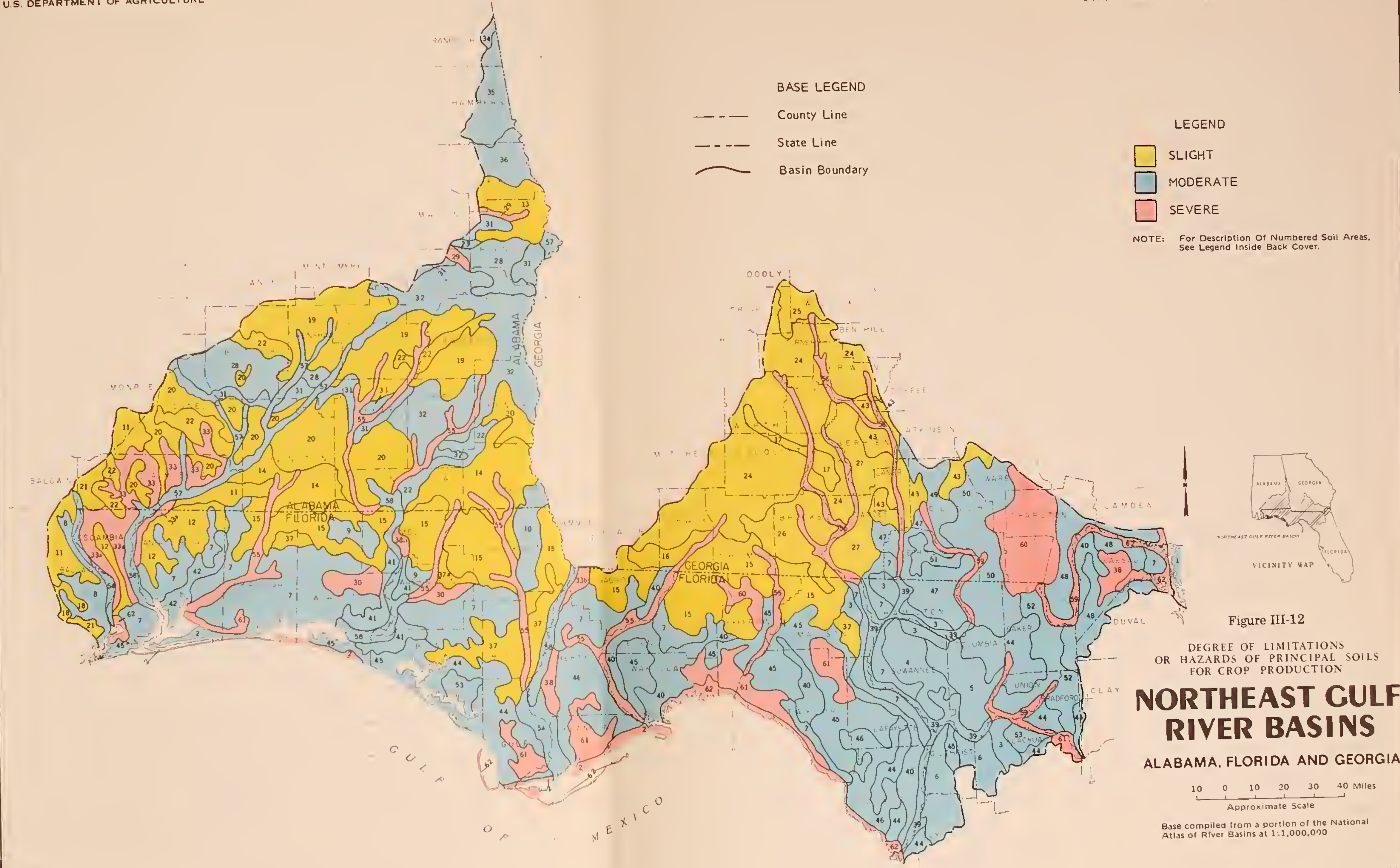


Figure III-12

DEGREE OF LIMITATIONS OR HAZARDS OF PRINCIPAL SOILS FOR CROP PRODUCTION

NORTHEAST GULF RIVER BASINS

ALABAMA, FLORIDA AND GEORGIA

10 0 10 20 30 40 Miles

Approximate Scale

Base compiled from a portion of the National Atlas of River Basins at 1:1,000,000

REVISED APRIL 1977 4-R-34809

SOURCE: Data compiled by SCS River Basin Planning Staff.

REVISED JUNE 1974

USDA-SCS-FORT WORTH, TEXAS 1977

With information about location and extent of different kinds of soils, the capability grouping makes it possible to appraise the quality of the soil resources for any part of the Basin and the treatment needed to sustain or improve them. Many of the natural limitations or hazards can be corrected or overcome by proper treatment and management.

Soil resource groups - Another grouping of soils for agricultural purposes is by Soil Resource Groups. These groups are aggregations of soil capability units which are similar in terms of crop and pasture yields, production costs and treatment needs. They may or may not be closely associated geographically. For this reason, they cannot be delineated on a map. Soil Resource Groups were used in making analyses of current and projected crop and livestock production. (See Appendix for more details on soil resource groups).

Interpretations for other uses - The Land Capability Classification does not adequately cover soil limitations as they apply to non-agricultural uses. However, the same basic properties of the soil that affect its capability for growing crops also affect its capacity to support the weight of buildings, to absorb septic tank effluent, or capacity to serve other uses. The grouping of soils for non-agricultural uses is made in terms of limitations, restrictions, or hazards for specific uses. These are expressed as slight, moderate, and severe. These interpretations indicate the natural limitations imposed by the soil for the proposed use and point up the kind and intensity of treatment needed to overcome these shortcomings. They have an important bearing on the suitability of land for different uses. Brief definitions of the three limitation groups are as follows:

Slight: The soil is well adapted for the proposed use and has few if any limitations, restrictions, or hazards that would interfere with the proposed use.

Moderate: The soil has moderate limitations, restrictions, or hazards for the proposed use, but these can be easily corrected.

Severe: The soil has serious limitations, restrictions, or hazards for the proposed use, and requires intensive management if it is to be so used.

Some of the most important properties affecting these interpretations are wetness, flood hazard, texture and consistence of different layers, depth to rock, permeability, traffic-supporting capacity, load-supporting capacity, shrink-swell potential, slope, and erodability. Some of these, such as wetness, affect all uses. Others, such as traffic-supporting capacity, affect only one or two uses. The interpretations are based on a weighted evaluation of all significant properties. Low ratings for some soils are based on only one outstanding limiting property; others are limited by several unfavorable properties that must be considered in giving a proper rating.

For this report, limitations for non-agricultural purposes were grouped under one category, "community development" for displaying on the general soil map, (Figure III-13). This delineation also represents the classification for uses such as highways, recreation areas, sanitary landfills, and septic tank filter fields. Since the soils limitations for most of these uses are similar, the one map is considered adequate to show general limitations and hazards for non-agricultural uses.

Land Use and Management

Land use information contained in this report was developed using a combination of data from several sources, including the 1969 Conservation Needs Inventories (CNI) for Florida, Georgia, and Alabama; 1970 Census; U. S. Forest Service statistical bulletins; Statistical Reporting Service; and primary data obtained through Soil Conservation Service field offices. Attempts were made to update the data to 1972, using SRS reports and information from SCS field offices, especially concerning changes in cropland acreages. Some increases in urban areas were made, based on increased population to 1972.

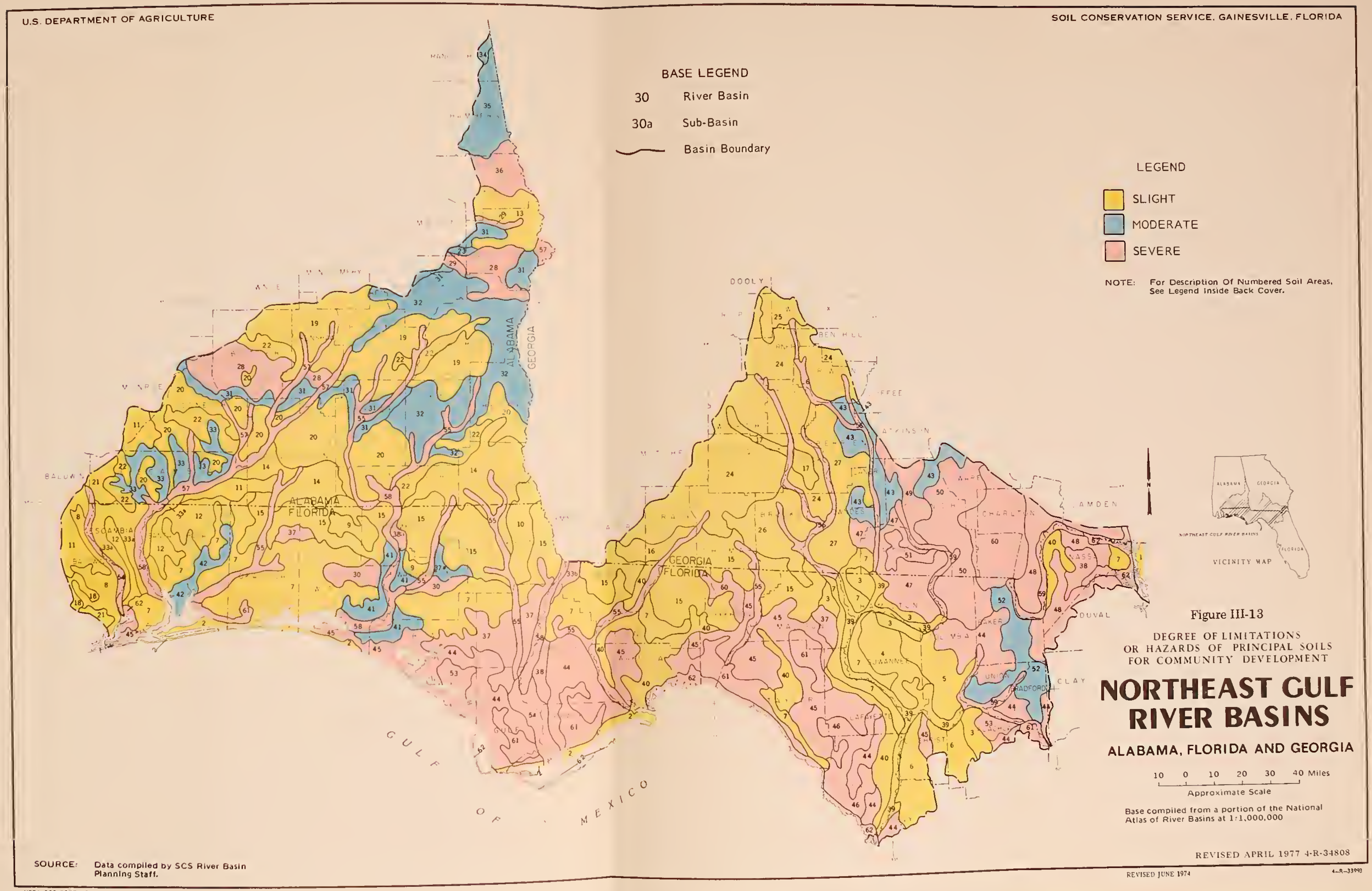
The 1960 Bureau of the Census "Area Measurement Reports" were used to determine total county areas. County data were aggregated to develop sub-basin and basin areas. Some adjustments were made in county water acreages where measurements indicated needed changes, and where man-made reservoirs have increased water areas.

Hydrologic delineations of sub-basins are based on the "Atlas of River Basins of the United States", with some needed refinements of watershed boundaries.

Forests occupy a large portion of the Northeast Gulf River Basins - approximately 70.4 percent. The remainder of the area is comprised of cropland (16.2 percent); pasture (6.1 percent); urban and built-up (2.8 percent); miscellaneous uses (1.8 percent); and water, including fresh and salt water (2.7 percent) (Figure III-14).

In each sub-basin, forest land represents the largest area of all uses (Table III-3). This is especially true of the coastal flatwoods areas where forest land covers essentially the entire area except for small acreages of crops and pastures, and urban areas.

Agriculture - Most of the cropland in the Basins is located on the higher elevations of the Southern Coastal Plain. Field crops such as corn, peanuts, soybeans, cotton, and small grains are the principal crops, with relatively small vegetable and tobacco acreages. Much of the cropland is on soils having slopes which require one or more management practices to prevent erosion, including such practices as minimum tillage, crop rotations, grassed waterways, contour farming, terraces, and diversions.



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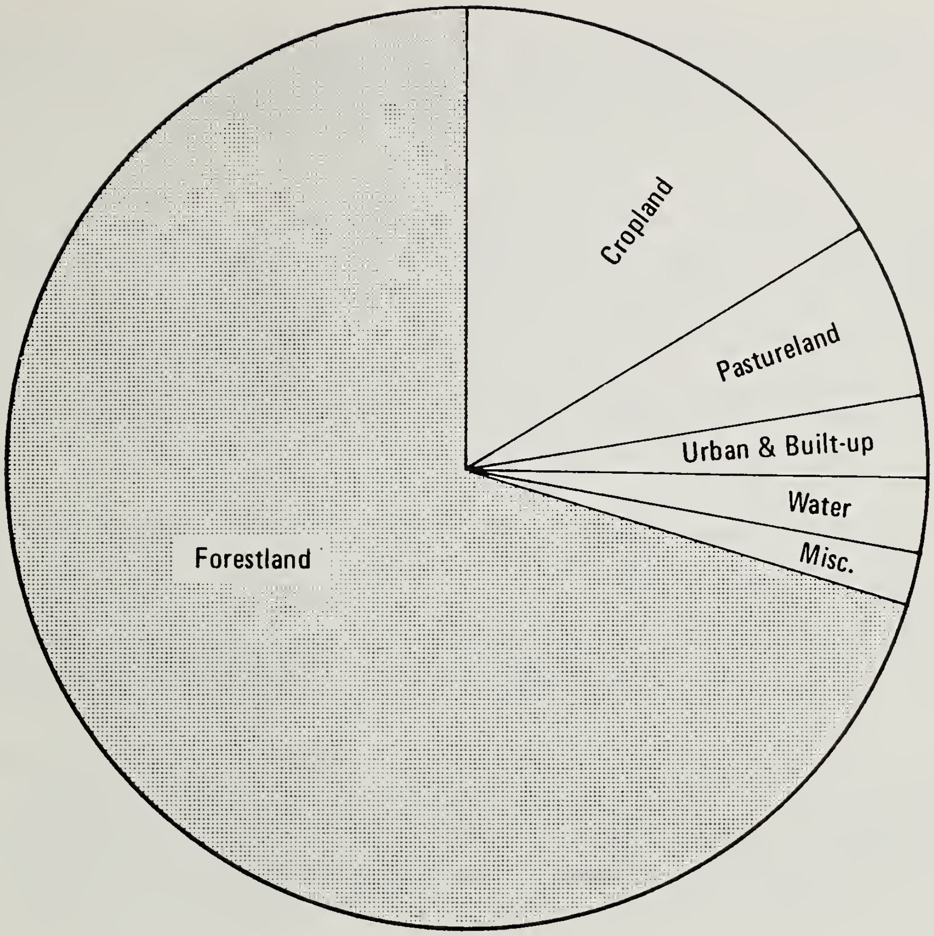
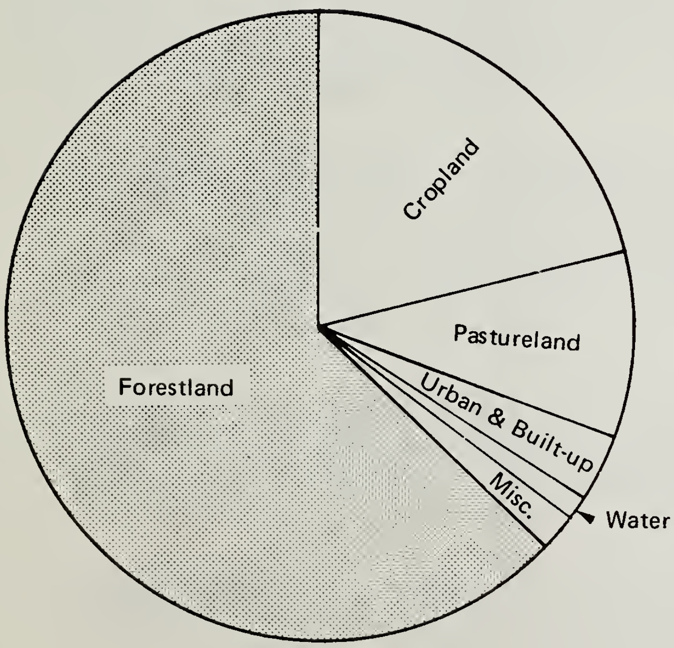
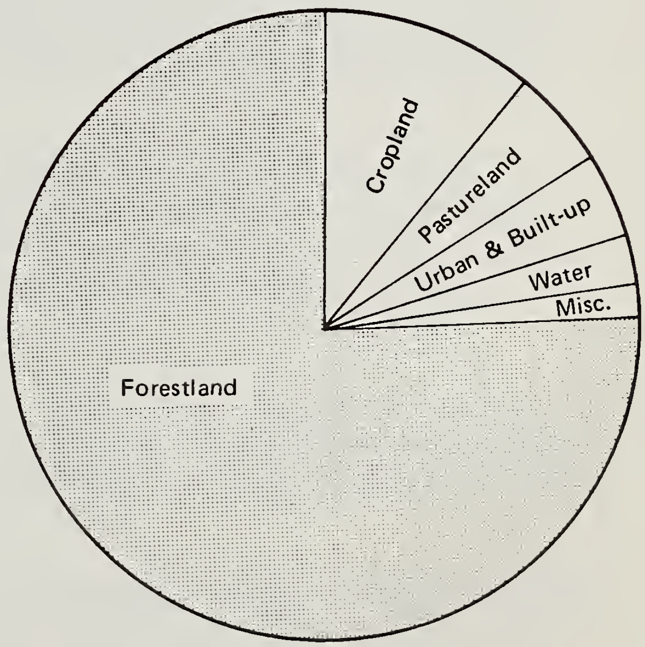


Northeast Gulf Basins 1/



Alabama Subarea



Florida Subarea

Figure III-14

Land Use - 1972

1/ Includes Alabama, Florida & Georgia Subareas

Improved pasture acreage has been on the increase in recent years. The location pattern of pasture in the Basin is generally similar to that of cropland, since most farms are general farms producing livestock and rowcrops.

Forestry - Timber lands have always been important to the South's economic growth and stability. More timber products have come out of the South during the past 100 years than from any other section of the United States. The Northeast Gulf River Basins (Alabama, Georgia, Florida) have a total of 17.4 million acres of commercial forest land. This represents almost 10 percent of all commercial forest acreage in the South and 70 percent of the total area in the Basins.

Principal forest types are longleaf-slash pine and loblolly-shortleaf pine (Figure III-15). Together they make up about 51 percent of total commercial forest stands. Other forest types include oak-pine, oak-hickory, oak-gum-cypress, and elm-ash-cottonwood (Table III-4). One-third of the total commercial forest acreage is sawtimber (Table III-5).

A small amount of forest land--41,075 acres--is identified as non-commercial. One-half of this acreage is of commercial quality, but excluded from harvesting by public law, either under federal or state management. The remaining amounts are nonproductive; that is, the land does not have the capacity to grow stands of commercial quality timber.

The forest types are named after their dominant species; however, each type has its own community of associated plants which are subordinate to the overstory. The understory usually consists of trees, wood shrubs, forbs, and grasses. The forest types and their respective plant associates are:

Longleaf-slash pine - Palmetto, wax myrtle, and gallberry are usually found in this association as are the grasses chalky bluestem, indiangrass, pineland threeawn (wiregrass), and several panicum species. Many annual forbs and several legumes also occur within this system.

Loblolly-shortleaf pine - Wood shrubs and vines such as blackberries, greenbriers, and grapes are numerous. Perennial legumes and annual forbs are plentiful. Indiangrass, switchgrass, and several bluestem species are the most common grasses.

Oak-pine - This community is found on the high sandy ridges. Turkey oak and longleaf pine are the dominant species in this relatively open woodland. Woody vines and legumes such as common lespedeza and milkpea are usually found here. The major forb is the golden aster. Scattered palmetto are present. The grass cover consists of some bluestems, indiangrass, hairy panicum, and pineland threeawn.

Table III-3. Land use by sub-basins and states, 1972, Northeast Gulf River Basins

Sub-Basin State	Total Area[1/]	Crop-Land	Pasture	Forest-Land	Miscel-laneous	Urban & Built-up	Water
	(1000 Acres)						
St. Marys-16	(1083.1)	(16.3)	(11.2)	(991.8)	(30.4)	(14.4)	(19.0)
FL	571.1	12.5	9.8	512.3	15.9	11.5	9.1
GA	512.0	3.8	1.4	479.5	14.5	2.9	9.9
Suwannee-25	(2632.8)	(335.5)	(129.0)	(2082.8)	(20.6)	(25.1)	(30.8)
FL	1621.3	324.9	127.4	1103.1	16.6	20.0	29.3
GA	1002.5	10.6	1.6	979.7	4.0	5.1	1.5
Alapaha-25a	(1193.2)	(318.3)	(62.1)	(756.4)	(15.2)	(25.2)	(16.0)
FL	92.4	17.9	6.9	63.3	0.4	3.0	0.9
GA	1100.8	300.4	55.2	693.1	14.8	22.2	15.1
Withlacoochee-25b	(936.4)	(309.4)	(67.0)	(497.8)	(14.3)	(29.5)	(18.4)
FL	145.8	52.0	15.1	73.7	1.5	0.7	2.8
GA	790.6	257.4	51.9	424.1	12.8	28.8	15.6
Little-25bl	(556.0)	(204.1)	(45.2)	(269.0)	(11.2)	(20.5)	(6.0)
GA	556.0	204.1	45.2	269.0	11.2	20.5	6.0
Santa Fe-25c	(940.9)	(159.6)	(96.5)	(629.6)	(9.4)	(24.2)	(21.6)
FL	940.9	159.6	96.5	629.6	9.4	24.2	21.6
Aucilla-26	(643.5)	(117.9)	(27.5)	(471.8)	(7.7)	(8.9)	(9.7)
FL	512.5	73.7	21.1	399.7	5.6	4.6	7.8
GA	131.0	44.2	6.4	72.1	2.1	4.3	1.9
St. Marks-27	(706.6)	(78.8)	(37.7)	(512.2)	(15.2)	(32.4)	(30.3)
FL	632.4	66.5	35.8	457.4	14.2	29.2	29.3
GA	74.2	12.3	1.9	54.8	1.0	3.2	1.0
Ochlockonee-28	(1643.8)	(366.8)	(90.6)	(1071.6)	(29.2)	(45.3)	(40.3)
FL	849.3	77.3	35.1	676.0	14.4	13.7	32.8
GA	794.5	289.5	55.5	395.6	14.8	31.6	7.5
Apalachicola-29	(689.1)	(49.1)	(14.4)	(582.8)	(15.2)	(9.4)	(18.2)
FL	689.1	49.1	14.4	582.8	15.2	9.4	18.2
Chattahoochee-29a	(1713.0)	(349.3)	(173.2)	(1040.3)	(26.1)	(77.4)	(46.7)
FL	112.6	34.7	6.3	60.6	0.9	1.0	9.1
AL	1600.4	314.6	166.9	979.7	25.2	76.4	37.6
Chipola-29b	(822.4)	(153.0)	(63.5)	(559.9)	(8.6)	(26.1)	(11.3)
FL	631.9	103.0	54.0	443.5	4.2	16.6	10.6
AL	190.5	50.0	9.5	116.4	4.4	9.5	0.7

Table III-3. Land use by sub-basins and states, 1972 - NE Gulf RB

Sub-Basin State	Total Area[1/]	Crop-Land	Pasture	Forest-Land	Miscel-laneous	Urban & Built-up	Water
	(1000 Acres)						
Choctawhatchee-30	(2036.1)	(516.9)	(187.2)	(1198.3)	(40.8)	(58.2)	(34.7)
FL	965.6	122.8	77.6	701.7	13.5	20.1	29.9
AL	1070.5	394.1	109.6	496.6	27.3	38.1	4.8
Pea-30a	(1002.7)	(230.6)	(130.0)	(587.0)	(24.2)	(27.6)	(3.3)
FL	66.3	11.3	7.5	46.0	0.8	0.6	0.1
AL	936.4	219.3	122.5	541.0	23.4	27.0	3.2
Yellow-31	(889.0)	(143.6)	(53.2)	(652.0)	(23.8)	(12.2)	(4.2)
FL	553.5	75.6	23.8	434.7	10.6	5.6	3.2
AL	335.5	68.0	29.4	217.3	13.2	6.6	1.0
Blackwater-32	(534.9)	(90.6)	(11.3)	(409.9)	(11.1)	(8.9)	(3.1)
FL	454.3	76.7	8.9	348.3	8.9	8.7	2.8
AL	80.6	13.9	2.4	61.6	2.2	0.2	0.3
Escambia-33	(580.4)	(89.2)	(19.4)	(410.9)	(10.3)	(42.9)	(7.7)
FL	348.0	44.2	6.4	249.5	6.9	34.0	7.0
AL	232.4	45.0	13.0	161.4	3.4	8.9	0.7
Conecuh-33a	(1561.5)	(238.7)	(148.5)	(1106.7)	(27.5)	(32.0)	(8.1)
FL	2.6	0.8	-	1.5	0.1	0.2	-
AL	1558.9	237.9	148.5	1105.2	27.4	31.8	8.1
Sepulga-33a	(665.0)	(80.9)	(55.6)	(502.3)	(6.2)	(18.1)	(1.9)
AL	665.0	80.9	55.6	502.3	6.2	18.1	1.9
Perdido-34	(684.7)	(116.2)	(17.4)	(451.6)	(24.0)	(51.0)	(24.5)
FL	236.3	29.9	1.3	149.6	5.7	34.0	15.8
AL	448.4	86.3	16.1	302.0	18.3	17.0	8.7
GCA-a(FL)	643.2	16.5	2.9	416.1	14.8	26.6	166.3
GCA-b(FL)	849.7	15.7	7.5	656.4	17.9	41.7	110.5
GCA-c(FL)	362.0	0.1	-	349.2	3.3	4.4	5.0
GCA-d(FL)	1169.7	13.2	55.4	1045.1	28.0	11.3	16.7
AC-a (FL)	276.3	1.3	13.2	212.6	20.7	11.3	17.2
Total AL	7118.6	1510.0	673.5	4483.5	151.0	233.6	67.0
Total FL	12726.8	1379.3	626.9	9612.7	229.5	332.4	546.0
Total GA	4961.6	1122.3	219.1	3367.9	75.2	118.6	58.5
TOTAL BASIN	24807.0	4011.6	1519.5	17464.1	455.7	684.6	671.5

1/ Based on total county area (land and water) as reported by U. S. Bureau of Census.

Oak-hickory - The scrub oaks such as black jack, post oak, and southern red oak with mockernut hickory are the dominant species with a midstory including dogwood and redbud. Yaupon grows well in this community. Palmetto occurs in scattered clumps. Bluestems, panicums, and switchgrass are the major grasses.

Oak-gum-cypress - This ecosystem is usually referred to as hardwood swamp. Water oak, swamp chestnut oak, sweet gum, water tupelo, black gum, sweetbay, redbay, magnolia, ash, cabbage palm, baldcyress, and maple are the major tree species. Also found are greenbrier, elderberry, myrtle, titi, and buttonbush. The grasses are barnyard grass, maidencane, and plumegrass. Some of the aquatic plants are pickerelweed, cattails, and sawgrass.

Elm-ash-cottonwood - This vegetative community is found in the floodplain of some of the major streams. The canopy is closed which limits the growth of the understory; however, vines such as greenbriers, grapes, and Virginia creeper are abundant. Virginia wildrye, longleaf uniola, and several bluestem species are found in open areas.

Table III-4. Forest types, Northeast Gulf River Basins and subareas, 1972

Type	Alabama subarea	Florida subarea	Georgia subarea	Northeast Gulf Basins	
	Thousand acres			Thousand acres	Percent
Longleaf-Slash Pine	720.5	4440.1	1593.4	6754.0	39
Loblolly-Shortleaf Pine	1274.6	596.0	312.9	2183.5	12
Oak-Pine	875.2	1153.5	463.7	2492.4	14
Oak-Hickory	991.3	1355.4	294.0	2640.7	15
Oak-Gum-Cypress	616.5	2017.7	684.7	3318.9	19
Elm-Ash-Cottonwood	5.4	50.0	19.2	74.6	1
Total	4483.5	9612.7	3367.9	17464.1	100

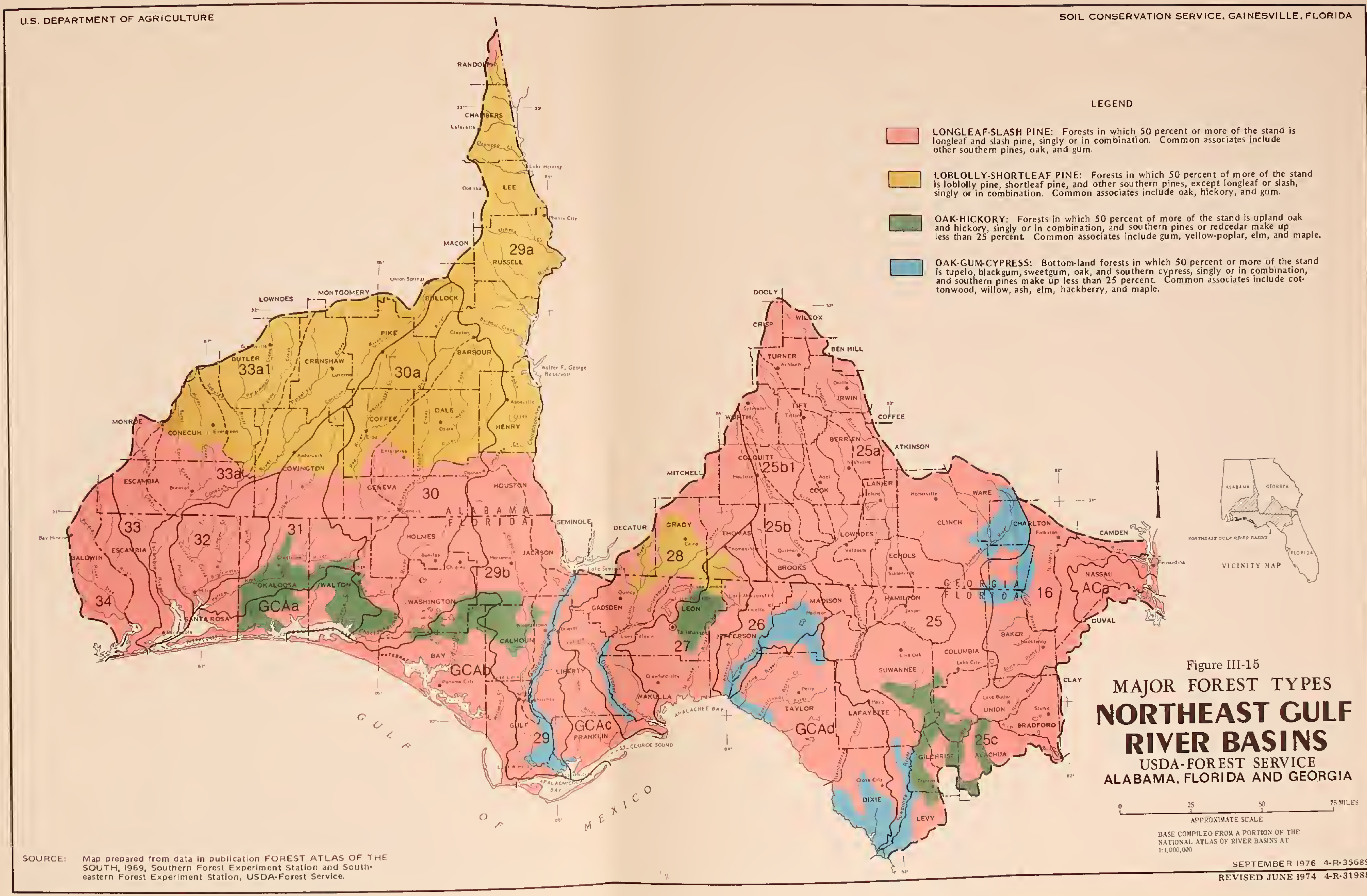


Figure III-15
MAJOR FOREST TYPES
NORTHEAST GULF RIVER BASINS
USDA-FOREST SERVICE
ALABAMA, FLORIDA AND GEORGIA

SOURCE: Map prepared from data in publication FOREST ATLAS OF THE SOUTH, 1969, Southern Forest Experiment Station and Southeastern Forest Experiment Station, USDA-Forest Service.

USDA-SCS-FORT WORTH, TEXAS 1977

Table III-5. Size class of timber, Northeast Gulf River Basins and subareas, 1972

Type	Alabama subarea	Florida subarea	Georgia subarea	Northeast Gulf Basins	
	Thousand acres			Thousand acres	Percent
Sawtimber	1526.6	2952.0	1186.2	5664.8	32
Pole timber	1332.1	2538.7	874.3	4745.1	27
Seedling-sapling	1561.6	3033.8	1145.1	5740.5	33
Nonstocked	63.2	1088.2	162.3	1313.7	8
Total	4483.5	9612.7	3367.9	17464.1	100

Land Ownership

Approximately 93 percent of the Basins is in private ownership. Farm sizes range from small subsistence or part-time farms of less than 40 acres to large commercial operations of several thousand acres. Many farmers lease lands in addition to their own in order to have more efficient operations. The largest tracts of land under private ownership are those owned by forest industries. These tracts may be as large as several thousand acres in size. Some of the larger individual private holdings are in "plantation" type farms owned by one or more persons who are engaged in businesses other than farming. The primary purpose of these operations is for game management and hunting. Row crops are planted for the dual purpose of agricultural production and as a food source for game animals and birds.

Publicly owned lands in the Basins are predominantly forestlands (Table III-6), but other lands such as marshes, other open areas for wildlife, water areas, and, especially on the military bases, land for administrative areas and landing fields are also included. There are about 785,000 acres in three national forests - Apalachicola and Osceola in Florida, and Conecuh in Alabama. Military ownership accounts for approximately 572,000 acres, mainly in Eglin and Tyndall Air Force bases in Florida, and Fort Rucker, Alabama. The United States Department of the Interior manages about 450,000 acres in wildlife refuges, 375,000 acres of which are located in Georgia in the Okefenokee Swamp.

Principal state forests are Blackwater River, Pine Long, and Cary in Florida and Geneva in Alabama. These four forests contain more than 200,000 acres. Numerous state parks and recreation areas are scattered throughout the Basins, varying in size from one acre to about 7000 acres. Total state-owned land in parks, forests, recreation areas and historical sites is approximately 243,000 acres. Not included in this figure are recent purchases of land by the State of Florida as areas of critical concern.

Table III-6. Ownership classes, commercial forestland - Northeast Gulf River Basins and subareas, 1972

Ownership Class	Alabama subarea	Florida subarea	Northeast Gulf Basins 1/	
	(1000 ac.)	(1000 ac.)	(1000 ac.)	(Percent)
PUBLIC:				
National Forest	86.2	693.6	779.8	6
Other Public	86.5	713.1	799.6	6
PRIVATE:				
Forest Industry	1034.6	4185.1	5219.7	37
Farmer	1508.8	1477.1	2985.9	21
Miscellaneous Private	1767.4	2297.6	4065.0	29
Leased to Industry		246.2	246.2	1
TOTAL	4483.5	9612.7	14096.2	100

1/ Georgia not included

Floodprone Areas

In the Northeast Gulf River Basins 12.73 million acres in Florida and 7.12 million acres in Alabama were inventoried to determine the location and extent of floodprone land and its current land use. The U. S. Geological Survey 100-year frequency floodprone maps were the base maps for the survey. Floodprone areas were divided into three categories - riverine, tributary, and coastal.

The Florida floodprone survey classified areas directly flooded by major rivers as riverine. The delineations were followed upstream on the tributaries to the approximate mean sea level elevation of the flood stage at the mouth of each tributary.

Tributary flooding encompassed (1) those areas not directly influenced by the major rivers, including small streams, marshes, swamps and ponds, and (2) the upstream portions or source areas of major rivers less than 250,000 acres. As accumulated drainage area exceeded this amount, it then was classified as riverine. The break, on the upstream portions of major rivers, between tributary and riverine flooding coincided with increments of watersheds delineated during the Conservation Needs Inventory of 1967 (Figure III-16).

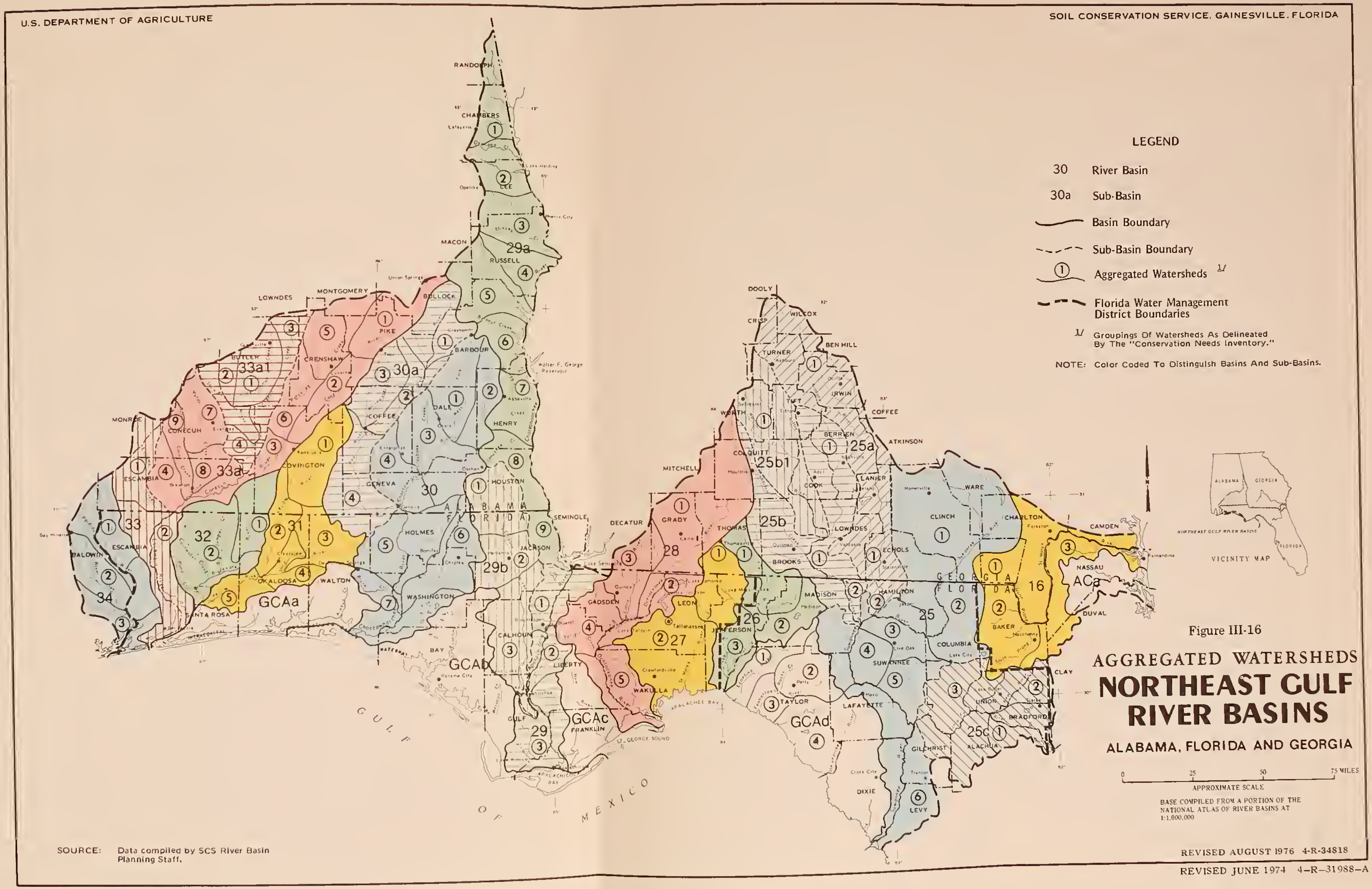


Figure III-16

AGGREGATED WATERSHEDS

NORTHEAST GULF RIVER BASINS

ALABAMA, FLORIDA AND GEORGIA

REVISED JUNE 1974 4–R–31988–A

USDA-SCS-FORT WORTH, TEXAS 1977

Coastal flooding was delineated as the lowlands below the 100-year hurricane line. The elevations adopted for the 100-year hurricane line were taken from the Coastal Coordinating Council's Florida Coastal Zone Management Atlas, published in December 1972.

The three major classifications of floodprone areas - riverine, tributary, and coastal - were inventoried as to land use in the flooded area. The land use emphasis was on the extent of present development or improvement in the floodprone areas. The categories for these developed flooded areas are cropland, pastureland, planted trees, and urban or built-up. Areas that did not fall into one of these categories were classified as natural state except the "open water" areas which were divided into fresh and salt. The fresh water areas were further classified into streams, lakes or impoundments. In Florida, the Mark Hurd photography was used to delineate the open water. Open water areas in Alabama were included in the natural state classification. The U.S.G.S. floodprone maps were utilized by Soil Conservation Service field office personnel in delineating current land use in the floodprone areas.

Floodprone areas were measured and recorded by land use within each section and summarized by township and range. In areas where sections were not surveyed such as bays, marshes and swamps, or in old Spanish land grants where boundaries are askew with township and range lines, standard 640-acre sections were marked off and numbered according to survey procedures for townships. The back-up data files will have to be consulted for the location and numbering of the unsurveyed sections. The Government lots along the Florida-Georgia boundary were incorporated into the sections to the south by extending the section lines up through the Government lots.

In Florida, where U.S.G.S. floodprone maps have not been made, the inventory was left incomplete for the Interim Report. It is anticipated that the maps will be available and the inventory completed before the final report is published.

Florida floodprone areas in the Northeast Gulf River Basins are summarized by Water Management Districts (See Appendix). The Northwest Florida Water Management District is entirely within the Northeast Gulf Basins and the Suwannee River Water Management District is almost wholly in the Basins. A small portion of the St. Johns River Water Management District is located in the northeast corner of the Basins (Figure III-2).

The Northwest Florida Water Management District has 7.45 million acres divided into eight major rivers and three Gulf Coastal areas. The total floodprone land in this district is 2.63 million acres or 35.3 percent of the District. About 1.7 million acres in Escambia, Okaloosa, Santa Rosa, Walton, and Holmes counties do not have floodprone maps; when the inventory is completed, the percent of floodprone land in the district will exceed 35.3 percent. Of the 2.63 million acres floodprone, 0.6 percent is in cropland, 0.6 percent in pastureland, 0.8 percent in urban or built-up areas, 3.5 percent in planted forestland, and 15 percent in open water. The remaining 79.5 percent of the floodprone land is classified as natural state (natural forestland, marshes, and swamps).

The Suwannee River Water Management District is comprised of 4.4 million acres divided into five major rivers with one large Gulf Coastal Area. The district has 2.0 million acres of floodprone land or 45.4 percent of the total watershed. Maps were available for almost all of this district. Of the District acres classified as floodprone, 0.4 percent is in cropland, 1.1 percent in pastureland, .5 percent in urban or built-up, 8.2 percent in planted forestland, 2.6 percent in open water, and 87.2 percent in natural state.

Approximately 0.87 million acres of the St. Johns River Water Management District are within the study area, including one major river and one Atlantic Coastal Area. It has 0.34 million acres floodprone or 39.0 percent of the District area surveyed in the Northeast Gulf River Basins. Floodprone maps are not available in the eastern part of Baker County and the northwestern part of Nassau County, so the inventory is incomplete on about 275,000 acres in this water management district. Of the 0.34 million acres classified as floodprone, 0.4 percent is in pastureland, 0.5 percent in urban or built-up, 2.5 percent in planted forestland, 6.0 percent in open water, and 90.6 in natural state.

In summary, of the 12.7 million acres in the Florida subarea inventoried at this time, 5.0 million acres (39.0 percent) are floodprone (Table III-7). Of the areas classified as floodprone, 0.4 percent is in cropland, 0.8 percent in pastureland, 0.7 percent in urban & built-up areas, 5.3 percent in planted forestland, 9.4 percent in open water, and 83.4 percent in natural state.

Alabama floodprone survey was recorded on 7.5-minute series U.S.G.S maps. Some 15-minute series maps were used where the 7.5-minute maps were not available. Maps for many areas in the northern and western part of the Basin were not available in either series. In these areas, county transportation maps were used as base maps. An experienced Soil Conservation Service Soil Scientist delineated the floodprone boundaries by correlating soil types to flood frequency. Available general and detailed soils maps were used in making the delineations. These delineations were made on all main and tributary streams until the stream flood plain narrowed to 400 feet in width.

The floodprone boundaries were not field checked to determine accuracy except at a limited number of known points.

Identification of land use in the floodprone areas was made by technicians of the Soil Conservation Service. Classifications used are: cropland, pastureland, planted trees, urban or built-up, and natural state which includes naturally occurring timber stands. In Alabama the delineation between tributary and riverine areas is set at the mouth of each tributary.

The Alabama floodprone areas were summarized by counties, aggregations of CNI Watersheds within sub-basins, and by sub-basins (Figure III-16). The sub-basins were further summarized into four major basins: (Figure III-2) Chattahoochee, Chipola, Choctawhatchee, and Perdido-Escambia (See Appendix).

The Chattahoochee Basin is comprised of one major river system having about 1.60 million acres of watershed within the study area, of which 0.24 million acres are classified as floodprone. Land use in the floodprone area includes 3.1 percent in cropland, 3.8 percent in pastureland, 0.8 percent in planted trees, 0.5 percent in urban and built-up area, and 91.8 percent in natural state.

The Chipola Basin is a small area of 190,000 acres with 32,000 acres floodprone.

The Choctawhatchee Basin is made up of two major river systems: the Choctawhatchee and Pea Rivers. This Basin has over 2.0 million acres within the watershed with about 0.25 million acres classified as floodprone land. The floodprone area has 1.2 percent in cropland; 3.4 percent in pastureland; 2.1 percent in planted trees and 0.2 percent in urban or built-up areas. The remaining 93.1 percent of the floodprone land was in natural state.

The Perdido-Escambia Basin is made up of three river systems with eight large creek tributaries, having a total watershed area of 3.32 million acres. The floodprone land within this basin is 0.38 million acres, of which 0.3 percent is in cropland; 2.2 percent in pastureland; 2.7 percent in planted trees and 0.3 percent in urban or built-up. The remaining 94.5 percent was classified as natural state.

In summary, Alabama has 7.12 million acres within the Northeast Gulf Basins, 0.90 million acres (12.6 percent) of which are floodprone, (Table III-8). The floodprone area is in planted trees (1.9 percent), cropland (1.3 percent), pastureland (3.0 percent), urban and built-up (0.3 percent), and natural state (93.5 percent).

Table III-7. Total watershed areas and land use within the floodprone areas - Northeast Gulf River Basins
SUMMARY - Florida Subarea

Water Management District	Type Floodprone	Total Watershed	Floodprone: Total Floodprone	Natural State	Planted Trees	Pasture Land	Crop-land	Urban & Built-up	Open Water: Fresh	Open Water: Salt
		Acres								
Northwest Florida W.M.D.	Tributary		1403783	1283065	69932	9574	11236	3084	26892	-
	Riverine		313687	265998	6665	3515	2391	103	35015	-
	Coastal		910821	540263	16418	3486	1159	18016	1614	329865
	Total	7450138	2628291 1/	2089326	93015	16575	14786	21203	63521	329865
Percent of W.M.D. in Floodprone		35.3								
Percent of Floodprone			100.0	79.5	3.5	0.6	0.6	0.8	2.4	12.6
Suwannee River W.M.D.	Tributary		1500706	1329505	130403	10288	3403	1476	25631	-
	Riverine		162969	119873	16052	10707	4223	5840	6274	-
	Coastal		336328	295351	17335	267	21	2826	290	20238
	Total	4403398	2000003	1744729	163790	21262	7647	10142	32195	20238
Percent of W.M.D. in Floodprone		45.4								
Percent of Floodprone			100.0	87.2	8.2	1.1	0.4	0.5	1.6	1.0
St. Johns River W.M.D.	Tributary		236887	225942	7731	1549	-	764	901	-
	Riverine		14253	12543	706	-	-	2	1002	-
	Coastal		88961	69598	-	15	-	879	20	18449
	Total	873537	340101 1/	308083	8437	1564	-	1645	1923	18449
Percent of W.M.D. in Floodprone		38.9								
Percent of Floodprone			100.0	90.6	2.5	0.4	-	0.5	0.6	5.4
TOTAL-NORTHEAST GULF RIVER BASINS-FLORIDA		12727073	4968395	4142138	265242	39401	22433	32990	97639	368552
Percent of Florida Subarea in Floodprone		39.0								
Percent of Floodprone			100.0	83.4	5.3	0.8	0.4	0.7	2.0	7.4

1/ Floodprone maps not available in portions of Escambia, Santa Rosa, Okaloosa, Walton, Baker, and Nassau counties. Inventory incomplete in these areas.

Table III-8. Total watershed areas and land use within the floodprone areas - Northeast Gulf River Basins
SUMMARY - Alabama Subarea

River Basin	Type Flooding	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop-Land	Floodprone: Urban or Built-up
		Acres						
Chattahoochee	Tributary		188425	179190	1099	5705	2333	98
	Riverine		48735	38536	731	3265	5089	1114
	Total	1600431	237160	217726	1830	8970	7422	1212
Percent of Basin in Floodprone		15.6						
Percent of Floodprone			100.0	91.8	0.8	3.8	3.1	0.5
Choctawhatchee	Tributary		191615	184934	1714	4139	774	54
	Riverine		55243	44812	3453	4136	2302	540
	Total	2006934	246858	229746	5167	8275	3076	594
Percent of Basin in Floodprone		12.3						
Percent of Floodprone			100.0	93.1	2.1	3.4	1.2	0.2
Chipola	Tributary		32256	30981	48	906	286	35
	Total	190459	32256	30981	48	906	286	35
Percent of Basin in Floodprone		16.9						
Percent of Floodprone			100.0	96.0	0.2	2.8	0.9	0.1
Perdido-Escambia	Tributary		286838	269484	9418	7059	691	186
	Riverine		83505	80583	830	1292	556	244
	Coastal		13383	12627	-	-	-	756
	Total	3320825	383726	362694	10248	8351	1247	1186
Percent of Basin in Floodprone		11.6						
Percent of Floodprone			100.0	94.5	2.7	2.2	0.3	0.3
TOTAL-NORTHEAST GULF RIVER BASIN-ALABAMA		7118649	900000	841147 1/	17293	26502	12031	3027
Percent of Basin in Floodprone		12.8						
Percent of Floodprone			100.0	93.5	1.9	3.0	1.3	0.3

1/ Open Water areas included in natural state

Wetlands - Florida Subarea

In order to better serve the populace, the Florida Department of Natural Resources has submitted to the legislature a method of delineating wetlands so that these valuable resources may be identified and preserved where deemed necessary for the continuance of a satisfactory and enjoyable life for the inhabitants of the State. In the past, some swamps and marshes have been drained and filled for housing developments, highways, airports, shopping centers, and other uses. It has been common to "get these useless lands on the tax rolls" without proper consideration of the costs to the taxpayer for services required for such developments and the loss of fish and wildlife production areas. During wet periods of the year, the wetlands help control excess water by building up and holding higher water levels. This water is slowly released to help maintain stream flows.

Of particular importance to Florida and the adjacent states are the estuarine areas where fresh water from land drainage is mixed with sea water. Nutrients from land and sea combine to produce more protein than some of the most intensively managed farms. Many commercial fish such as spotted sea trout, mullet, and redfish spend most of their lives in these productive areas as do crabs, oysters, and some species of clams. Several species of commercially important shrimp live and spawn as adults offshore and come to the estuarines as larvae for protection and the abundant food, then return to sea where they mature. Any destruction of the salt marsh means reduction of commercial and sports fisheries which attract both tourists and residents. The economic considerations alone may be sufficient reasons for preservation of these self-sustaining ecosystems.

The marshes provide storm protection to inland areas and the estuarine system acts as a reservoir to retard high waters during the most severe hurricanes. The value of the system for tertiary waste treatment far exceeds the amounts paid for marshes to the most aggressive developer. However, as a receptacle for primary wastes, the marshes would be practically worthless, as highly organic effluent would rapidly overload the system, thereby depleting the oxygen to the detriment of most living organisms.[1/]

1/ Gosselink, J. G., E. P. Odum, and R. M. Pope, 1973. The Value of the Tidal Marsh. LSU-SG--74-03.

The wetlands, as measured and located in this study, are based on vegetation common to each type. These vegetative communities are as follows:

A. Freshwater Swamps

1. River, creek, and lake overflow areas -

   These communities will have predominantly one or more of the following species:

   Pond-cypress - *Taxodium ascendens*
   Bald-cypress - *Taxodium distichum*
   Red maple - *Acer rubrum*
   River birch - *Betula nigra*
   Black willow - *Salix nigra*
   Coastal plain willow - *Salix caroliniana*
   Blackgum - *Nyssa sylvatica*
   Ogeechee tupelo - *Nyssa ogeche*
   Water hickory - *Carya aquatica*
   Water ash - *Fraxinus caroliniana*
   Buttonbush - *Cephalanthus occidentalis*

2. Bogs and bayheads -

   These communities will have predominantly one or more of the following species:

   Pond pine - *Pinus serotina*
   Loblolly bay - *Gordonia lasianthus*
   Sweet bay - *Magnolia virginiana*
   Swampbay - *Persea palustris*
   Titi - *Cyrilla racemiflora*
   Sphagnum moss - *Spagnum sp.*

3. Inland ponds and sloughs -

   These communities will have predominantly one or more of the following species:

   Pond-cypress - *Taxodium ascendens*
   Blackgum - *Nyssa sylvatica*
   Water tupelo - *Nyssa aquatica*
   Titi - *Cyrilla racemiflora, cyrilla parviflora*
   Black titi - *Cliftonia monophylla*
   Willow - *Salix sp.*
   Primrose willow - *Ludwigia peruviana*
   Pond apple - *Annona glabra*

B. Freshwater Marshes

1. Sawgrass marsh -

These communities will have predominantly one or more of the following species:

Sawgrass - Cladium jamaicensis
Arrowhead - Sagittaria sp.
Maidencane - Panicum hemitomon
Cattail - Typha domingensis, T. latifolia
Pickerel weed - Pontederia lanceolata, P. cordata
Buttonbush - Cephalanthus occidentalis
Spartina - Spartina bakeri
Switchgrass - Panicum virgatum

2. Cattail - bulrush - maidencane marsh -

These communities have predominantly one or more of the following species:

Bulrush - Scirpus validus, S. americus, S. robustus
Cattail - Typha latifolia, T. domingensis
Maidencane - Panicum hemitomon
Spartina - Spartina bakeri
Pickerel weed - Pontederia lanceolata, P. cordata
Water lily - Nymphea sp.
Spatterdock - Nuphar advena
Buttonbush - Cephalanthus occidentalis
Soft rush - Juncus effusus
Common reed - Phragmites communis (australis)
Bladderwort - Utricularia sp.

3. Wet prairies -

These communities have predominantly one or more of the following species:

Maidencane - Panicum hemitomon
Cordgrasses - Spartina bakeri, S. patens
Spike rush - Eleocharis sp.
Beak rush - Rhynchospora sp.
St. Johns wort - Hypericum sp.
Spiderlilly - Hymenocallis palmeri
Swamplilly - Crinum americanum
Yellow eyed grass - Xyris ambigua
Whitetop sedge - Dichromena colorata

C. Saltwater Marshes

1. Spartina and needlerush marshes -

These communities will have predominantly one or more of the following species:

Cordgrasses - *Spartina alterniflora, S. patens, S. Cynosuroides, S. spartinae*
Needlerush - *Juncus roemerianus*
Seashore saltgrass - *Distichlis spicata*
Saltwort - *Batis maritima*
Glassworts - *Salicornia sp.*
Fringerush - *Fimbristylis castanea*
Salt dropseed - *Sporobolus virginicus*
Seaside daisy - *Borrichia frutescens*
Salt jointgrass - *Paspalum vaginatum*

Because of photographic and time limitations, wetlands smaller than 25 acres were not delineated; however developments - cropland, pastureland, planted trees, and urban areas within the wetlands were delineated down to 10 acres. Where there were considerable amounts of wetlands on a photo, but in increments smaller than 25 acres, the amount of each type was estimated by percentage and added to the total. The wetlands were summarized by counties, sub-basins, and by Water Management Districts.

The areas were examined on the ground where possible and mapped on aerial photographs. Inaccessible areas which appeared on the photographs to be the same type as areas already examined were mapped similarly. For further delineation and clearer definition, stereoscopic, infra-red prints were examined. This study is believed to be the first of its kind on such a large area and may prove to be a valuable tool for land-regulating agencies (Table III-9).

Table III-9. Florida wetlands of the Northeast Gulf River Basins by counties

COUNTY	Acres by Wetland Type[1/]							
	A-1	A-2	A-3	B-1	B-2	B-3	C-1	TOTAL
*Alachua	1,838	1,490	4,710	125	115			8,278
Baker	7,872	27,073	40,539					75,484
Bay	14,587	1,203	32,798		1,032		2,572	52,192
Bradford	4,661	3,380	7,915		15			15,971
Calhoun	41,754	5,833	23,267					70,854
Columbia	3,842	23,138	45,810	215	795			73,800
Dixie	8,405	506	90,992	1,803	595		21,618	123,919
*Duval	5,140		12,173	490			14,747	32,550
Escambia	30,250		2,042	659			215	33,166
Franklin	30,491	9,657	134,968	2,748		4,880	17,704	200,448
Gadsden	33,074		1,952		65			35,091
*Gilchrist	2,857	63	12,754	282	116			16,072
Gulf	82,244	2,713	52,435	6,255			1,375	145,022
Hamilton	1,556	2,253	30,457		227			34,493
Holmes	18,083	873	10,503					29,459
Jackson	25,168	1,185	13,380		1,385			41,118
Jefferson	17,619	907	31,878		6,559		4,207	61,170
Lafayette	1,070	22,514	71,020		277			94,881
Leon	7,230	2,787	23,914		10,836			44,767
*Levy	5,790		7,285	6,896	33		7,267	27,271
Liberty	104,071	36,366	101,407		90	12,556		254,490
Madison	5,425	7,471	76,535		1,865			91,296
Nassau	40,187	546	26,979	1,065			26,284	95,061
Okaloosa	63,394	530	6,262					70,186
Santa Rosa	54,448	337	10,990		110	10,345	5,096	81,326
Suwannee	807	100	741	117	141			1,906
Taylor	6,200	15,349	146,255	1,507	20		25,966	195,297
Union	7,555	1,718	9,471					18,744
Wakulla	16,588	30,442	30,492	1,936	2,097		19,707	101,262
Walton	72,621	484	17,918	720	305		2,950	94,998
Washington	21,966	1,115	15,858	30	120			39,089
TOTAL	736,793	200,033	1,093,700	24,848	26,798	27,781	149,708	2,259,661

*Partial County

1/ Florida Department of Natural Resources, January 3, 1974

Wetlands - Alabama Subarea

Alabama used a different approach than Florida for identifying and classifying the wetlands. Each district conservationist in the county involved was assisted by a biologist or conservation officer from the Alabama Department of Conservation and Natural Resources where requested. In some counties, employees of other state and federal agencies contributed to the field surveys. In the majority of the counties, floodprone maps as provided by the U. S. Geological Survey were used to delineate the wetland types according to Circular 39[1/]. This classification is based on vegetation, period of inundation, and water depth. The delineations were measured down to 25 acres; however, where there were considerable areas on one map which were less than 25 acres, the investigators estimated the amount and added it to the total acres by type. Considerable personal knowledge and judgment was used in this inventory (Table III-10).

The wetlands as measured in Alabama are of the following types:

Inland Fresh Areas

Type 1. Seasonally flood basins - bottomland hardwoods with some herbaceous growth.

Type 2. Meadows - shallow lake basins and sloughs with cordgrass, beakrush, and paspalums.

Type 3. Shallow marshes - shallow basins or sloughs usually covered to 6 inches or more of water with maidencane, arrowhead, and pickerelweed.

Type 4. Deep marshes - covered by 6 inches to 3 feet or more of water during the growing season with pondweeds, naiads, coontail, watermilfoil, waterlilies, spatterdock, hyacinth or waterprimrose.

Type 5. Open water - shallow ponds and reservoirs with water usually less than 10 feet fringed by borders of pondweeds, naiads, wild celery, coontail, waterlilies, spatterdock, and water hyacinths.

Type 6. Shrub swamps - found along sluggish streams and occasionally in the flood plain covered by as much as 6 inches of water with alders, willow, buttonbush, and swamp-privet.

1/ Wetlands of the United States, Fish & Wildlife Service, U.S.D.I., 1956

Type 7. Wooded swamps - covered by as much as one foot of water along sluggish streams, on flood plains and very shallow lake basins with water-oak, tupelo gum, black gum, and cypress.

(No types 8-14 in Alabama subarea)

Coastal Saline Areas

Types 15-19. Varying sites of salt flats, meadows, and marshes covered either by tidal action or periodically by wind-driven waters with vegetation of rushes, cordgrass, widgeongrass, eelgrass, and turtlegrass.

Table III-10. Alabama wetlands of the Northeast Gulf River Basins by counties

COUNTY	Acres by Wetland Type 1/ 1	2	3	4	5	6	7	15-19	TOTAL
*Baldwin	1610	-----	-----	-----	25	-----	863	7000	9498
Barbour	13466	600	1192	288	193	393	282	------	16414
*Bullock	2642	-----	615	-----	-----	140	195	------	3592
*Butler	26654	130	44	1228	344	732	4086	------	33218
*Chambers	4940	-----	100	110	-----	1875	290	------	7315
Coffee	19585	1299	550	105	1130	180	1690	------	24539
Conecuh	20075	1000	3120	1205	1604	1650	38400	------	67054
Covington	5092	75	61	146	26	232	4497	------	10129
Crenshaw	12988	-----	-----	484	708	------	1188	------	15368
Dale	10876	-----	-----	-----	775	126	354	------	12131
*Escambia	11009	-----	1062	185	-----	-----	5661	------	17917
Geneva	7283	4969	4926	1683	497	1238	80	------	20676
Henry	9383	-----	675	-----	-----	1154	11057	------	22269
Houston	30580	-----	220	-----	766	438	2640	------	34644
*Lee	2888	-----	-----	-----	-----	-----	679	------	3567
*Lowndes	3322	-----	75	-----	-----	51	73	------	3521
*Monroe	5470	-----	125	-----	-----	-----	1510	------	7105
*Montgomery	2818	80	-----	-----	-----	-----	150	------	3048
Pike	22055	-----	-----	40	287	25	23100	------	45507
*Randolph	2428	-----	-----	50	188	124	524	------	3314
Russell	2810	130	-----	-----	-----	200	435	------	3575
TOTAL	217974	8283	12765	5524	6543	8558	97754	7000	364401

*Partial County

1/ Circular 39, Wetlands of the United States, Fish and Wildlife Service, U.S.D.I., 1956

Water Resources

Water Resource Projects

The Soil Conservation Service, the U. S. Army Corps of Engineers and private power companies have water resource projects throughout the Northeast Gulf Basins. Some of the projects are completed while others are in various stages of planning and construction (Figure III-17 and legend).

The Corps of Engineers constructed a major multi-purpose project on the Chattahoochee and Apalachicola Rivers.[1/] This project has locks and dams for navigation and flood control, recreation, fish and wildlife, and power generation. The four dams in the project create 118,000 surface acres of fresh water, store 2,180,000 acre-feet of water, and generate about 234,000 KW of electricity at full pool stage.

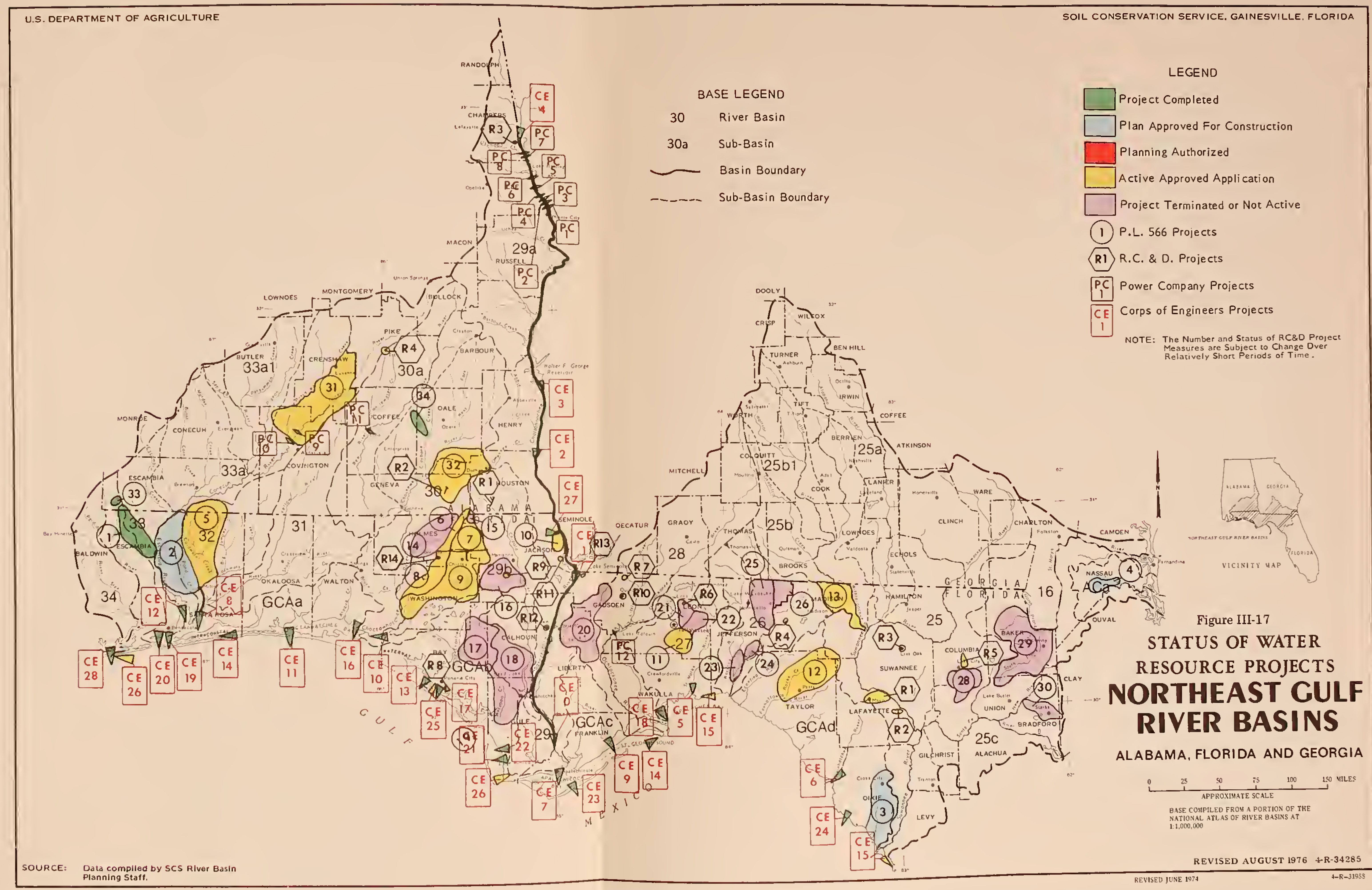
Since 1894, the major part of the Corps of Engineers' activities in the Basin has been navigation and harbor projects. They have constructed twenty-two of these projects in the Northeast Gulf Basins covering about 500 miles of channel improvement at a cost of about 26 million dollars[1/] for construction and maintenance. Ten of these projects have received major construction or maintenance within the past ten years. The average annual tonnage shipped through these facilities has reached about 4.6 million tons. The Corps has two beach erosion control studies in the Basins.

Private power companies constructed twelve dams for generation of hydro-electric power. These plants have a combined generating capacity of about 210,000 KW.

The U. S. Department of Agriculture, Soil Conservation Service, has actively participated in Water Resource Projects through the P.L. 566 Program. In Florida, twenty-nine applications have been filed for assistance under this program. One project has been completed, two are in construction, and one has been approved for construction. These four projects cover 394,000 acres. The Florida area has nine active applications which cover 800,000 acres. An additional 16 applications were received and found to be not feasible. In Alabama SCS has provided assistance in four watersheds within the Basins. One has been constructed; one is being planned, one is approved for operation, and one was found to be not feasible.

Resource Conservation and Development (RC&D) projects are a work of the U.S. Department of Agriculture, Soil Conservation Service. The projects are usually smaller than P.L. 566 projects and attempt to solve more localized problems. Five RC&D project areas are located within or partially within the Basins, three in Florida and two in Alabama. The project measures from these five areas range in scope from school yard, roadside and gully stabilization to municipal water supplies. The Northeast Gulf River Basin has 18 RC&D project measures in Florida and Alabama in varying stages of completion.

1/ Source: Water Resource Development in Florida & Alabama by U.S. Army Corps of Engineers - Published 1 Jan 73



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Legend for Figure III-17

Corps of Engineers Projects

Multi-Purpose Projects

CE0 - Apalachicola, Chattahoochee River
CE1 - Jim Woodruff Lock and Dam
CE2 - George W. Andrews Lock and Dam
CE3 - Walter F. George Lock and Dam
CE4 - West Point Dam

Navigation Projects

CE5 - St. Marks River
CE6 - Steinhatchee River
CE7 - Apalachicola Bay
CE8 - Blackwater River
CE9 - Carrabelle Harbor
CE10 - Choctawhatchee River
CE11 - East Pass Channel into Choctawhatchee Bay
CE12 - Escambia and Conecuh River
CE13 - Grand Lagoon, Panama City
CE14 - Gulf Intra-coastal Waterway between Apalachee Bay and the Mexican Border
CE15 - Gulf Intra-coastal Waterway from St. Marks to Tampa Bay
CE16 - LaGrande Bayou
CE17 - Panama City Harbor
CE18 - Panacea Harbor
CE19 - Pensacola Harbor
CE20 - Bayou Chico Channel
CE21 - Port St. Joe Harbor
CE22 - Gulf County Canal
CE23 - St. George Island Channel
CE24 - Horseshoe Cove
CE28 - Perdido Pass

Beach Erosion Control Projects

CE25 - Panama City Beach Erosion Control Study
CE26 - Shores of Northwest Florida Beach Erosion Control Study

Flood Control Projects

CE27 - Jackson County Limestone Sink Area

Note: Restudies of projects already listed are not shown.

Legend for Figure III-17 (Cont.)

Soil Conservation Service Projects

P. L. 566 Projects

Florida

1 - Pine Barren Creek
2 - Pond Creek
3 - California Lake
4 - Mills Creek
5 - Coldwater Creek
6 - N.W. Holmes Creek
7 - N.E. Holmes Creek
8 - S.W. Holmes Creek
9 - S.E. Holmes Creek
10 - West Seminole
11 - Lake Munson Basin
12 - San Pedro Bay
13 - Cherry Lake
14 - Wrights Creek
15 - Little, Fish, Minnow Creek
16 - Dry Creek
17 - Bear Creek
18 - Dead Lake
19 - Wetappo Creek
20 - Telogia Creek
21 - Lake Jackson Basin
22 - Lafayette Alford Basin
23 - Bailey Mills Creek
24 - Buggs Creek
25 - Wolf Creek
26 - Sneads Smokehouse
28 - Big Alligator Lake-Rose Creek
29 - Tributary to St. Marys River
30 - Water Oak Creek

Alabama

31 - Gantt Reservoir
32 - Southeast Choctawhatchee River
33 - Upper Brushy Creek
34 - Brackin's Mill

Legend for Figure III-17 (Cont.)

Soil Conservation Service Projects

RC&D Project Measures

Florida

R1 - Mayo-Calf Creek
R2 - Pickett Lake
R3 - Live Oak
R4 - Greenville Water Management Project
R5 - DeSoto Lake
R6 - Lake Jackson
R7 - Robertsville
R8 - Callaway-Martin
R9 - Long Branch
R10 - Quincy
R11 - Sneads
R12 - Blountstown
R13 - Chattahoochee
R14 - Bonifay

Alabama

R1 - Boggy Creek
R2 - Slocomb
Goshen (not shown Fig. III-17)
R3 - Moores Creek
R4 - Walnut Creek

Power Company Projects

PC1 - Eagle-Phenix Dam
PC2 - City Mills Dam
PC3 - North Highlands Dam
PC4 - Oliver Dam
PC5 - Goat Rock Dam
PC6 - Bartletts Ferry Dam
PC7 - River View Dam
PC8 - Langdale Dam
PC9 - Gantt Dam
PC10 - River Falls Dam
PC11 - Elba Dam
PC12 - Jackson Bluff Dam

Water Availability

Surface water - In general, most of the surface water of the Basin is of good quality and requires limited treatment for most uses. The runoff from most of the areas in the Basins is high with annual runoff averaging 15-20 inches per year. Some areas average almost 40 inches annually (Figure III-18). Although the stream gages record almost 40 inches runoff, much of this water comes from springs and is not due to runoff as it is normally defined. Probably much of the spring flow comes from ground water supplies that originate outside the drainage area of the stream. Very little of the total runoff is actually used at the present time, and most of this water flows unused either to the Gulf or the Atlantic. Abundant surface water is one of the assets of the Basins that should make the area self sufficient in good quality water for many years. There will be areas of local water shortages, but in many cases there are potential reservoir sites on nearby streams that can be developed to meet these needs.

Numerous reports have been published concerning the water resources of both Alabama and Florida. In the Alabama subarea, at least eleven counties have studies completed by the Alabama Geological Survey showing availability of both ground and surface water. These reports contain quality and quantity information for wells, springs, and streams. In the Florida subarea, the Florida Geological Survey has studied and published water resources reports describing the ground water, lakes, and streams in 22 counties. The U. S. Geological Survey publishes annual reports for both Alabama and Florida with stream flow measurements and water quality data at selected sites throughout each respective state. In Florida, they also publish annual reports on lake stages throughout the year.

Ground water - Table III-11 describes the various geologic units and their water bearing characteristics in the area covered by the Basins in Alabama and Florida. The areas where the various aquifers are tapped can be determined from the aquifer map, Figure III-19. The sediments of the coastal plain dip at right angles away from their contact with the crystalline piedmont rocks; thus, the dip is to the south in eastern Alabama and the Florida Panhandle near the Alabama-Georgia state line, becoming more to the southwest in southwestern Alabama and the western Florida Panhandle. Sediments of the Florida Peninsula dip to the east and to the west from the crest of the Peninsular Arch which trends north-south in approximately the center of the Peninsula.

The aquifer map indicates the areas in which major aquifers are now being tapped. It does not indicate the southernmost point from which fresh water can be obtained from them because it is the usual practice to draw on the first source yielding sufficient water rather than to drill deeper. The map also shows several aquifers overlapping which means that if sufficient water is not available in the first aquifer, the well can be deepened to tap successively deeper aquifers.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA

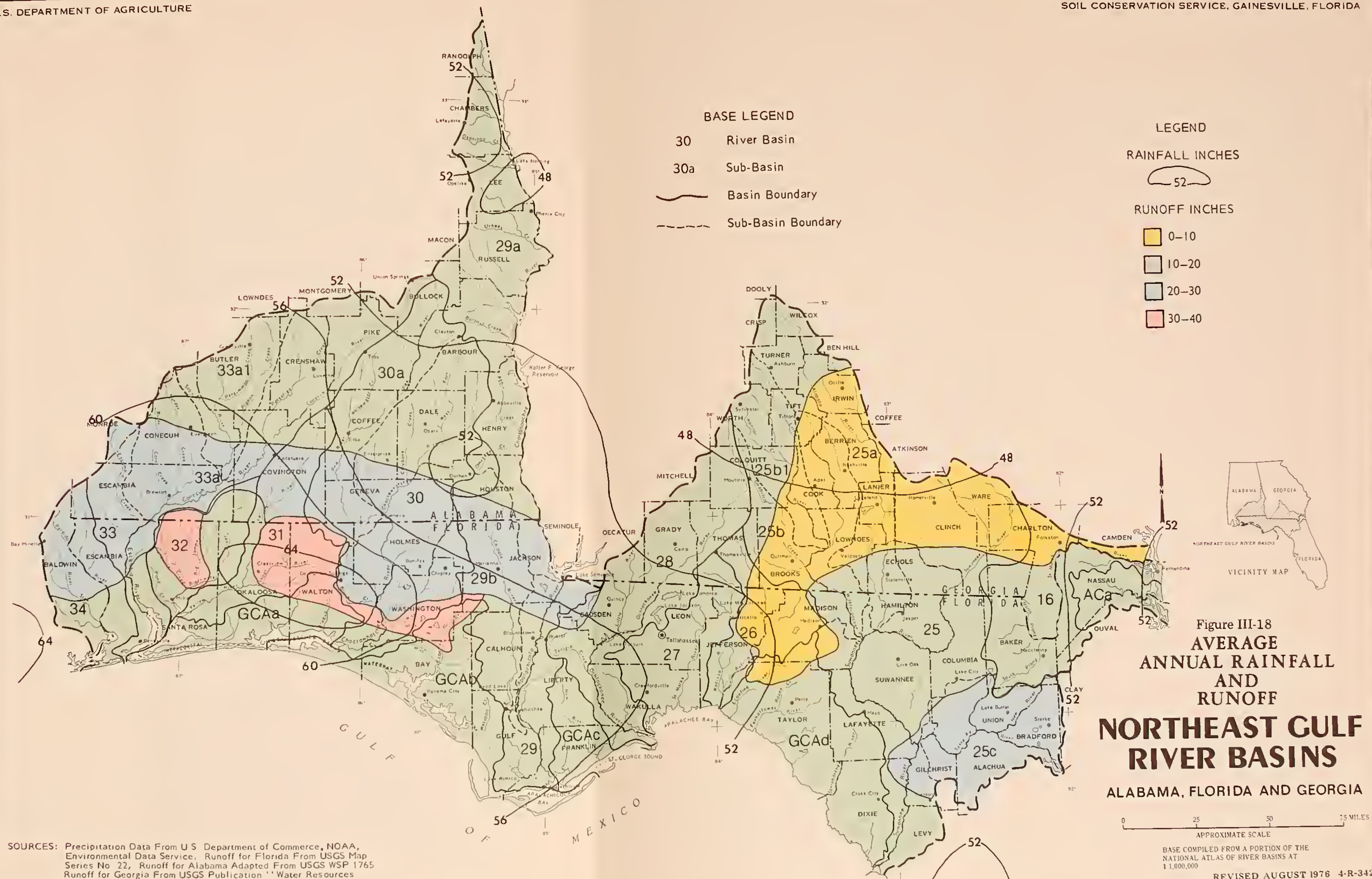

Figure III-18
AVERAGE ANNUAL RAINFALL AND RUNOFF

NORTHEAST GULF RIVER BASINS

ALABAMA, FLORIDA AND GEORGIA

REVISED AUGUST 1976 4-R-34249

SOURCES: Precipitation Data From U S Department of Commerce, NOAA, Environmental Data Service, Runoff for Florida From USGS Map Series No 22, Runoff for Alabama Adapted From USGS WSP 1765 Runoff for Georgia From USGS Publication "Water Resources Investigations in Georgia."

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REVISED JUNE 1974 4-R-31988-A

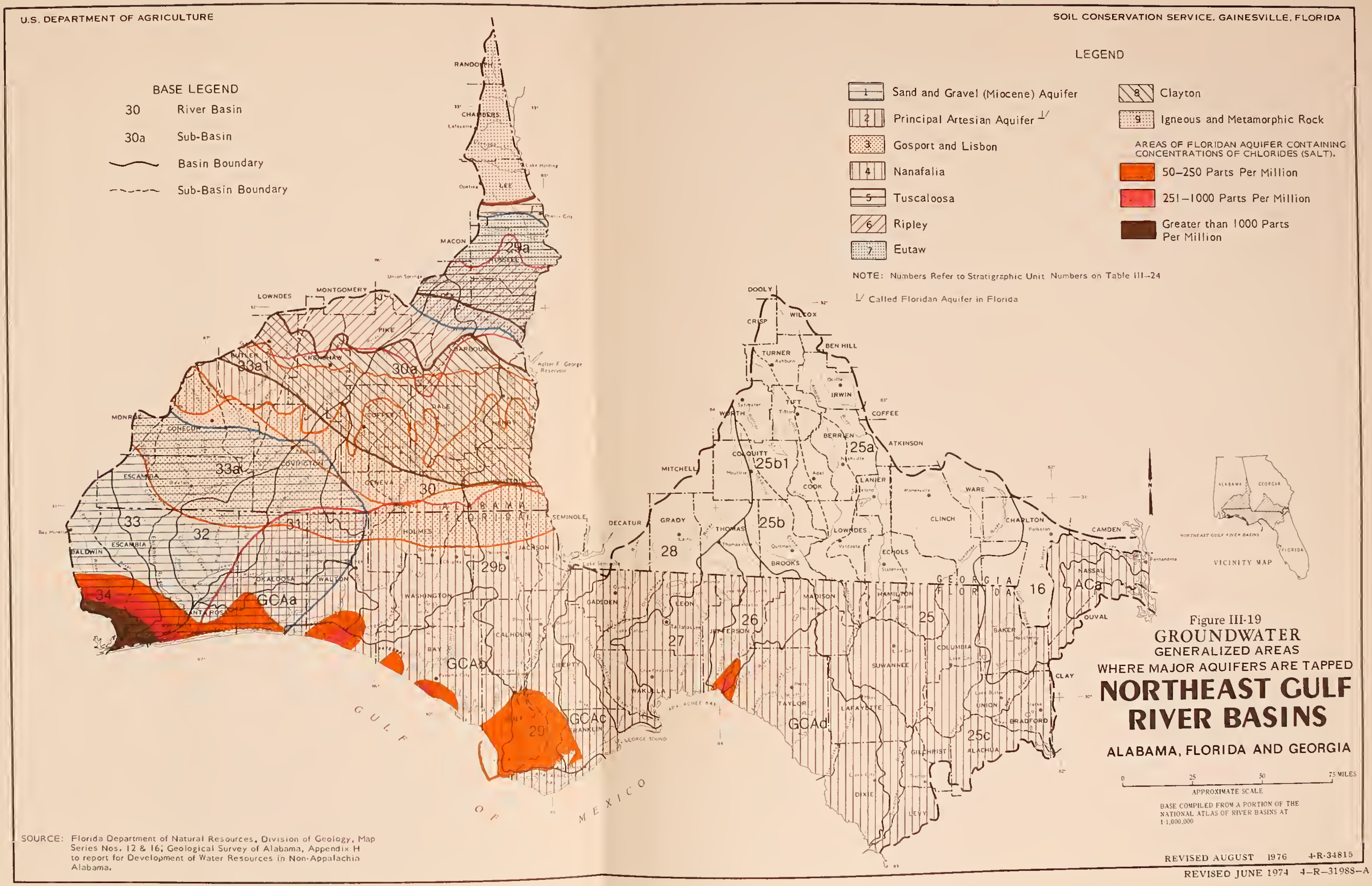

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Table III-11. Water bearing characteristics of major water yielding formations in Florida & Alabama portions of Northeast Gulf River Basins1/

System	Series	Stratigraphic Unit	Approximate Thickness(Ft)	Lithology	Water Bearing Characteristics
Tertiary	Pliocene & Miocene	Citronelle Fm. & Undiffereniated sand & gravel (1)	200 to 1000+	Fine to coarse grained sand, gravelly sand & clay	Yields small to very large quantities of water
	Oligocene & Eocene	Oligocene Series & Jackson Group (Floridan Aquifer) (2)	200 to 3000+	Cavernous limestones with some marl & sandy limestone	Wells yield large to very large quantities of water, depending on size & number of cavaties penetrated
	Eocene	Gosport Sand & Lisbon Formation Undifferentiated (3)	100 to 250	Fine to coarse grained sand with wedges of carbonaceous shale; calcareous glauconitic sand; sandy clay, clay; some limestone	Wells tapping sand beds yield moderate to large quantities of water
		Nanafalia Formation (4)	100 to 250	Coarse grained sand near bottom; glauconitic sand, sandy clay, and massive clay near top	Wells tapping the coarse sands yield large to very large quantities of water
	Paleocene	Clayton Formation (8)	15 to 200	Gravelly, coarse grained sand, sandy limestone, massive limestone, shell beds	Wells yield moderate to large quantities of water
Cretaceous	Upper Cretaceous	Ripley Formation (6)	35 to 250	Very fine to coarse grained sand interbedded with sandy limestone and clay	Wells yield large to very large quantities of water
		Eutaw Formation & McShan Fm. Undifferentiated (7)	250 to 400	Fine to coarse grained sand interbedded with fossiliferous clay & beds of sandy clay	Wells yield moderate quantities of water
		Tuscaloosa Group Undifferentiated (5)	250 to 1000+	Very fine to very coarse grained sand; sandy gravel, sandy clay and massive clay	Well yields range from moderate to very large
Proterozoic(?)	Paleozoic(?) Pre-Cambrian(?)	Metamorphic & Igneous rocks of uncertain age (9)	water-bearing portion 25 to 500	Crystalline rocks generally deeply weathered. Weathered zone (Saprolite) Generally from 5 to 100 ft.	Wells tapping the saprolite yield small to moderate quantities of water. Wells drawing from fractured bedrock may yield large quantities

1/ Modified from "Report for Development of Water Resources in Non-Appalachia, Alabama", Appendix H, 1968.
NOTE: All formations are not listed, only those shown on Figure III-19. Formations are listed from top to bottom
Well Yields: Small 0 to 10 GPM; moderate, 10 to 100 GPM; large, 100 to 500 GPM; very large, more than 500 GPM

The entire Florida portion of the Basins and extreme southeast Alabama are underlain by a series of hydraulically connected limestone formations. These formations are collectively known in Florida as the Floridan Aquifer. This aquifer is the principal source of ground water in all the Florida portion of the Basins except the counties of Escambia, Santa Rosa and western Okaloosa, where it is too highly mineralized for most uses.

More detailed information can be found in publications by the Geological Survey of Alabama; the Division of Geology, Florida Department of Natural Resources; and the U. S. Geological Survey. The respective state surveys have published reports on the geology and ground water of most of the counties within the Basins.

Most of the geologic formations in the Coastal Plain contain both permeable and impermeable beds. The permeable materials - sand, gravel, and limestone - form aquifers that will yield water to wells and springs. The impermeable beds do not produce water readily to wells and restrict the movement of water underground. The productivity of an aquifer depends upon its permeability, thickness, and extent. Small to moderate yields may be obtained from thick beds of low permeability, such as fine sand, or from thinner beds of more permeable materials. Very large yields can be withdrawn from thick and extensive beds of highly permeable materials.

The character of the formations in the Coastal Plain changes both downdip and laterally. Generally, these changes are very gradual; for example, downdip there is a tendency for the formations to become finer grained. Further downdip, they tend to grade into limestone. Thus, many miles downdip a formation or aquifer that in the outcrop area is composed of coarse grained material may become predominantly fine grained. Such an aquifer would tend to become less productive with increasing depth. As water moves downdip in these formations, it becomes more mineralized as a result of dissolving minerals from the sediments as it passes through. Most of the formations, including the aquifers, were deposited in saline or brackish water of ancient seas. Thus, these formations contained connate, or residual, salty waters. Over geologic time, fresh water falling as rain and seeping into these formations has flushed the salt water from the shallower or updip formations. Therefore, fresher water of better quality can be expected from the shallower aquifers, and the water will become more mineralized with depth. Fresh water occurs in most aquifers in the Coastal Plain to depths of 1,000 to 2,000 feet except near the seacoast where the salt water is much shallower. Withdrawals of waters near the coast must be carefully regulated to prevent encroachment of the salt water. This encroachment, or salt water intrusion, has already occurred in several spots along the Gulf and Atlantic coasts (Figure III-19).

The yield of a well is usually expressed in gallons per minute per foot of drawdown. This means that at a certain yield, the water level in the well drops to a certain point where it stabilizes. When the pumping rate is increased, the water level will drop again to a point of stabilization. When the use is so great that the water level continues to fall and drops below the pump intake, obviously the capacity of the well has been exceeded and the pumping rate must be cut back or the well deepened.

The drop in the water level during pumping causes the water to flow toward the well from the surrounding aquifer. Assuming that the aquifer is homogenous, the water will flow in equally from all directions, thus causing the water level around the well to drop in a circular pattern. The drop is usually greatest near the well, becoming less pronounced with distance from the well. This drawdown is called the cone of depression. The slope and the area the cone covers indicates the transmissability or ability to transmit water of the aquifer. The flatter the drawdown curve and the larger the area, the greater the transmissability.

A well will have a certain yield where the drawdown and the cone of depression will be stabilized year after year with minor seasonal variations. When this condition exists, the well will yield that amount of water continuously for many years. However, when the drawdown and cone of depression continue to increase, the well is exceeding its capacity and the yield will be curtailed sometime in the future. This is called "mining" water.

A well can be stable, producing a sustained yield, until one or more other wells are drilled too close so that the cones of depression coalesce. If this condition is severe, production from all wells will eventually be curtailed. Thus spacing of wells or well fields should be carefully regulated.

It has been stated many times that "the Southeastern Coastal Plain Area has sufficient ground water for any foreseeable needs." This statement is generally true; however, there are already areas within the Northeast Gulf River Basins where excessive pumping has caused problems.

In Escambia County, Florida, excessive concentrated pumping to the north is thought to be interfering with the municipal supply wells of Pensacola. The Pensacola area as well as areas in Walton, Okaloosa, Bay, Taylor, Jefferson, and Duval counties, Florida; and the Brunswick area in Georgia have experienced salt water intrusion caused by excessive withdrawals of ground water. These trouble spots will increase unless withdrawals are properly regulated.

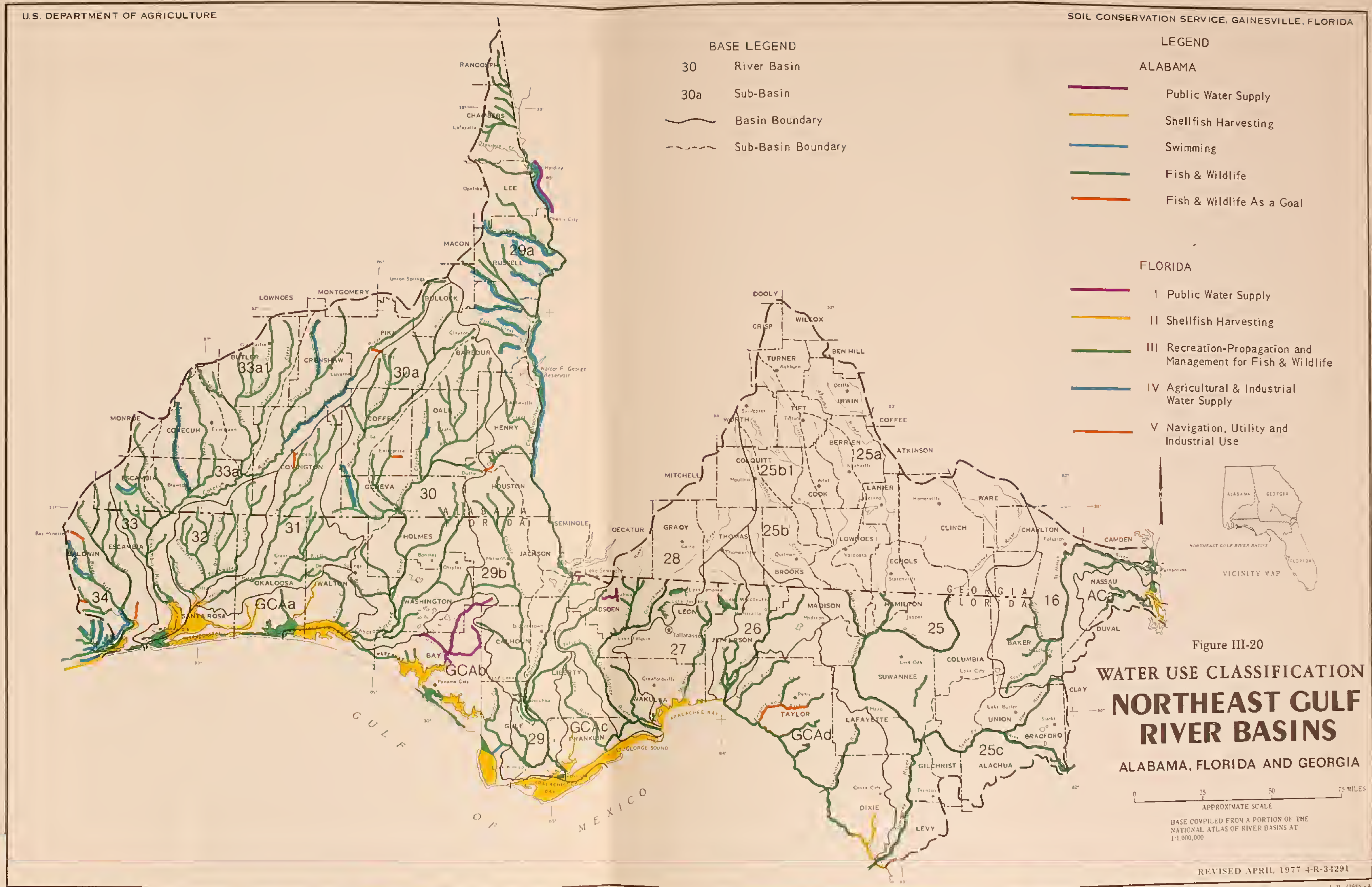
Streams - The streams in the Basins are generally perennial although some of the smaller streams cease to flow during the dry seasons of the year. Table III-12 gives the minimum, average, and maximum flows for some of the major streams in the Basins. The Aucilla River in Florida with a drainage area of almost 750 square miles is the largest stream in the Basins that has a record of no flow sometime during its period of record. Econfina Creek is unique in that the minimum flow of over 2.5 cfs per square mile is larger than the average flow per square mile for any of the large streams in the Basins. This unusual condition is due to the fact that most of the flow is from springs that tend to have a rather constant discharge through all periods. The average annual runoff for Econfina Creek is over 58.5 inches which is slightly larger than the average annual rainfall for the same area. Flow from the springs accounts for this unusual condition and indicates that at least part of the flow comes from recharge areas outside of the drainage area for Econfina Creek.

Most streams in Alabama have well defined flood plains while in Florida many streams have poorly defined flood plains, especially those along the Gulf of Mexico east of the Apalachicola River. Due to shorter times of concentration, peak flows for most of the Alabama streams tend to be higher per square mile than for the streams in Florida. The Suwannee River in Florida has an unusually long time of concentration. Twenty or more days may be required for the peak discharge to reach the mouth of the Suwannee River after a rain in the headwaters of the watershed. The large storage capacity in the Okefenokee Swamp and the flat gradient of the stream both tend to lengthen the time of concentration on this stream.

Several streams in the Basins are unique in that the normal flow enters the ground and emerges again further downstream. The Santa Fe River flows underground for several miles and the Aucilla River goes underground in several locations.

There are over 7000 miles of streams in the Florida part of the Basins. The Suwannee-St. Marys sub-basins have over 1200 miles of streams and Northwest Florida has over 5800 miles. The stream mileage is not known in the Alabama part of the Basins, but based on West Florida data there are probably over 7000 miles of streams in this part of the Basins.

Water use classifications of streams for the Northeast Gulf River Basins are shown in Figure III-20.



USDA-SCS-FORT WORTH, TEXAS 1977

REVISED JUNE 1974

Table III - 12. Maximum, minimum and average runoff at selected gaging stations, Northeast Gulf River Basins

Gaging Station	Period of record	Drainage Area	WATERSHED				SQUARE MILE		
			Average	Average	Maximum	Minimum	Average	Maximum	Minimum
		sq.mi.	In/Yr	cfs	cfs	cfs	cfs	cfs	cfs
FLORIDA									
Perdido River 02376500	31 yrs 1941-72	394	25.06	727	39000	192	1.85	99.0	0.487
River Styx 02377500	14 yrs 1951-65	93.2	25.88	177	14000	16	1.90	150.2	0.017
Escambia River 02375500	38 yrs 1934-72	3817	21.00	5902	77200	578	1.54	20.2	0.151
Pine Barren Creek 02376000	20 yrs 1952-72	75.3	24.89	138	24800	51	1.83	329.3	0.677
Blackwater River 02370000	22 yrs 1950-72	205	19.61	296	26200	60	1.44	127.8	0.293
Big Coldwater Creek 02370500	34 yrs 1938-72	237	29.45	514	32000	156	2.17	135.0	0.658
Pond Creek 02370700	14 yrs 1958-72	58.7	16.96	73	4580	26	1.24	78.0	0.443
Yellow River 02368000	34 yrs 1938-72	624	24.05	1105	28000	131	1.77	44.9	0.210
Shoal River 02368500	21 yrs 1951-72	123	24.51	222	10500	42	1.80	85.4	0.341
Alaqua Creek 02367000	21 yrs 1951-72	65.6	31.88	154	9020	27	2.35	137.5	0.412
Choctawhatchee River 02366500	42 yrs 1930-72	4384	21.37	6899	69600	1290	1.57	15.9	0.294
Holmes Creek 02366000	22 yrs 1950-72	386	21.99	625	10900	234	1.62	28.2	0.606
Econfina Creek 02359500	37 yrs 1935-72	122	58.55	526	4860	307	4.31	39.8	2.516
Chipola River 02359000	37 yrs 1/	781	25.53	1468	25000	330	1.88	32.0	0.423

1/ 1921-27, 1929-31, 1943-72

Table III - 12. (Cont.)

Gaging Station	Period of record	Drainage Area		WATERSHED			SQUARE MILE		
			Average	Average	Maximum	Minimum	Average	Maximum	Minimum
		sq.mi.	In/yr	cfs	cfs	cfs	cfs	cfs	cfs
FLORIDA									
Apalachicola River 02358700	15 yrs 1957-72	17600	18.13	23490	162500	6280	1.33	9.2	0.357
New River 02330300	8 yrs 1964-72	81.7	27.76	167	8810	0	2.04	107.8	0.000
Ochlockonee River 02329000	46 yrs 1926-72	1140	11.79	990	55900	17	0.87	49.0	0.015
Little River 02329500	22 yrs 1950-72	237	16.10	281	45600	6.7	1.19	192.4	0.028
St. Marks River 02326900	16 yrs 1956-72	535	16.61	654	4010	310	1.22	7.5	0.579
Aucilla River 02326500	22 yrs 1950-72	747	6.18	340	6580	0	0.46	8.8	0.000
Econfina River 02326000	22 yrs 1950-72	198	8.64	126	2540	2.3	0.64	12.8	0.012
Fenholloway River 02324500	26 yrs 1946-72	110	16.05	130	4810	0.8	1.18	43.7	0.007
Steinhatchee River 02324000	22 yrs 1950-72	350	12.73	328	17600	3.4	0.94	50.3	0.010
Suwannee River 02323500	32 yrs 1940-72	9730	14.60	10460	84700	3270	1.07	8.7	0.336
Santa Fe River 02322500	42 yrs (1927-29 1932-72)	1080	21.00	1670	17000	609	1.55	15.7	0.564
Withlacoochee River 02319000	41 yrs 1931-72	2120	10.29	1670	79400	70	0.79	37.5	0.033
St. Marys River 02231000	46 yrs 1926-72	700	13.15	678	28100	12	0.97	40.1	0.017

Table III - 12. (Cont.)

Gaging Station	Period of record	Drainage Area	WATERSHED				SQUARE MILE		
			Average	Average	Maximum	Minimum	Average	Maximum	Minimum
		sq.mi.	In/Yr	cfs	cfs	cfs	cfs	cfs	cfs
ALABAMA									
Conecuh River 02371500	35 yrs 1937-72	492	18.08	655	15800	22	1.33	32.1	0.045
Murder Creek 02374500	35 yrs 1937-72	170	21.25	266	22000	38	1.56	129.4	0.224
Sepulga River 02373000	30 yrs 1937-67	464	18.91	646	28100	3.5	1.39	60.6	0.008
Yellow River 023678	9 yrs 1958-67	447	23.46	772	14400	84	1.73	32.2	0.188
Choctawhatchee River 02361000	42 yrs 2/	683	18.95	953	25800	61	1.40	37.8	0.089
Pea River 02364500	46 yrs 3/	1187	19.38	1694	30000	41	1.43	25.3	0.035
Chattahoochee River 02341500	43 yrs 1929-72	4670	19.19	6599	145000	294	1.41	31.0	0.063
Uchee Creek 02342500	26 yrs 1946-72	325	18.13	434	55100	6.4	1.34	169.5	0.020

2/ 1922-27, 1935-72

3/ 1904-13, 1922-25, 1935-70

<u>The Waters of Florida</u> are classified according to usage as follows:

Class I - Public Water Supply
Class II - Shellfish Harvesting
Class III - Recreation - Propagation and Management of Fish & Wildlife
Class IV - Agricultural and Industrial Water Supply
Class V - Navigation, Utility and Industrial Use

Class I and II waters have criteria standards based on sewage and industrial waste, odor, pH, dissolved oxygen, toxic substances, and bacteriological quality.

Class III and IV waters are controlled by all of the criteria above plus deleterious materials and turbidity.

Class V waters are checked for sewage and industrial waste, pH, dissolved oxygen, and odor producing substances.

The criteria standards and limits of the above substances are published in the Florida Department of Pollution Contol Rules for Water Pollution, Chapter 17 - 3.09 through 17 - 3.11.

<u>The Waters of Alabama</u> are classified according to their usage as follows:

1. Public Water Supply
2. Shellfish Harvesting
3. Swimming and other whole-body water-contact sports
4. Fish and Wildlife
5. Fish and Wildlife as a Goal

Water quality criteria used in these classifications include sewage and industrial waste, pH, temperature, dissolved oxygen, toxic substances, color, taste, odor, bacteria, radioactivity, turbidity, and other deleterious materials.

Under Act No. 1260, Acts of Alabama, 1971, as amended, the Alabama Water Improvement Commission has the responsibility for development and regulation of water quality criteria. These are based on present scientific knowledge, experience, and judgement.

Act No. 1260 includes as its purpose...."to conserve the waters of the State and to protect, maintain and improve the quality thereof for public water supplies for the propagation of wildlife, fish and aquatic life, and for domestic, agricultural, industrial, recreational and other legitimate beneficial uses; to provide for the prevention, abatement and control of new or existing water pollution; and to cooperate with other agencies of the State, agencies of other states and the federal government in carrying out these objectives".

Waters of quality higher than that established by the standards as of the effective date of such standards shall be maintained at that high quality standard. "In no case will developments constituting a new or increased source of pollution to high quality waters be allowed to install or operate less than the highest and best degree of treatment available under existing technology. This degree of treatment for industrial and municipal waste is generally considered to be a minimum of secondary treatment...."1/

Water Use and Management

The 1970 water use for each county in the Basins by type of use and source of water is shown by Tables III-13, -14, and -15. Ground water sources include shallow or deep wells depending on which aquifer is tapped. Surface water may be from any surface source including springs, streams, ponds or lakes. Figure III-21 shows the total annual fresh water use for each county in terms of depth in inches evenly spread over the entire county. Much of this water is not consumed but may be returned to the same stream or other source from which it came. Often the water may be changed in quality and quantity although not necessarily to such an extent as to make it unusable for beneficial purposes. The total of all water uses for most counties amounts to less than one inch over the area. The amount of water available per year in each county from both ground water and surface water may vary from 15 to 25 inches; so, in most counties there is plenty of good quality water available for future expansion.

Municipal - Most of the municipal water comes from ground water supplies. Five counties in the Florida and Alabama sub-areas obtain some or all of their municipal water from surface water sources. Bay County uses 37.4 million gallons per day (mgd) from surface water supplies of which 33 mgd are supplied to industry and commerce. Bay County uses more municipal water than any other county, and all of this water comes from the Econfina Creek which has an unusually large base flow. The minimum discharge for the Econfina Creek in a period of 37 years record is 198 mgd which is more than five times the 1970 municipal water use for Bay County.

Industrial - Self-supplied industrial water requirements in the Basins exceeded municipal requirements in 1970 by almost 4 to 1. In Florida most of the industrial water is from ground water supplies, whereas in Alabama most industrial water comes from surface sources. One of the largest industrial uses of water in the Basins is for pulp mills. Another large industrial user of water is the phosphate mining industry which is expanding in the Basins.

1/ Water Quality Criteria, Alabama Water Improvement Commission

Table III-13. Municipal, industrial and thermoelectric water use by counties, Northeast Gulf River Basins, 1970
(million gallons per day)

Alabama

County	Municipal: Ground	Municipal: Surface	Self-Supplied Industry: Ground	Self-Supplied Industry: Surface	Thermoelectric Power Plants: Ground	Thermoelectric Power Plants: Surface
Baldwin*	1.3		1.0			
Barbour	1.4		0.1	1.3		
Bullock*	0.1					
Butler*	1.6		0.8	1.1		
Chambers*		2.5		6.0		
Coffee	2.8		0.2			
Conecuh	0.4					
Covington	1.8		0.2		0.3	63.4
Crenshaw*	0.4		0.1	1.3		
Dale	2.4					
Escambia*	2.5		0.8	43.8		
Geneva	1.0		0.1			
Henry	0.6		0.1			
Houston	4.4		0.7			
Lee*			0.1			
Lowndes*	0.1					
Macon*						
Monroe*						
Montgomery*						
Pike	1.5		0.3	0.5		
Randolph*						
Russell*	0.1	3.4	0.4	30.0		
Total	22.4	5.9	4.9	84.0	0.3	63.4

*Partial County

Florida

County	Municipal: Ground	Municipal: Surface	Self-Supplied Industry: Ground	Self-Supplied Industry: Surface	Thermoelectric Power Plants: Ground	Thermoelectric Power Plants: Surface
Alachua*	1.4		0.5			
Baker	0.5					
Bay	0.7	37.4 1/	2.0	0.1	0.1	
Bradford	0.7		1.4		6.5	
Calhoun	0.2					
Columbia	1.7					
Dixie	0.4		0.9			
Duval*	0.3		3.0			
Escambia	20.3		47.8	42.9	0.8	335.0
Franklin	0.5					
Gadsden	0.8	1.2	0.1	2.1		
Gilchrist*	0.1					
Gulf	0.1	0.4	19.0	36.0		
Hamilton	0.5		18.4			
Holmes	0.3					
Jackson	1.6		1.2		1.4	144.0
Jefferson	0.4		0.2			
Lafayette	0.1					
Leon	12.0		27.9			
Levy*	0.4					
Liberty	0.2		0.8	0.5		
Madison	0.6					
Nassau	2.0		50.0			
Okaloosa	7.9		4.7			
Santa Rosa	2.4		10.3			
Suwannee	0.6		7.1			173.0
Taylor	1.2		53.7			
Union	0.1		0.6			
Wakulla	0.2		0.7	0.4		160.0
Walton	0.7		1.2			
Washington	0.4					
Total	59.3	39.0	251.5	82.0	8.8	812.0

*Partial County

1/ Includes 33 mgd for industry and commerce.

Table III-14. Rural water use by counties, Northeast Gulf River Basins, 1970 (million gallons per day)

Alabama

County	Domestic: Ground	Livestock: Ground	Livestock: Surface	Irrigation: Ground	Irrigation: Surface	Catfish Farmings: Ground	Catfish Farmings: Surface
Baldwin*	1.3	0.2	0.2	0.4	0.4		
Barbour	1.0	0.3	0.3			0.2	0.1
Bullock*	0.4	0.1	0.1		0.1	0.1	0.1
Butler*	1.0	0.2	0.2			0.1	0.1
Chambers*	0.8	0.1	0.1		0.1		0.1
Coffee	1.2	0.2	0.4			0.1	0.1
Conecuh	1.1	0.2	0.3			0.1	
Covington	1.3	0.3	0.4		0.1	0.1	
Crenshaw*	0.8	0.2	0.2			0.1	0.2
Dale	2.9	0.2	0.2			0.2	
Escambia*	1.5	0.2	0.3	0.1	0.1	0.1	0.1
Geneva	1.0	0.3	0.3		0.3	0.1	0.1
Henry	0.7	0.2	0.2		0.1		0.1
Houston	1.5	0.4	0.4	0.4	0.5	0.1	0.1
Lee*	1.0	0.1	0.1				0.1
Lowndes*							
Macon*	0.1						
Monroe*	0.2						
Montgomery*	0.4	0.1	0.1				
Pike	1.1	0.3	0.4				
Randolph*	0.2						
Russell*	1.6	0.1	0.3			0.1	
Total	21.1	3.7	4.5	0.9	1.7	1.4	1.2

*Partial County

Florida

County	Domestic: Ground	Livestock: Ground	Livestock: Surface	Irrigation: Ground	Irrigation: Surface
Alachua*	1.3	0.3	0.2	2.4	
Baker	0.7	0.1	0.1	0.2	0.1
Bay	3.6			1.6	
Bradford	0.9	0.1	0.1	0.1	0.2
Calhoun	0.4	0.1	0.1	0.2	
Columbia	0.9	0.2	0.1	1.4	
Dixie	0.3	0.1		0.3	
Duval*	0.8	0.2	0.2		
Escambia	4.7	0.3	0.2		
Franklin	0.3			0.1	
Gadsden	2.2	0.4	0.3		2.0
Gilchrist*	0.2	0.1	0.1	0.6	
Gulf	0.4				
Hamilton	0.3	0.1	0.1	3.0	
Holmes	0.5	0.2	0.1		0.2
Jackson	1.9	0.6	0.4	0.8	0.2
Jefferson	0.6	0.3	0.2	0.2	0.4
Lafayette	0.2	0.3	0.2	4.1	
Leon	2.5	0.1	0.1	1.1	
Levy*	0.2	0.1	0.1	2.9	0.5
Liberty	0.2				
Madison	0.7	0.2	0.2	1.5	0.2
Nassau	1.2	0.5	0.3		
Okaloosa	2.7	0.1	0.1	0.8	0.4
Santa Rosa	2.3	0.1	0.1	1.7	
Suwannee	0.8	0.3	0.2	2.1	
Taylor	0.3	0.1		0.1	
Union	0.7	0.1	0.1	0.2	0.1
Wakulla	0.4				
Walton	0.7	0.2	0.1	6.0	
Washington	0.8	0.2	0.1	0.2	
Total	33.7	5.4	3.8	31.6	4.3

Table III-15. Total water use, by counties, Northeast Gulf River Basins, 1970 (million gallons per day)

Alabama				Florida			
County	Ground	Surface	Total	County	Ground	Surface	Total
Baldwin*	4.2	0.6	4.8	Alachua*	5.9	0.2	6.1
Barbour	3.0	1.7	4.7	Baker	1.5	0.2	1.7
Bullock*	0.7	0.3	1.0	Bay	8.0	37.5	45.5
Butler*	3.7	1.4	5.1	Bradford	9.7	0.3	10.0
Chambers*	0.9	8.8	9.7	Calhoun	0.9	0.1	1.0
Coffee	4.5	0.5	5.0	Columbia	4.2	0.1	4.3
Conecuh	1.8	0.3	2.1	Dixie	2.0		2.0
Covington	4.0	63.9	67.9	Duval*	4.3	0.2	4.5
Crenshaw*	1.6	1.7	3.3	Escambia	73.9	378.1	452.0
Dale	5.7	0.2	5.9	Franklin	0.9		0.9
Escambia*	5.2	44.3	49.5	Gadsden	3.5	5.6	9.1
Geneva	2.5	0.7	3.2	Gilchrist*	1.0	0.1	1.1
Henry	1.6	0.4	2.0	Gulf	19.5	36.4	55.9
Houston	7.5	1.0	8.5	Hamilton	22.3	0.1	22.4
Lee*	1.2	0.2	1.4	Holmes	1.0	0.3	1.3
Lowndes*	0.1		0.1	Jackson	7.5	144.6	152.1
Macon*	0.1		0.1	Jefferson	1.7	0.6	2.3
Monroe*	0.2		0.2	Lafayette	4.7	0.2	4.9
Montgomery*	0.5	0.1	0.6	Leon	43.6	0.1	43.7
Pike	3.2	0.9	4.1	Levy*	3.6	0.6	4.2
Randolph*	0.2		0.2	Liberty	1.2	0.5	1.7
Russell*	2.3	33.7	36.0	Madison	3.0	0.4	3.4
Total	54.7	160.7	215.4	Nassau	53.7	0.3	54.0
				Okaloosa	16.2	0.5	16.7
				Santa Rosa	16.8	0.1	16.9
				Suwannee	10.9	173.2	184.1
				Taylor	55.4		55.4
				Union	1.7	0.2	1.9
				Wakulla	1.3	160.4	161.7
				Walton	8.8	0.1	8.9
				Washington	1.6	0.1	1.7
				Total	390.3	941.1	1331.4

*Partial County

*Partial County

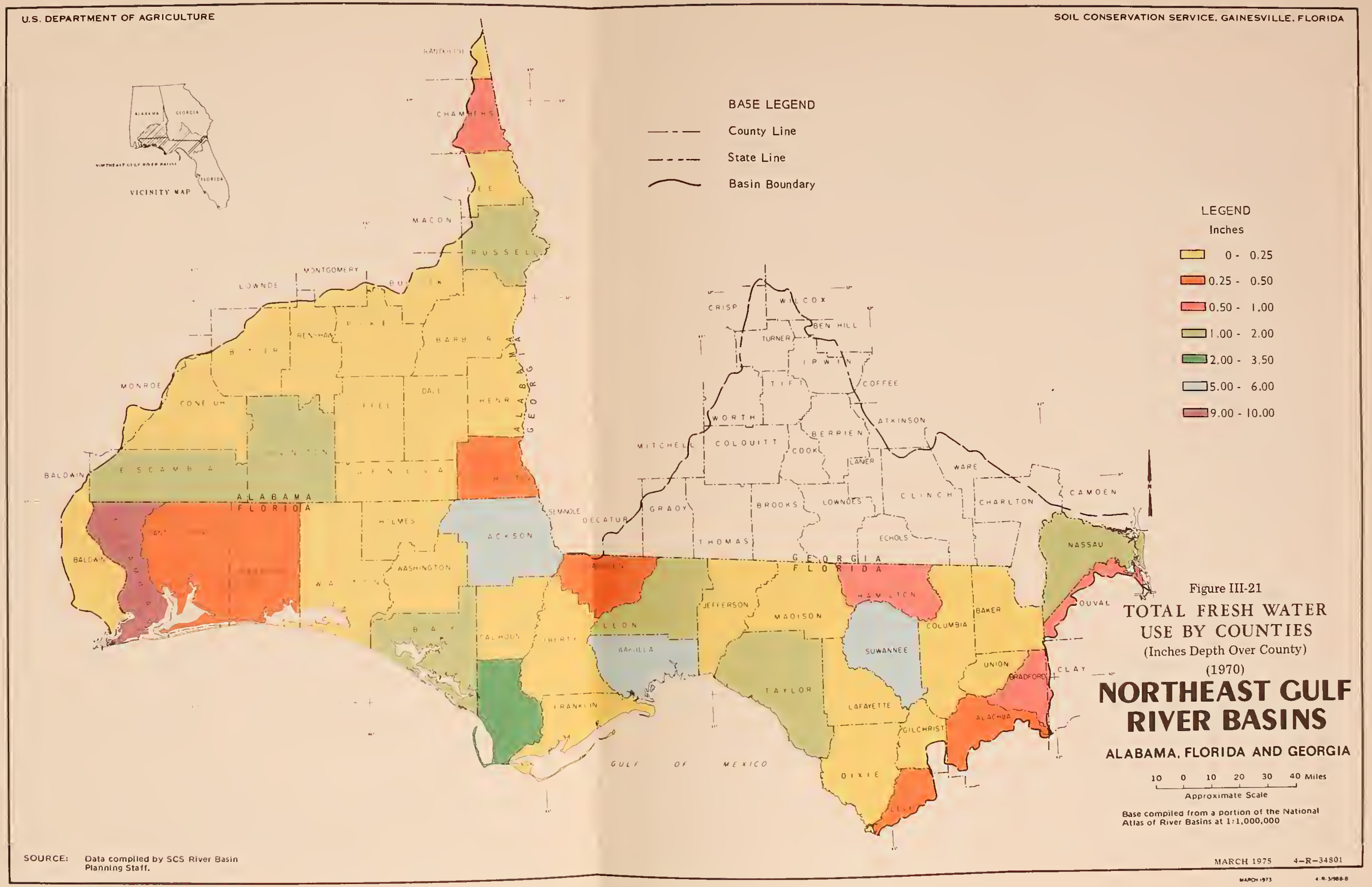


Figure III-21
TOTAL FRESH WATER USE BY COUNTIES
(Inches Depth Over County)
(1970)
NORTHEAST GULF RIVER BASINS
ALABAMA, FLORIDA AND GEORGIA

USDA-SCS-FORT WORTH, TEXAS 1977

Electric power - Thermoelectric power plants use more water than all other water users in the Basins combined (Table III-13). Only a very small part of this water is consumed and the remainder is returned to the source, heated to some extent, but otherwise unaltered in its quality. Because of the large amount of water used by thermoelectric plants for cooling, most of these plants are located on large streams with dependable supplies of water or are located on large bodies of water such as the Gulf of Mexico where the heated discharge water is soon dissipated or diluted with cooler water. Hydroelectric plant water use was not inventoried since practically all of this water passes through the turbines and then is discharged back into the stream unaltered.

Agricultural - The water used by agriculture was broken down into domestic, livestock, irrigation, and catfish farming. Water for catfish farming was not inventoried in Florida because there is very little of this enterprise in the state. Rural domestic (household) water was from ground water supplies and was estimated at 100 gallons per day per rural resident. Livestock water requirements were estimated on the basis of 15 gallons per day per beef animal; for dairies, drinking water was estimated at 20 gallons per day per dairy cow and 115 gallons for cleaning purposes. Irrigation water requirements were based on a county inventory of irrigated crops conducted with the assistance of Soil Conservation Service district conservationists.

Fish and Wildlife

General

The river basins study is directed toward satisfying human needs and desires through economic development and enhancement of environmental quality. The principal concern for the fish and wildlife resource is in its beneficial effects on man. The condition of the resource is an indicator of the quality of the environment. The decrease of animal species, the death of fish in a polluted stream, the loss of animals from habitat deterioriation - each is a symptom of environmental decline.

Fish and wildlife are for hunting, fishing, food, fertilizer, bait, and other uses. Non-consumptive resource uses, such as bird watching, hiking, camping, and nature photography are increasing at a greater rate than are the consumptive uses. Conservation, or the wise use of the resource, often requires intensive management if some species are to survive and to continue to proliferate. Acquisition, preservation, and enhancement of fish and wildlife habitat are essential for man's present enjoyment and for the benefit of future generations.

Population studies, man-days in pursuit of quarry, and available suitable habitat inventories are necessary in order to determine needs. Human population trends, growth patterns, and changing land use patterns must be studied to determine future needs. Public attitudes may change but the present concern over environmental matters has caused a shift in emphasis away from purely economic development.

The fish and wildlife resources were inventoried and evaluated by personnel of the Florida Game & Fresh Water Fish Commission, Alabama Department of Conservation & Natural Resources, U. S. Forest Service, U. S. Fish & Wildlife Service, Soil Conservation Service, and Florida Department of Natural Resources. Some data were already available before the start of the river basins study while other information was gathered during and as a result of the study. The present level of use of the fish and wildlife resources and the opportunities for increased utilization are discussed, including sport and commercial fisheries, and hunting. Threatened species of animals and their habitats are examined with the prospect of preserving areas for continuation and management of the species. The inventory part of the study was necessary to determine the problems and possible management methods needed to provide adequate hunting and fishing in the years ahead.

The advisory committees in the states involved determined priorities and coordinated the fish and wildlife studies of the different agencies.

Fisheries Resource

Lakes, ponds, rivers, streams, estuaries, and off-shore areas were inventoried for their fishery production. Commercial salt and fresh water enterprises were evaluated for their harvest and economic impact. The Florida Department of Natural Resources, Florida Game & Fresh Water Fish Commission, Corps of Engineers, Alabama Development Office and the Georgia Game & Fish Commission contributed data for the inventory.

The total weight of fish per acre is the usual standard of measuring the carrying capacity of a body of water. This weight will change from season to season due to habitat quality, fishing success, management of waters, abnormal climatic conditions, and many other factors. Because of the presence of non-game, or so called "rough" fish and undersized game fish, it was estimated that approximately 60 percent of the total weight of the fish was harvestable.

When increased fishing pressure does not result in an appreciable increase in harvest of fish, then the carrying capacity of that body of water has been reached for that particular set of conditions. The minimum acceptable catch is variable depending upon the type of fishing, location, fishing experience and other conditions. An average catch of 2 to 3 pounds per man-day was determined to be a satisfactory return for the effort expended in fresh waters.

Florida and Alabama both have selected areas which are under continuing programs of fishery improvement. These fish management areas (Table III-16) are continually investigated for productivity, environmental status, and weed infestation and corrective actions are taken when necessary. A recent innovation has been the introduction of striped bass and other highly valued sports fish into lakes to control shad and thereby enhance the sports fisheries.

Wildlife Resource

The state wildlife agencies of Florida and Alabama provided the majority of the information related to the consumptive use of wildlife, which, along with the forests, are considered a renewable resource. The harvest figures (Table III-17) were obtained by mail sampling of a portion of the holders of hunting licenses and from checking station data in the management areas. Turkey, deer, and wild hog are the big game animals in the Basin, while quail, squirrel, doves, rabbit, and waterfowl are considered to be small game. Fox, raccoon, and bobcat provide a different type of hunting pleasure and may or may not be harvested. Population data on the big game species, such as deer and turkey, provide indications of the amount and condition of wilderness areas.

Table III-16. State managed public fishing lakes by sub-basins and counties, Northeast Gulf River Basins, Alabama and Florida[1/]

Sub-Basin - Lake	County	Acres
Blackwater River (32)		
Bear Lake	Santa Rosa, Fla.	107
Hurricane Lake	Okaloosa, Fla.	350
Chattahoochee River (29a)		
Barbour County Public Lake	Barbour, Ala.	75
Chambers County Public Lake	Chambers, Ala.	188
Chattahoochee State Park Lake	Houston, Ala.	17
Lee County Public Lake	Lee, Ala.	141
Chipola River (29b)		
Merritt's Mill Pond	Jackson, Fla.	202
Choctawhatchee Bay (GCAa)		
Campbell Lake	Walton, Fla.	125
Choctawhatchee River (30)		
Dale County Public Lake	Dale, Ala.	95
Geneva County Public Lake	Geneva, Ala.	60
Smith Lake	Washington, Holmes, Fla.	160
Lake Victor	Holmes, Fla.	130
Juniper Lake	Walton, Fla.	685
Conecuh River (33a)		
Crenshaw County Public Lake	Crenshaw, Ala.	50
Escambia River (33)		
Lake Stone	Escambia, Fla.	120
Ochlockonee River (28)		
Lake Talquin	Leon-Gadsden, Fla.	8850
Pea River (30a)		
Coffee County Public Lake	Coffee, Ala.	70
Pike County Public Lake	Pike, Ala.	45
Suwannee River (25)		
Governor Hill Lake	Dixie, Fla.	156
Koon Lake	Lafayette, Fla.	110
Lake Francis	Madison, Fla.	26
Suwannee Lake	Suwannee, Fla.	63
Watertown Lake	Columbia, Fla.	46
Steinhatchee River (GCAd)		
Blue Spring Lake	Taylor, Fla.	80
Yellow River (31)		
Karick Lake	Okaloosa, Fla.	75

1/ Refer to Figure III-23

About 100,000 acres of national wildlife refuges are located in the study area (Figure III-22). These refuges contain habitat representative of all of the southeastern United States except that of subtropical south Florida. There are pine flatwoods, fresh water swampland marshes, salt water marshes, and upland hardwood hammocks. Shore birds, waterfowl, songbirds, raptors, deer, bobcat, raccoons, and other species are native to the refuges. Cooler winter weather brings many migratory birds to the area. The refuges play an important part in national and state programs to save threatened or endangered species of wildlife. Wildlife observations, sightseeing, picnicking, nature photography, fishing, and sometimes hunting, are enjoyed on the refuges. Outdoor conservation classes are conducted by refuge personnel both on and off the refuges. Wildlife observation and fishing are the most popular activities. Generally, more than one activity is enjoyed by the visitors, such as picnicking while bird watching.

The state and national forests within the Basins provide hunting and fishing opportunities for many sportsmen. Prescribed burning and clearcutting in small blocks contribute to high wildlife populations. The forests are among the last areas with viable black bear populations because of large tracts of dense vegetation and relative inaccessibility to man. Hunting is controlled by the state game agencies. As with the federal refuge system, the national forests harbor several threatened wildlife species.

Military bases permit access for hunting and fishing as their primary interest dictates. The military and the state agencies cooperate in management and enforcement policies. As a rule, the animal populations are high because of protection in restricted areas and because of habitat improvement.

The states either lease or own many widely scattered game management areas (Figure III-23). The leased lands are owned by timber related corporations who receive protection for their land and equipment in addition to favorable public relations. These management areas receive the heaviest use from outdoorsmen.

The majority of the forest industry firms in Alabama and Florida permit hunting on some or all of their holdings. Although this privilege opens between four and five million acres to hunters, permission is required in order to enter these lands. Some of the firms either lease land to hunting clubs or charge a small fee to individual hunters for annual hunting rights. In this way, better control is exercised over the land than if the public were given access indiscriminantly. The fees are used for road maintenance and habitat improvement.

Small landowners or farmers will occasionally allow hunters on their land; however, a written permit is required by law. Careless acts by a few undisciplined hunters have caused many landowners to fence and post their land. Increased population, more leisure time, and a new awareness of nature have led to greater pressure on the shrinking natural areas, most of which are owned by private individuals.

Areas of Federal Ownership or Interest[1/]

National Forests, Wildlife Refuges, Military Reservations, Parks, Corps of Engineers

1. Conecuh National Forest
2. Apalachicola National Forest
3. Osceola National Forest
4. St. Marks National Wildlife Refuge
5. West Point Lock & Dam
6. Eglin Air Force Base
7. Fort Rucker Military Reservation
8. St. Vincent National Wildlife Refuge
9. Tyndall Air Force Base
10. Fort Benning
11. Eufaula National Wildlife Refuge
12. Gulf Island National Seashore
13. Cedar Keys National Wildlife Refuge
14. Jim Woodruff Lock & Dam
15. George W. Andrews Lock & Dam
16. Walter F. George Lock & Dam
17. Pensacola Naval Air Station & Outlying Fields

1/ Figure III-22

National Historic Places

Alabama

Barbour County
Clayton
Miller-Martin Town House
Octagon House

Eufaula
Bray-Barron Home
Cato House
Drewry-Mitchell-Moorer House
Fendall Hall
Kendall Manor
Kiels-McNab-Doughtic House
Lore Historic District
McNab Bank Building
Sheppard Cottage
Shorter Mansion
Governor Sparks (H.C.Hart) House
The Tavern (River Tavern)
Wellborn House

Bullock County
Union Springs
Bullock County Courthouse Historic District

Chambers County
LaFayette
Oliver House

Coffee County
Elba
Coffee County Courthouse

Enterprise
Boll Weevil Monument
Seaboard Coastline Depot

Conecuh County
Evergreen
L & N Depot

Covington County
Opp
Shepard House

Crenshaw County
Highland Home
Kirkpatrick House

National Historic Places (Cont.)

Alabama (Cont.)

Dale County
Newton
Oates-Reynolds Memorial Building

Ozark
Claybank Log Church

Houston County
Dothan
Federal Building and U. S. Courthouse

Lee County
Opelika
Lee County Courthouse
U. S. Post Office

Pike County
Troy
College Street Historic District

Randolph County
Rock Mills
McCosh Grist Mill

Russell County
Fort Mitchell
Fort Mitchell Site

Holy Trinity
Apalachicola Fort

Phenix
Fort No. 5 (Confederate Breastwork)

Seale
Russell County Courthouse
Bass-Perry House

Florida

Baker County
Olustee
Olustee Battlefield

Sanderson
Burnsed Blockhouse

Bradford County
Starke
Old Bradford County Courthouse

Calhoun County
Blountstown
Cayson Mound and Village Site

Columbia County
Lake City
Henderson House

Escambia County
Pensacola
Buccaneer (Schooner)
Dorr House
Fort George Site
Fort Pickens
*Fort San Carlos DeBarrancas
L&N Marine Terminal Building
Lavelle House
Old Christ Church
Pensacola Historic District
Pensacola Athletic Club
Pensacola Lighthouse and Keeper's Quarters
*Plaza Ferdinand VIII
Saenger Theatre
St. Michael's Creole Benevolent Association Hall

National Historic Places (Cont.)

Florida (Cont.)

Franklin County

Apalachicola
- Pierce Site
- Raney House
- Trinity Episcopal Church

East Point
- Porter's Bar Site

Little St. George Island
- Cape St. George Light

St. Teresa
- Yent Mound

Sumatra
- *Fort Gadsden Historic Memorial

Gadsden County

Chattahoochee
- Martin House
- U. S. Arsenal Officers Quarters

Mt. Pleasant
- Davis House

Quincy
- Love House
- McFarlin House
- Methodist Parsonage
- Quincy Library
- Quincy Woman's Club
- Shelfer House
- Stocton-Curry House
- Old Philadelphia Presbyterian Church

Jackson County

Greenwood
- Erwin House
- Great Oaks (House)
- Pender's Store

Marianna
- Ely-Criglar House
- West House
- Waddell's Mill Pond

Jefferson County

Capps
- May House

Lamont
- San Miguel de Asile Mission Site

Lloyd
- Lloyd Railroad Depot
- San Joseph de Ocuya Site

Monticello
- Perkins Opera House
- Wirick-Simmons House
- Lyndhurst Plantation
- San Juan de Aspalaga Site

Leon County

Tallahassee
- Bellevue
- Brokaw-McDougall House
- Governor Call House (The Grove)
- Cascades Park
- Chaires House (The Columns)
- Florida State Capitol
- Goodwood (Old Croom Mansion)
- Historic District (Zone I & II)
- Union Bank
- Escambe'
- Lake Jackson Mounds
- *San Luis de Apalache
- San Pedro y San Pablo de Patole
- First Presbyterian Church
- Walker Library
- Pisgah United Methodist Church

Woodville
- Natural Bridge Battlefield

Liberty County

Bristol
- Torreya State Park

National Historic Places (Cont.)

Florida (Cont.)

Madison County
Madison
Dial House
Wardlaw-Smith House

Nassau County
Fernandina Beach
Bailey House
Fairbanks House
Fernandina Historic District
The Tabby House (Lewis House)
Fort Clinch

Okaloosa County
Fort Walton Beach
Fort Walton Mound

Suwannee County
Live Oak
Hull-Hawkins House

Wakulla County
Crawfordville
Old Wakulla County Courthouse

Hyde Park
Bird Hammock

St. Marks
*Fort San Marcos de Apalache

St. Marks National Wildlife Refuge
St. Marks Lighthouse

Walton County
DeFuniak Springs
Chautaugua Auditorium

*National Historic Landmark

State Designated Outdoor Recreation Areas[1/] - Northeast Gulf River Basins

Wildlife Management Areas

Florida		Acres	Alabama		Acres
1.	LaFloresta Perdido	30,100	19.	T.R. Miller	37,200
2.	St. Regis	20,000	20.	Conecuh	51,200
3.	Blackwater	183,100	21.	Covington	16,000
4.	Eglin	464,700	22.	Geneva	7,000
5.	Point Washington	186,000	23.	Barbour	14,000
6.	Gaskin	118,300	24.	Butler	30,000
7.	G.U. Parker	17,000			
8.	Edward Ball	75,000		Total	2,849,100
9.	St. Vincent	12,400			
10.	Apalachicola	557,400			
11.	Apalachee	6,000			
12.	Robert Brent	95,000			
13.	Aucilla	165,000			
14.	Tide Swamp	20,500			
15.	Steinhatchee	382,000			
16.	Osceola	157,200			
17.	Lake Butler	109,000			
18.	Nassau	95,000			

Aquatic Preserves (Florida)

1.	Fort Pickens	Escambia
2.	Yellow River Marsh	Santa Rosa
3.	Saint Andrews Bay	Bay
4.	Saint Joseph Bay	Gulf
5.	Apalachicola Bay	Franklin
6.	Alligator Harbor	Franklin
7.	Nassau - St. Johns River	Nassau-Duval
8.	Fort Clinch State Park	Nassau

Canoe Trails

	Miles		Miles
1. Perdido River	27	12. Sopchoppy River	15
2. Coldwater Creek	16	13. Wakulla River	4
3. Sweetwater-Juniper Creek	15	14. Wacissa River	14
4. Blackwater River	35	15. Aucilla River	19
5. Yellow River	50	16. Withlacoochee River	58 - (20 in GA)
6. Shoal River	27		
7. Holmes Creek	20	17. Suwannee River	168 - (20 in GA)
8. Econfina Creek	22		
9. Chipola River	55	18. St. Marys River	66
10. Upper Ochlockonee River	73 - (35 in GA)	19. Santa Fe River	26
11. Lower Ochlockonee River	65		

1/ Figure III-23

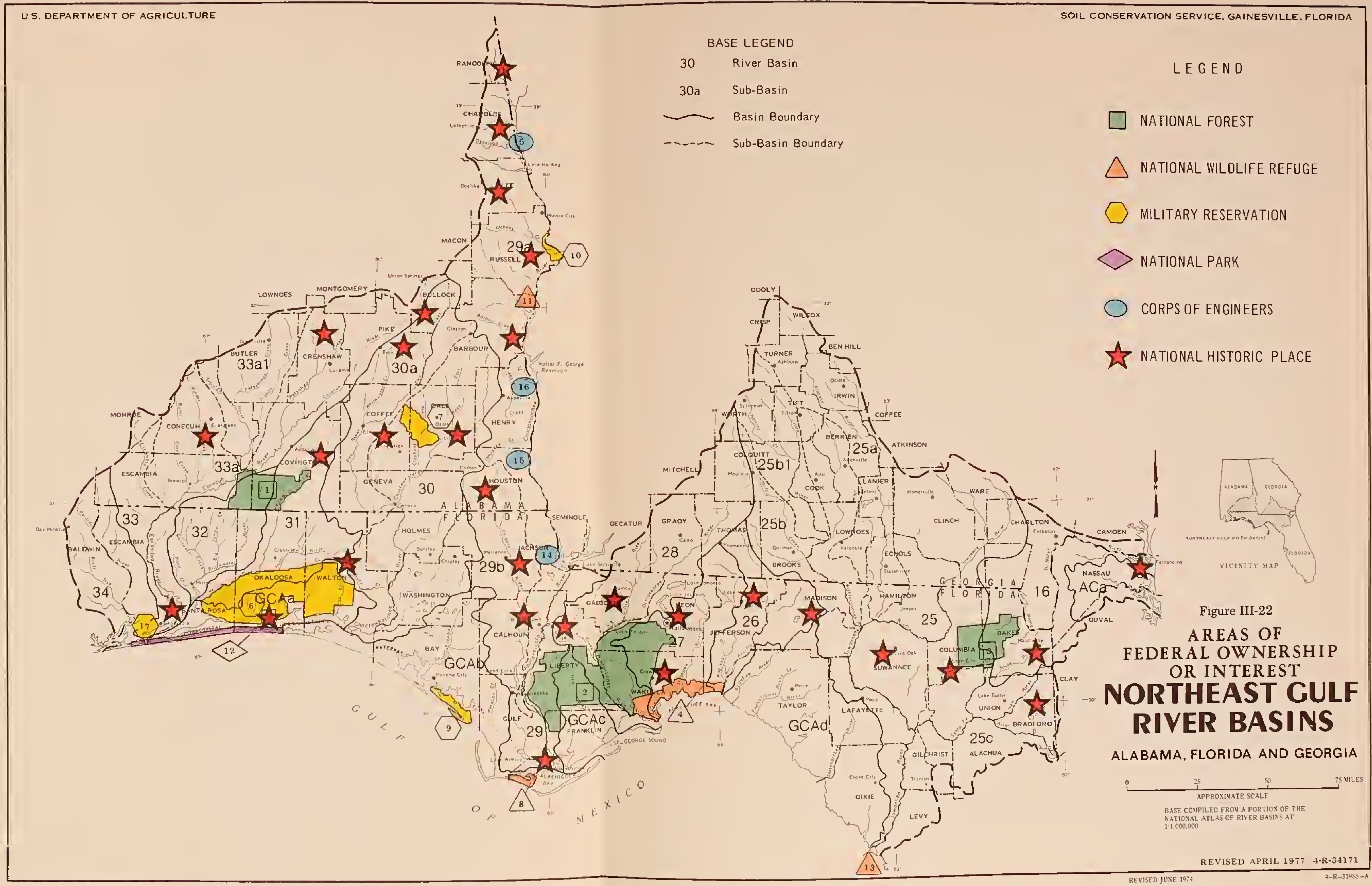
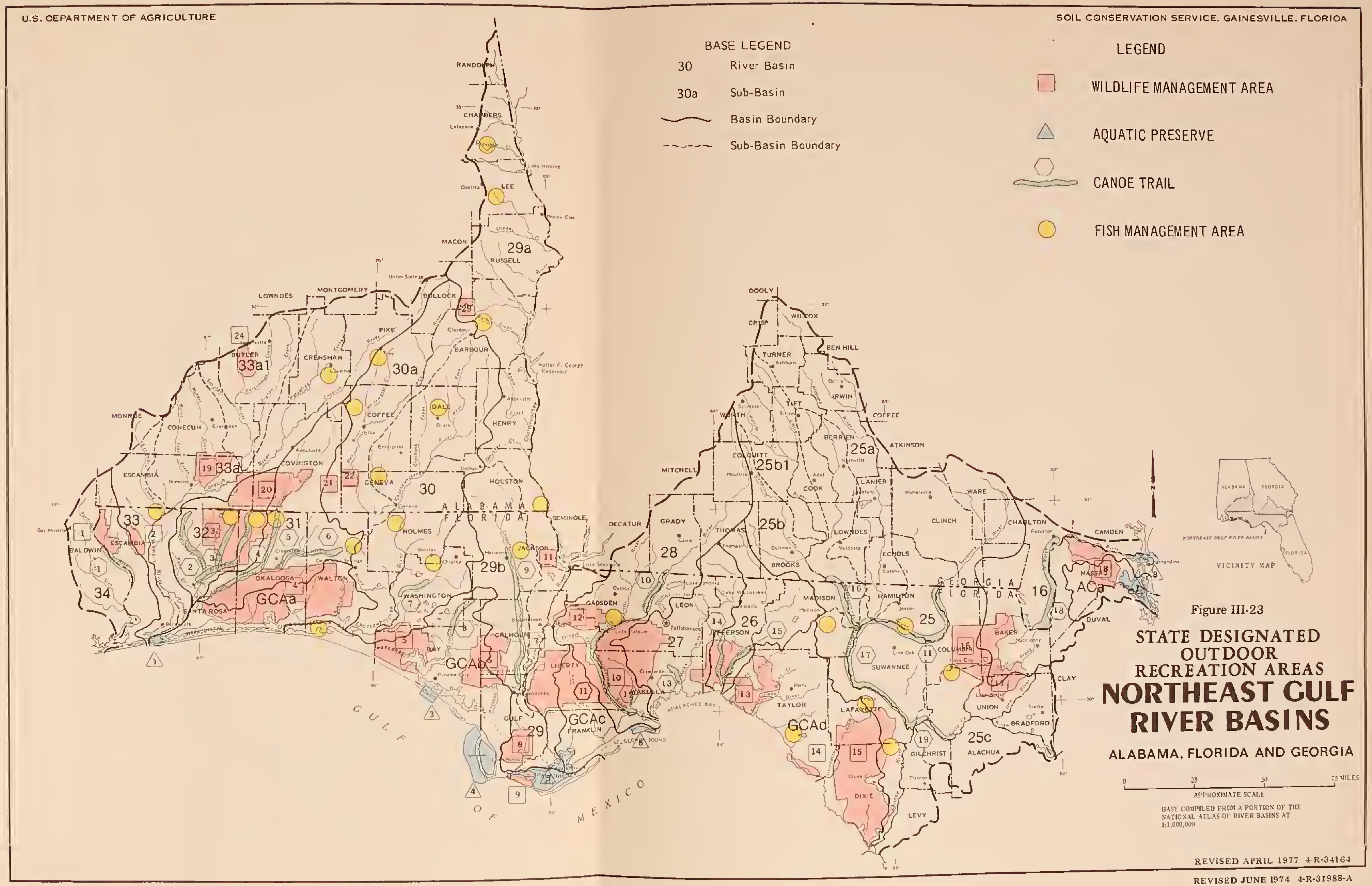


Figure III-22
AREAS OF FEDERAL OWNERSHIP OR INTEREST
NORTHEAST GULF RIVER BASINS
ALABAMA, FLORIDA AND GEORGIA

USDA-SCS-FORT WORTH, TEXAS 1977

REVISED JUNE 1974 4-R-31955-A



USDA-SCS-FORT WORTH, TEXAS 1977

REVISED JUNE 1974 4-R-31988-A

A questionnaire about the status of wild turkey in Florida was distributed to wildlife officers, game managers, and biologists of the Game and Fresh Water Fish Commission. These people are the most knowledgeable concerning wild animals in their jurisdiction. They were requested to locate on a map the areas where turkeys are seen (Figure III-24). They were also asked to estimate the population trend for the past 10 years. Generally, the personnel were in agreement concerning the distribution; however, there was some disagreement about the population trends. Most of the respondents said the birds were decreasing while the remainder said the population was either stable or increasing.[1/]

During the period 1950 to 1960 the turkey population approximately tripled because of excellent management, judicious turkey relocation, and the return of the land to forests. That trend has now reversed and many forested areas have been altered for different forms of development.

The Southeastern Cooperative Wildlife Disease Study of Athens, Georgia, supplies information to, and works with, thirteen southeastern states on diseases and related problems concerning wildlife. From field gathered data, the condition of various species can be determined. For instance, a heavy load of parasites indicates that an animal is in poor condition. A healthy animal usually has some parasites without showing any detrimental effects, but an animal in a starved or diseased condition will be heavily infested. The parasites are also indicators of the condition of the habitat. In a fairly recent occurrence of a large die-off of deer, it was found that there were too many deer for the area and not enough food. Weakened deer became susceptible to parasites which accelerated their decline. Because the hunters were prevented from harvesting the surplus animals, natural forces controlled the herd. From research conducted by the study, it has been determined that generally the deer population in the Basins is below the carrying capacity of the land and therefore can be considered in good condition (Figure III-25).

There are a few areas in Florida and many in Alabama where there are more deer than the land can support. In order to prevent deterioration of the habitat, depredation of farm crops, and an eventual die-off of deer, the surplus animals should be harvested. An enlightened public could provide support for actions deemed necessary by the state wildlife agencies to maintain or improve the status of game populations.

<u>Hunting potential</u> - The National Association of Conservation Districts, with assistance from the Soil Conservation Service conducted a nationwide Appraisal of Potential of Outdoor Recreation Development. Meetings were held in each county with recreation committees comprised of state and federal employees, members of the various environmental groups, and other interested citizens.

1/ Lovett Williams, Florida Game & Fresh Water Fish Commission

Factors which would affect the hunting potential were discussed at length. Among them were the climate, soils, water areas, wildlife habitat and populations, proximity to population centers, and the rural ownership patterns (Figure III-26).

Soils and climate are factors which influence the habitat as does the ownership patterns. Land which is primarily in large farms would provide little for the forest animals but would attract doves and quail. Conversely, the bottomland hardwoods would not be suitable for doves and quail but would be excellent habitat for turkey, deer, and squirrel.

Three categories of wildlife were considered by the committees: small game, big game, and waterfowl. Small game include squirrel, quail, dove, snipe, and woodcock. Big game consists of deer, turkey, wild hogs, and bear. Waterfowl are ducks, coot, and geese.

Rural counties with large tracts of natural woodland generally had higher potentials for big game hunting than the counties with many farms. Waterfowl hunting, as a rule, had low potential in most counties because of the lack of suitable habitat and the distance from the main flyways usually travelled by migratory ducks. Some counties which were determined to have a high potential for waterfowl hunting have good populations of native wood ducks. Small game such as quail and doves require open fields; therefore, heavily farmed counties usually had a better hunting potential for small game.

Game animal utilization - To determine the status of wildlife populations and the harvest rates of game species, the Florida Game and Fresh Water Fish Commission in cooperation with the Southeastern Cooperative Statistical Unit at North Carolina State University randomly selected two percent of the hunting license holders in Florida. Questionnaires were sent to these hunters requesting information on harvest by species hunted, and hunting pressure by the number of days hunted. There were 257,352 hunting licenses purchased in the state with 106,692 purchased in the two northernmost Game Commission regions. The northeast and northwest Florida Game & Fresh Water Fish Commission administrative regions roughly correspond to the Florida subarea of the Northeast Gulf River Basins. The data presented in Table III-17 are the results from the questionnaire for the 1973-74 hunting season.

Although the success ratio is somewhat less in some categories in the Florida subarea than in the state as a whole, the Basins have a wide variety of animals and many forested areas in which to hunt. For this rather sparsely settled area of Florida, hunting is an important recreational activity.

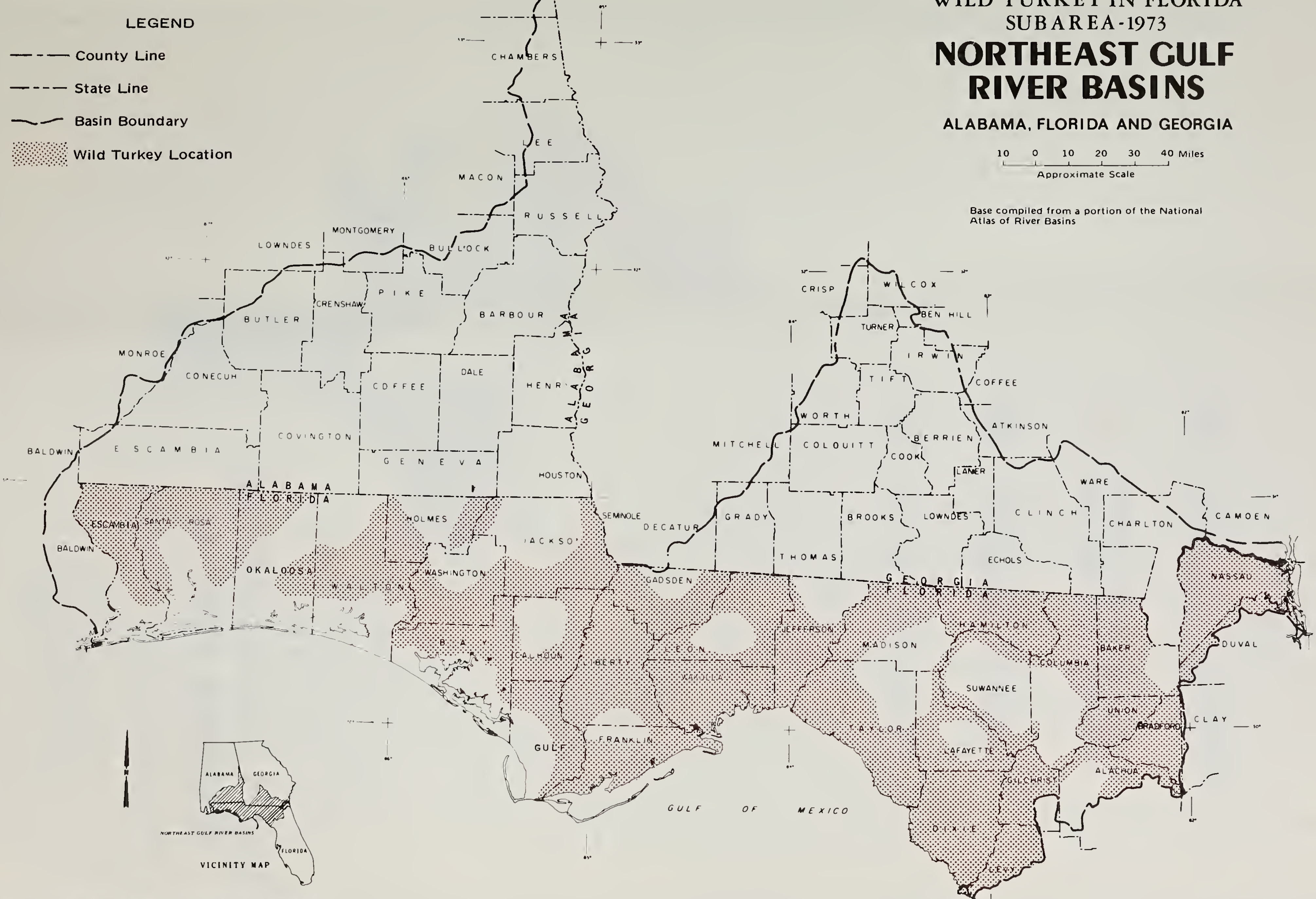
U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE. GAINESVILLE. FLORIDA

Figure III-24
WILD TURKEY IN FLORIDA
SUBAREA-1973

NORTHEAST GULF RIVER BASINS

ALABAMA, FLORIDA AND GEORGIA



SOURCE: Data compiled by Florida Game and Fresh Water Fish Commission.

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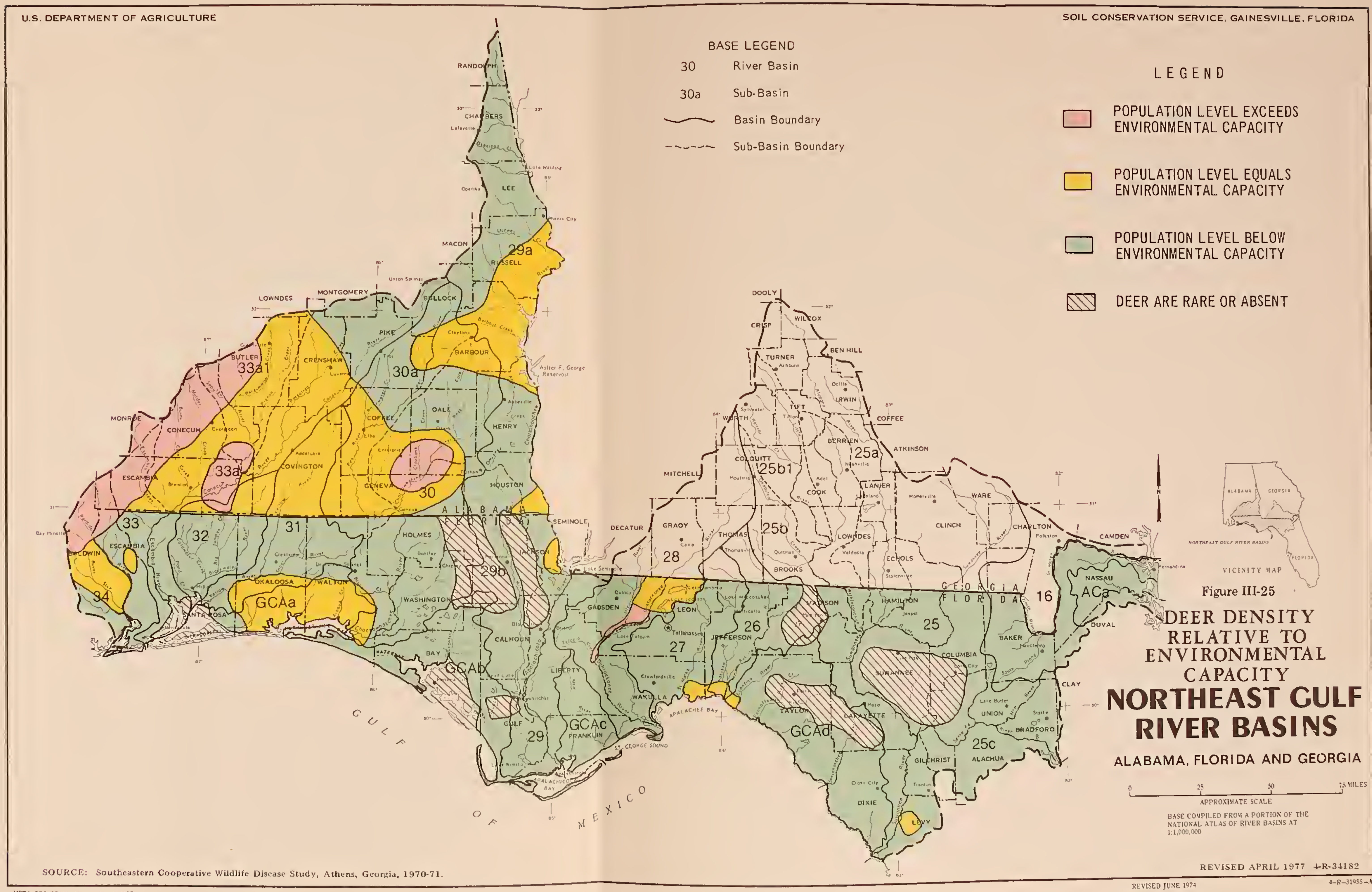

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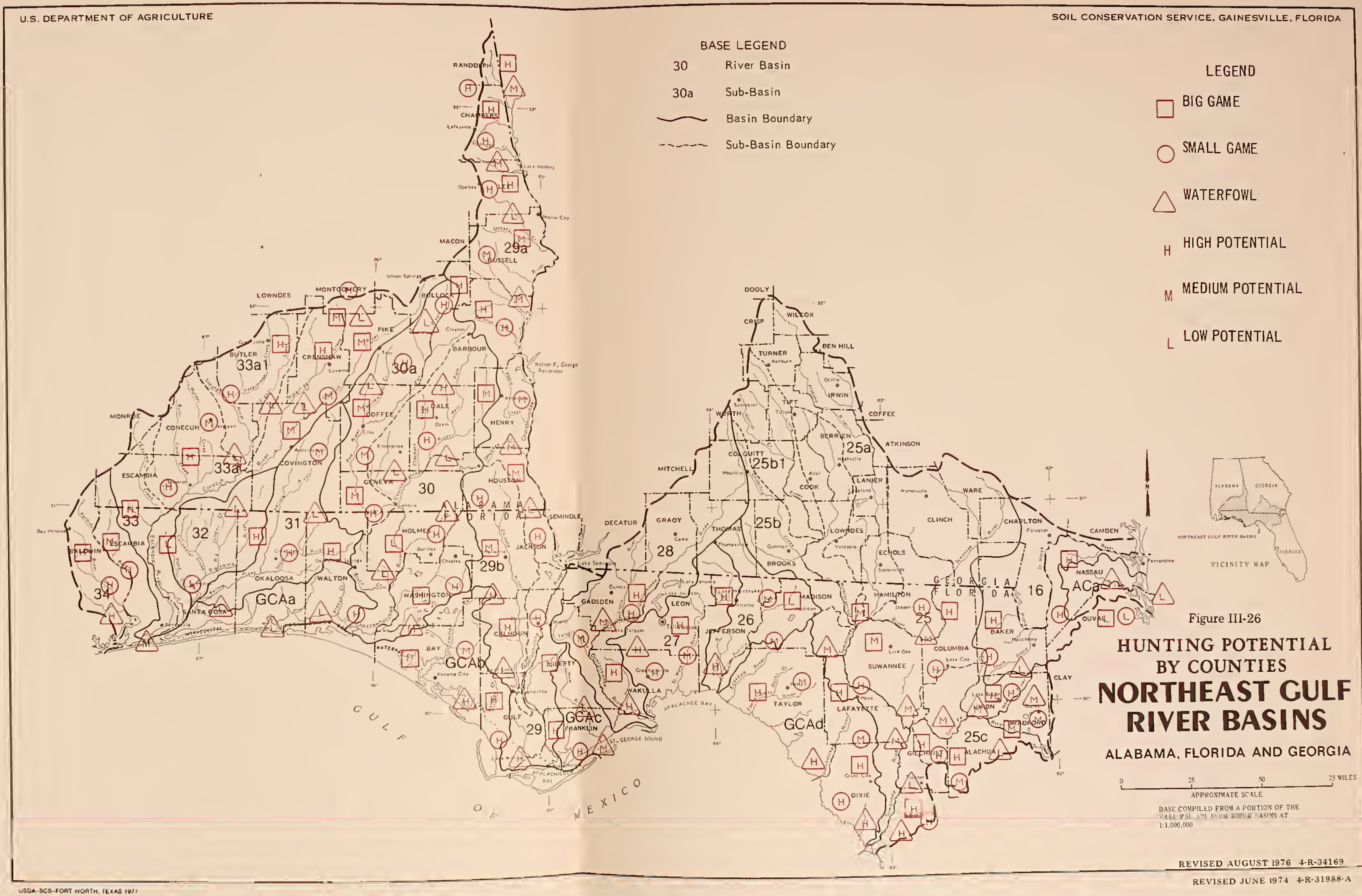


Figure III-26

HUNTING POTENTIAL BY COUNTIES
NORTHEAST GULF RIVER BASINS
ALABAMA, FLORIDA AND GEORGIA

Table III-17. Analysis of game animal utilization, State of Florida and Florida subarea, 1973-74

Species	Animals Harvested		Man-days Hunted Per Animal Harvested	
	State	Subarea	State	Subarea
Deer	57,122	20,627	32.99	37.09
Turkey	29,885	7,693	12.90	16.25
Quail	1,969,950	636,354	.42	.40
Squirrel	1,412,890	765,910	.52	.60
Wild Hog	84,128	32,681	6.40	4.01
Duck	469,774	138,238	.72	.51
Dove	3,758,350	1,127,955	.22	.21
Snipe	343,639	23,830	.35	.94
Rabbit	470,268	47,345	.84	2.00
Fox	7,751	5,757	18.40	13.92
Racoon	188,265	62,388	2.22	4.73
Bobcat	20,281	1,218	6.47	7.37

Threatened, Rare and Endangered Species

Threatened wildlife - A list of vertebrates that are threatened with extirpation within the River Basins has been compiled by the concerned state agencies and the U. S. Fish and Wildlife Service (Table III-18).

Some small inconspicuous animals may be endemic to a very small area, such as one spring or one segment of beach. These are so specialized that their living requirements may not be met in any other area. The widening of a road or destruction of a dune could eliminate the species. Other animals with a much greater range may disappear because of a change in their breeding areas, resting places or food supply.

Species attrition occurs naturally through catastrophe, competition, plant succession, disease and other subtle changes in the environment. Major habitat alterations by man which may greatly accelerate the decline of species include highway construction, impoundments, land drainage, timber harvesting, pesticides, farming, urbanization, industrial development, pollution, and strip-mining.

The most adaptable animals have been the most successful, while those that have not been able to change with their environment have become extinct or have suffered great numerical losses. The species whose numbers have declined drastically or have reached a critically low population level may be considered to be endangered. Some animals that still appear to be plentiful, such as the brown pelican in Florida, face habitat reduction and degradation to the degree that their existence is in doubt and so are determined to be a threatened species.

Table III-18. Endangered and Threatened Vertebrates in the Northeast Gulf River Basins, Alabama and Florida1/

Fish	
*Okaloosa Darter	Etheostoma okaloosae
Suwannee Bass	Micropterus notius
Reptiles and Amphibians	
Alligator	Alligator mississippiensis
Atlantic Loggerhead Turtle	Caretta caretta caretta
*Atlantic Ridley Turtle	Lepidochelys kempi
Black Pine Snake	Pituophis melanoleucus lodingi
Dusky Gopher Frog	Rana aerolata sevosa
Eastern Indigo Snake	Drymarchon corais couperi
Florida Gopher Frog	Rana aerolata aesopus
Flatwood Salamander	Ambystoma cingulatum
Gopher Tortoise	Gopherus polyphemus
Green Sea Turtle	Chelonia mydas
*Hawksbill Turtle	Eretmochelys imbricata imbricata
*Leatherback Turtle	Dermochelys coriacea
Pine Barrens Tree Frog	Hyla andersoni
Red Hills Salamander	Phaeognathus hubrichti
Saltmarsh Snake	Natrix fasciata clarki
Short-tailed Snake	Stilosoma extenuatum
Suwannee Turtle	Chrysemys concinna suwanniensis
Birds	
*Bachman's Warbler	Vermivora bachmanii
*Brown Pelican	Pelecanus occidentalis
Golden Eagle	Aquila chrysaetos
*Ivory-billed Woodpecker	Campephilus principalis
*Kirtland Warbler	Dendroica kirtlandii
Least-Tern	Sterna albifrons antillarum
Louisiana Seaside Sparrow	Ammospiza maritima fisheri
Magnificent Frigate Bird	Fregata magnificens rothchildi
Mottled Duck	Anas fulvigula
Osprey	Pandion haliaetus carolinensis
Oyster Catcher	Haematopus palliatus
*Peregrine Falcon	Falco peregrinus anatum
*Red-cockaded Woodpecker	Dendrocopos borealis
Reddish Egret	Dichromanassa refescens
Sandhill Crane	Grus canadensis pratensis
Snowy Plover	Charadrius alexandrinus
Southeastern Kestrel	Falco sparverius paulus
*Southern Bald Eagle	Haliaeetus leucocephalus leucocephalus
Wood Stork	Mycteria americana

Table III-18 (Cont.) Endangered and Threatened Vertebrates in the Northeast Gulf River Basins, Alabama and Florida1/

Mammals

Alabama Gulf Beach Mouse	Peromyscus polionotus ammomates
Choctawhatchee Beach Mouse	Peromyscus polionotus allophrys
Florida Black Bear	Ursus americanus floridanus
Florida Mouse	Peromyscus floridanus
*Florida Panther	Felis concolor coryi
Gray Bat	Myotis grisescens
*Indiana Bat	Myotis sodalis
*Manatee	Trichechus manatus latirostris
Perdido Bay Beach Mouse	Peromyscus polionotus trissyllepsis
Sherman's Fox Squirrel	Sciurus niger shermani

1/ Florida Game and Fresh Water Fish Commission

Endangered and Threatened Plants and Animals of Alabama, Bull. Alabama Mus. Nat. Hist.

* Endangered and Threatened Wildlife, Federal Register, Vol. 40, No. 188, Sept. 26, 1975.

Animals which are threatened with extinction and are listed in the Federal Register are eligible for benefits provided by the Endangered Species Act of 1969 (16 U.S.C. 668aa). Many states have adopted programs to protect threatened wildlife found within their borders. The extent of protection may be the preservation or restoration of habitat and prevention of over-exploitation of a species.

Threatened plants - The Conservation Act of 1973 (Public Law 93-205) states: "The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, protected, or restored; to provide a program for the conservation, protection, restoration or propagation of such endangered species and threatened species; and to take such steps as may be appropriate to achieve the purposes of this section."

Plant species, like wildlife species, benefit from preservation of habitat necessary for their continuation. Plants, being less mobile than animals, are even more vulnerable to expanding urbanization and industrialization and therefore must be identified before development eliminates or greatly reduces their population. Because these threatened species are generally not well known except by some of the more learned botanists, it is difficult for laymen to attach as much importance to them as they would to a bald eagle. Many plants have become extinct in recent years through man's work or some natural causes. Preservation of the habitat would not only protect the rare species but would also protect other little-known species of plants and animals which make up the ecosystem.

Three lists are included in this report: species that are endangered, threatened, or rare (Table III-19). Endangered species are in immediate danger of extinction or extirpation. Threatened species are those believed to likely move into the endangered category in the near future if factors at work continue operating. Many of these species are still common but are rapidly being depleted. Rare species have small and scattered populations which, although individually may be at risk, are sufficiently numerous or widespread to keep the species from being either endangered or threatened.[1/]

1/ Dan Ward, Institute of Food and Agricultural Sciences, University of Florida.

Table III-19. Endangered, threatened, and rare Florida plants[1/]

Endangered Species	Family	Common Name
Anemonella thalictroides (L.) Spach	Ranunculaceae	Rue-anemone
Cornus alternifolia L.f.	Cornaceae	Pagoda Dogwood
Croomia pauciflora (Nutt.) Torr.	Roxburghiaceae	Croomia
Cryptotaenia canadensis (L.) DC.	Umbelliferae	Honewort
*Harperocallis flava McDaniel	Liliaceae	Harper's Beauty
Oxypolis greenmanii Math. & Const.	Umbilliferae	Giant Water-drop-wort
Pachysandra procumbens Michx.	Buxaceae	Allegheny-spurge
Polygonella macrophylla Small	Polygonaceae	Large-leaved Joint-weed
*Ribes echinellum (Coville) Rehder	Saxifragaceae	Miccosukee Goose-berry
Staphylea trifolia L.	Staphyleaceae	Bladder-nut
*Torreya taxifolia Arn.	Taxaceae	Florida Torreya
Viola hastata Michx.	Violaceae	Halberd-leaved Yellow Violet
Threatened Species		
Baptisia hirsuta Small	Leguminosae	Hairy Wild-Indigo
Chrysopsis cruiseana Dress	Compositae	Cruise's Golden-aster
*Gentiana pennelliana Fern.	Gentianaceae	Wiregrass Gentian
Rhapidophyllum hystrix (Pursh) (Wendl. & Drude)	Palmae	Needle Palm
Rhododendron austrinum (Small) Rehder	Ericaceae	Orange Azalea
Sarracenia leucophylla Raf.	Sarraceniaceae	White-top Pitcher-plant
Smilax Smallii Morong	Liliaceae	Jackson-vine
Stewartia malacodendron L.	Theaceae	Silky Camellia
*Zamia integrifolia Ait.	Cycadaceae	Coontie
Rare Species		
Actaea pachypoda Ell.	Ranunculaceae	Baneberry
Aquilegia canadensis L.	Ranunculaceae	Columbine
Baptisia megacarpa Torr. & Gray	Leguminosae	Apalachicola Wild-Indigo
Botrychium lunarioides (Michx.) Sw.	Ophioglossaceae	Grape-fern
Brickellia cordifolia Ell.	Compositae	Flyr's Nemesis
Bumelia lycioides (L.) Pers.	Sapotaceae	Buckthorn
Callirhoe papaver (Cav.) Gray	Malvaceae	Poppy Mallow
Conradina glabra Shinners	Labiatae	Panhandle Rose-mary

1/ Florida Committee on Rare and Endangered Plants and Animals, Special Committee on Plants

* Proposed Endangered Status for Some U. S. Vascular Plant Taxa., Federal Register, Vol. 41, No. 117

Table III-19 (Cont.) Endangered, threatened, and rare Florida plants

Rare Species (Cont.)	Family	Common Name
Cynoglossum virginianum L.	Boraginaceae	Wild-comfrey
Dentaria laciniata Muhl, ex Willd.	Cruciferae	Toothwort
Dirca palustris L.	Thymeliaceae	Leatherwood
Drosera intermedia Hayne in Schrad.	Droseraceae	Water Sundew
Epigaea repens L.	Ericaceae	Trailing-arbutus
Erythronium umbilicatum Park & Hardi Hardin	Liliaceae	Dimpled Dogtooth-violet
Hepatica americana (DC) Ker	Ranunculaceae	Liverleaf
Hexastylis arifolia (Michx.) Small	Aristolochiaceae	Heartleaf
Hydrangea arborescens L.	Saxifragaceae	Wild Hydrangea
Hypericum lissophloeus Adams	Guttiferae	Smooth-barked St. Johns wort
Isopyrum biternatum (Raf.) T. & G.	Ranunculaceae	False Rue-anemone
Juncus gymnocarpus Coville	Juncaceae	Coville's Rush
Kalmia latifolia L.	Ericaceae	Mountain-laurel
Leitneria floridana Chapm.	Leitneriaceae	Corkwood
Liatris provincialis Godfrey	Compositae	Godfrey's Blazing-star
*Lilium iridollae Henry	Liliaceae	Panhandle Lily
*Linum westii Rogers	Linaceae	West's Flax
Litsea aestivalis (L.) Fern.	Lauraceae	Pond-spice
Lupinus westianus Small	Leguminosae	Panhandle Lupine
Macbridea alba Chapm.	Labiatae	White Birds-in-a-nest
Magnolia ashei Weatherby	Magnoliaceae	Ashe's Magnolia
Magnolia cordata Michx.	Magnoliaceae	Cucumber-tree
Malaxis unifolia Michx.	Orchidaceae	Green Adder's-mouth
Medeola virgininiana L.	Liliaceae	Indian Cucumber-root
Parnassia grandifolia DC	Saxifragaceae	Grass-of-Parnassus
Phyllanthus liebmannianus Muell. Arg. in DC.	Euphorbiaceae	Pine-wood Dainties
Pinckneya bracteata (Bartr.) Raf.	Rubiaceae	Fever-tree
Podophyllum peltatum L.	Berberidaceae	May-apple
Rhexia salicifolia Kral & Bostick	Melastomataceae	Panhandle Meadow-beauty
Rhododendron chapmanii Gray	Ericaceae	Chapman's Rhodo-dendron
*Salix floridana Chapm.	Salicaceae	Florida Willow
Sarracenia rubra Walt.	Sarraceniaceae	Red-flowered Pitcherplant
Schisandra glabra (Brickell) Rehder	Schisandraceae	Schisandra
Sphenostigma coelestinum (Bartr.) Foster	Iridaceae	Bartrum's Ixia
*Spigelia loganioides (T. & G.) DC	Loganiaceae	Pink-root

Table III-19 (Cont.) Endangered, threatened, and rare Florida plants

Rare Species (Cont.)	Family	Common Name
Taxus floridana Nutt. ex Chapm.	Taxaceae	Florida Yew
Trillium lancifolium Raf.	Liliaceae	Reflexed Wake-robin
Ulmus crassifolia Nutt.	Ulmaceae	Cedar Elm
Uvularia floridana Chapm.	Liliaceae	Florida Merry-bells
Veratrum woodii Robins	Liliaceae	False Hellebore
Xyris logisepala Kral	Xyrudaceae	Kral's Yellow-eyed grass

Table III-20. Endangered and threatened Alabama plants[1/]

Endangered Species	Family
Aster chapmanii T. & G.	Asteraceae
Aster eryngiifolius T. & G.	Asteraceae
Cyclodon alabamense (Vail) Small	Asclepiadaceae
Epidendrum conopseum R. Br.	Orchidaceae
Gentiana elliottii Chapm.	Gentianaceae
Gentiana villoso L.	Gentianaceae
Hibiscus coccineus Walt.	Maluaceae
*Lilium iridollae M. G. Henry	Liliaceae
Lilium superbum L.	Liliaceae
Onothera grandiflora Ait.	Onagraceae
*Phlox pulchra Werry	Polemoniaceae
Rhododendron prunifolium Millais	Ericaceae
Threatened Species	
Brickellia cordifolia Robinson	Asteraceae
Cacala diversifolia T. & G.	Asteraceae
Canna flacida Salisb.	Cannaceae
Carex baltzellii Chapm.	Cyperaceae
Cleistes divaricata (L.) Ames	Orchidaceae
Coreopsis gladiata Walter	Asteraceae
Gordonia lasianthus (L.) Ellis	Theaceae
Hypericum nitidum Lam.	Hypericaceae
Juncus gymnocarpus Coville	Juncaceae
Linum sulcatum var. harperii (Small) C. M. Rogers	Linaceae
Ludwigia arcuata Walter	Onagraceae
Momisia iguanea (L.) Rose & Standley	Ulmaceae
Pieris phillyreaefolia D. C.	Ericaceae
Rhapidophyllum hystrix (Fraser) H. Wendl.	Araceae
Rhexia salicifolia Kral & Bostick	Melastomataceae
Rudbeckia auriculata (Perdue) Kral	Asteraceae
Sabatia brevifolia Raf.	Gentianaceae
Sarracenia psittacina Michx.	Sarraceniaceae
Talinum mengesii W. Wolf	Portulacaceae
Viguiera porteri (A. Gray) Blake	Asteraceae
Warea amplexifolia Small	Brassicaceae
*Warea sessilifolia Nash	Brassicaceae
Xyris drummondii Malme.	Xyridaceae

1/ Endangered and Threatened Plants and Animals of Alabama, Bull. Alabama Mus. Nat. Hist.

* Proposed Endangered Status for Some U. S. Vascular Plant Taxa, Federal Register, Vol. 41, No. 117.

National Historic Places[1/]

In 1966, Congress passed the National Historic Preservation Act (80 Stat. 915, 16 U.S.C. 470) so that places which contributed to and are representative of our country's development could be preserved as a part of community life and serve as reminders to future generations of our rich national heritage.

Because of rapid expansions of urban areas, highways, and commercial, residential, and industrial developments, local and governmental programs were deemed inadequate to provide protection or restoration of such unique places; therefore, it was necessary for the federal government to assist private organizations and individuals, and state and local governments in their efforts to preserve historic places by setting the criteria for preservation and supplying grants-in-aid for such historic activities.

Placement in the National Register of Historic Places of districts, sites, buildings, and structures, and of objects significant in American history, architecture, archeology, and culture is delegated to the Secretary of the Interior.

The following offices have been designated by the Governors of Florida and Alabama to act as liaison officers under the National Historic Preservation Act:

Director, Division of Archives, History and Records Management
Department of State
401 East Gaines Street
Tallahassee, FL 32303

Executive Director
Alabama Historical Commission
725 Monroe Avenue
Montgomery, Alabama 36130

1/ Refer to Figure III-22

CHAPTER IV. HUMAN AND ECONOMIC RESOURCES

Methodology

Secondary data were utilized throughout this chapter, but minimal use was made of detailed state data for which compatible information in all states did not exist. County data were used but the basic reporting unit is the individual state subareas. Data for counties partially within the Basins were adjusted based on land area and estimates by USDA representatives in each county for agricultural items and the percentage of population in the hydrologic area for non-agricultural items. Population was estimated by determining whether towns listed in the 1970 Census of Population were located in or out of the Basins and assuming the remainder of the county's population was randomly distributed. The base year selected for the study was 1972. In cases where data are not available for 1972, the most recent year available is presented. All dollar values have been converted to 1972 dollars based on the Consumer Price Index for all items.

General-Historical

Population

In 1970 there were 1.59 million people residing within the Basins (Table IV-1). Population was 1.28 million in 1950 and 1.44 million in 1960 reflecting a gradual increase of approximately one percent per year. In 1970 the Florida subarea had the largest population with 53 percent followed by Alabama with 29 percent and Georgia with 18 percent.

U.S. Population increased 34 percent during the 1950-70 time period while the population of the Basin increased 24 percent. Between 1960 and 1970, 35 counties lost population (Figure IV-1), but recent indicators are that few counties are still declining.

Only 21 of the Basins' 77 counties gained in population at a faster rate than the national average. Almost 96 percent of the Basins' increase occurred in the Florida subarea. This subarea has increased in population by about 54 percent while the Alabama and Georgia subareas registered gains of only 1 and 2 percent, respectively. Over two-thirds of the population growth in the Basins occurred in Escambia, Okaloosa, and Leon counties in Florida.

Approximately one-fourth of the Basins' population was nonwhite in 1970, and each state subarea had a higher proportion of nonwhite than the remainder of its respective state (Table IV-2). The nonwhite population in the Basins declined from 410,000 in 1960 to 397,000 in 1970.

Table IV-1. Population, Northeast Gulf River Basins, and subareas 1950, 1960, and 1970

Item	Unit	1950	1960	1970
Total population				
Alabama subarea	Thousand	446	435	460
Florida subarea	do.	549	724	843
Georgia subarea	do.	281	286	288
Northeast Gulf Basins	do.	1,276	1,445	1,591

U.S. Bureau of Census, Census of Population, for 1950, 1960, and 1970, Washington, D.C.

Table IV-2. Percent nonwhite population, Northeast Gulf River Basins, subareas, and selected states, 1970

Area	Subarea	State
Alabama subarea	30.2	26.4
Florida subarea	20.5	15.8
Georgia subarea	32.1	26.1
Northeast Gulf Basins	25.1	--

U.S. Bureau of Census, Census of Population, 1970, Washington, D.C.

U.S. DEPARTMENT OF AGRICULTURE

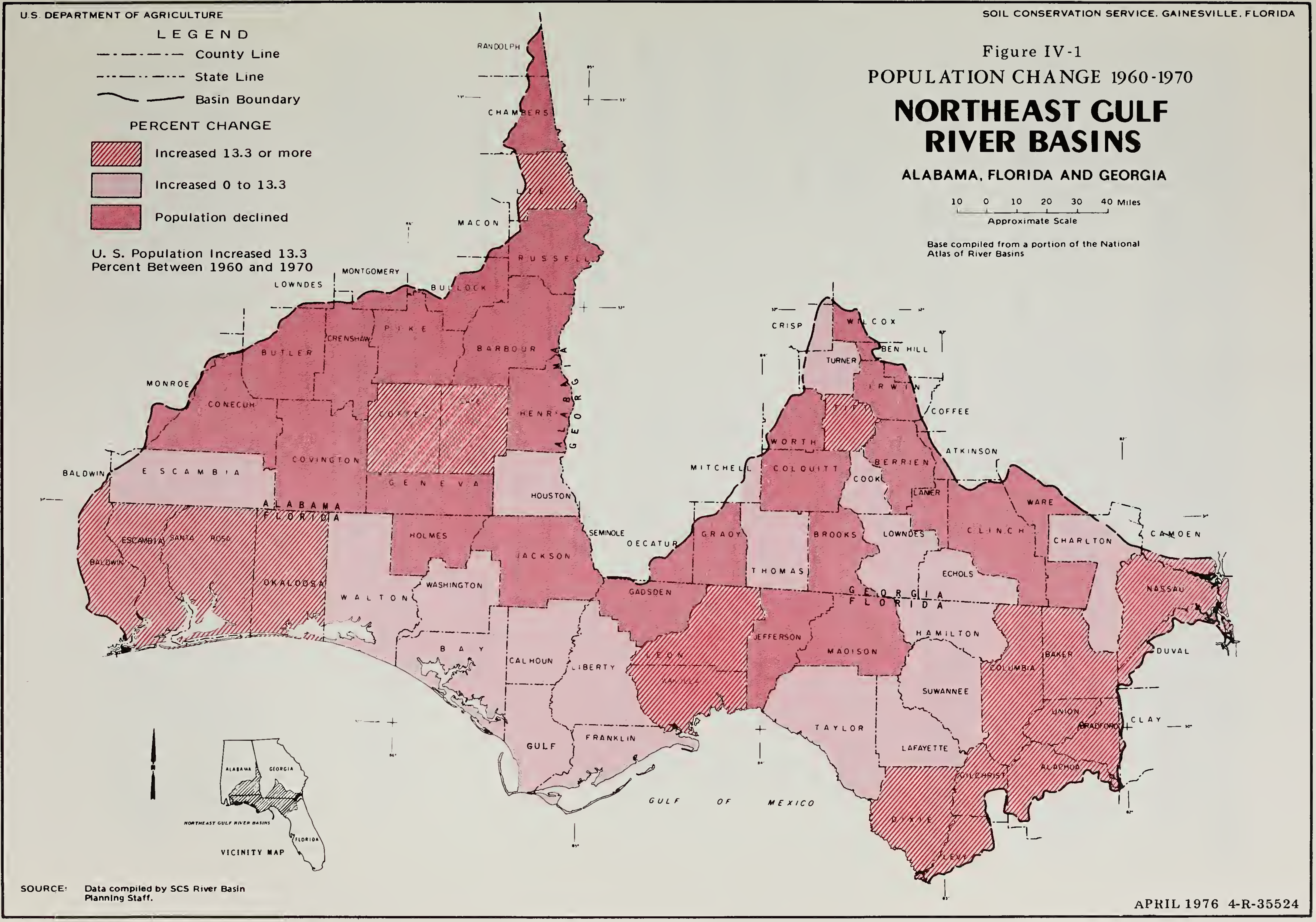
SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA

Figure IV-1

POPULATION CHANGE 1960-1970

NORTHEAST GULF RIVER BASINS

ALABAMA, FLORIDA AND GEORGIA



SOURCE: Data compiled by SCS River Basin Planning Staff.

APRIL 1976 4-R-35524

USDA-SCS-FORT WORTH, TEXAS 1977

There are seven Standard Metropolitan Statistical Areas (SMSA's) located in the Basins. Only two of these, Tallahassee and Pensacola, are completely within the Basins. Others partially within are Mobile and Montgomery, Alabama; Columbus, Georgia; Jacksonville and Gainesville, Florida.

In 1970 48 percent of the population was classified as rural,[1/] down considerably from the 69 percent of the population classified as rural in 1950 (Table IV-3). Over half of the population in both the Alabama and Georgia subareas was classified as rural in 1970.

Table IV-3. Percent of population classified as rural, Northeast Gulf River Basins, subareas, selected states, and United States, 1950, 1960, and 1970

Area	1950	1960	1970
Alabama subarea	69	58	52
Alabama	56	45	42
Florida subarea	64	53	43
Florida	35	26	19
Georgia subarea	66	55	54
Georgia	55	45	40
Northeast Gulf Basins	66	55	48
United States	40	37	27

U. S. Bureau of Census, Census of Population, Washington, D.C.

1/ The U.S. Bureau of Census applies the term "urban" to all incorporated or unincorporated places with 2,500 or more inhabitants and the densely settled fringe areas around them. Rural is the remainder.

Rural population can be separated into two components: rural farm and rural nonfarm. The rural farm population declined from 429,000 in 1950 to 95,000 in 1970. However, during this period there was a tendency for people to move to rural areas and work in town. Others kept their farm residences but pursued nonfarm employment. The number classified as rural nonfarm increased from 415,000 in 1950 to 656,000 in 1970.

The Basins are not densely populated, and only four counties have population densities of 125 or more per square mile. The number of persons per square mile increases rapidly with city size. For example, cities of 2500 to 4999 persons had a density of 683 per square mile or about one acre of urban and built-up area per person (Table IV-4). Cities with 25,000 or more residents had population densities almost three times as high.

Table IV-4. Population densities and land requirements, Northeast Gulf River Basins, 1970

Size of city	Population per square mile	Acres per person
2,500 - 4,999	683	.94
5,000 - 9,999	1,064	.60
10,000 - 25,000	1,201	.53
25,000 +	1,816	.35

U.S. Bureau of Census, Number of Inhabitants, United States Summary 1970, Washington, D.C., December 1971

Migration

Population gains are a result of natural increases (more births than deaths) and/or inmigration. The U.S. population is highly mobile. Approximately one person in five changes his residence during a given year. The prevalence of inmigration or outmigration is one indicator of local economic conditions and the desirability of an area. Obviously this has its limitations because of the differences in human values.

Net migration figures were derived by subtracting the net change in births less deaths from the change in population. The population increased 136,800 between 1960 and 1970 (Table IV-5). Births exceeded deaths by 215,100 which means that approximately 78,300 people moved out of the Basins to other areas of the U.S. This represented a net loss of over 5 percent of the Basins' 1960 population. The Florida subarea had a slight increase in net migration while both the Alabama and Georgia subareas exhibited a net loss from 1960 to 1970. Only 17 counties showed a net migration gain. Fourteen of these were in Florida and the other three were in Alabama. The average age of the Basins' population in 1970 was 26.1 years which increased slightly from 24.8 years in 1950. This reflects the fact that many of those who are migrating out of the area are in the younger age groups.

The outmigration of blacks and other minority races occurred at a much faster rate. Only three counties showed an increase in net migration. The Basins had a net migration loss of 91,600 (22 percent) with all three subareas showing a large loss (Table IV-6). This loss was primarily a result of declining agricultural employment and the more lucrative opportunities for employment and improved living conditions in other areas of the U.S.

Table IV-5. Net migration, all races, Northeast Gulf River Basins and subareas, 1960 to 1970

Area	Increase in population	Births	Deaths	Net Migration Number	Net Migration Percent Change 1/
Alabama subarea	15,500	101,800	46,100	-40,200	-9.2
Florida subarea	119,300	180,900	62,200	600	.1
Georgia subarea	2,000	69,000	28,300	-38,700	-13.5
Northeast Gulf	136,800	351,700	136,600	-78,300	- 5.4

1/ Migration change as a percent of 1960 population.

U.S. Bureau of Census, Components of Population Change by County: 1960 to 1970, Series P-25, No. 461, June 1971

Table IV-6. Net nonwhite migration, Northeast Gulf River Basins and subareas, 1960 to 1970

Area	Change in population	Births	Deaths	Net Migration Number	Net Migration Percent Change 1/
Alabama subarea	-14,900	41,800	16,400	-40,300	-27.5
Florida subarea	6,300	49,400	17,600	-25,500	-15.3
Georgia subarea	- 5,000	31,300	10,500	-25,800	-26.5
Northeast Gulf	-13,600	122,500	44,500	-91,600	-22.3

1/ Migration change as a percent of 1960 population.

U.S. Bureau of Census, Components of Population Change by County: 1960 to 1970, Series P-25, No. 461, June 1971.

Employment

The small change in population, especially in rural areas, has been largely a function of the lack of employment opportunities. The civilian labor force increased from 439,100 in 1950 to 556,900 in 1970.[1/] In 1970 women comprised 40 percent of the civilian labor force compared to 29 percent in 1950. Total civilian employment of persons 14 years and older increased from 425,600 to 542,000 (Table IV-7). A large gain in manufacturing employment occurred during this period as well as educational services and public administration. Services employed the largest number in the Basins (Figure IV-2). Manufacturing, services, and wholesale and retail trade represented about three-fourths of total employment in each state subarea (Table IV-8).

The percentage of the Basins' population employed has been lower than in the remainder of the U.S. This could indicate a very old or very young population, but in this case it basically indicated a lack of jobs. In many cases the skills of the labor force do not match the requirements of the jobs available.

Total employment increased 15.4 percent between 1960 and 1970 compared to a national increase of 19.6 percent. Employment in the Florida subarea increased 23.7 percent while the Georgia and Alabama subareas registered gains of less than 9 percent.

The rate of gain in employment was less in each state subarea than in the remainder of each state. Agricultural employment declined at a faster rate in the Alabama and Georgia subareas than nationally.

Employment in agriculture, forestry, and fisheries declined from 139,200 in 1950 to 44,200 in 1970. In 1950 this category represented 32.7 percent of total employment but declined to 8.2 percent by 1970. This decline in agricultural employment resulted from a large decrease in cotton acreage and increased farm size coupled with agricultural mechanization. Most of this labor had to be absorbed by other sectors of the economy, had to migrate outside the Basins, or had to become unemployed. However, in 1970 agriculture was still important and over 14 percent of the employment in the Georgia subarea was in agriculture. Each of the three state subareas had a larger share of total employment engaged in agriculture than for the state (Table IV-9). A larger percentage of people were employed in the manufacture of furniture, lumber, and wood products in each state subarea than in the remainder of the state.

Employment in manufacturing of furniture, lumber, wood products, and food and kindred products, as well as employment in railroads and private households declined between 1960 and 1970.

1/ Figure for 1970 does not include 14 and 15 year olds. However, this represents less than 1 percent of the total. The civilian labor force includes both employed and unemployed.

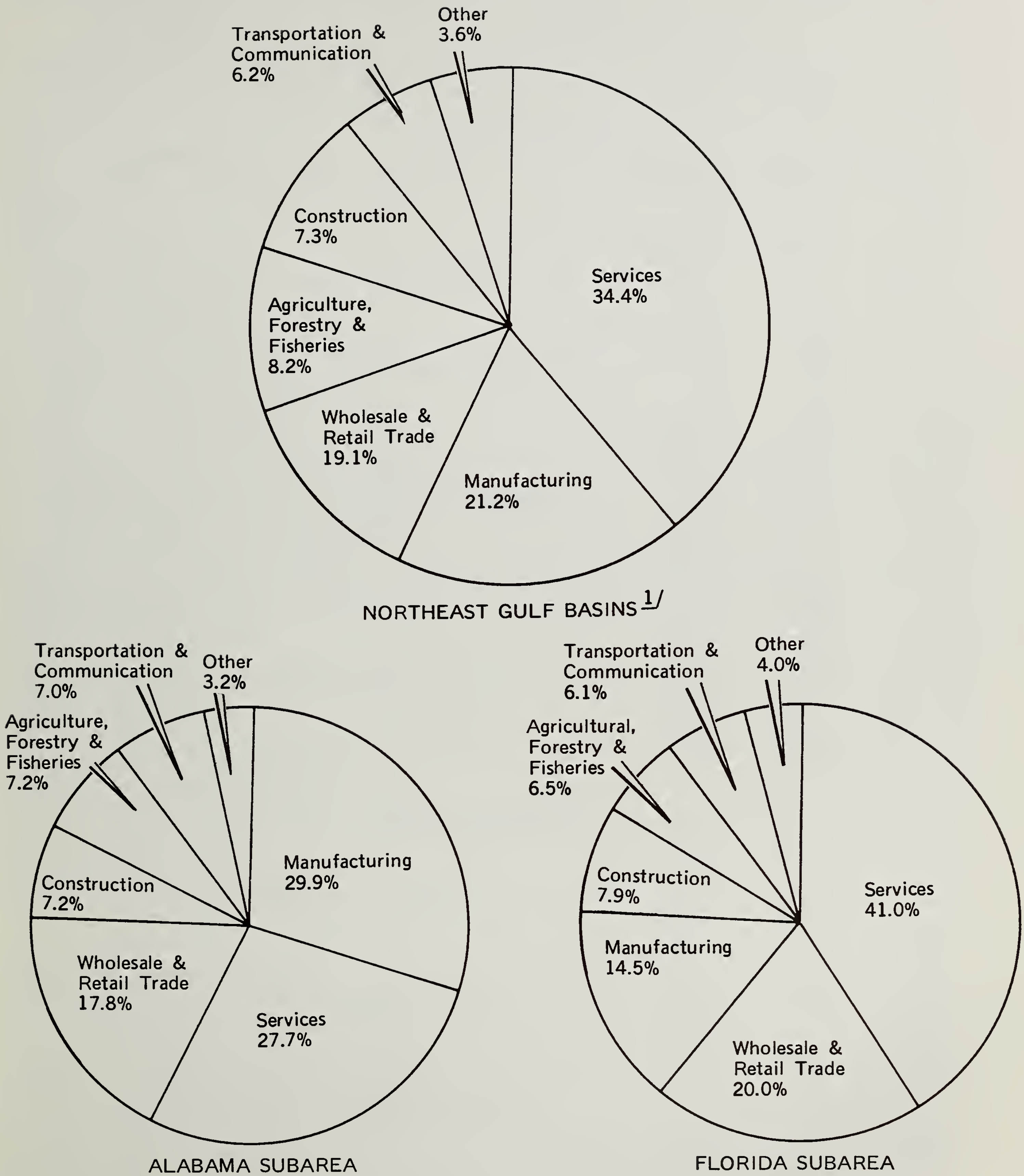


Figure IV-2 Distribution of employment, Northeast Gulf River Basins, 1970

1/ Includes Alabama, Florida & Georgia Subareas

Table IV-7. Employment by industries, Northeast Gulf River Basins, 1950, 1960, and 1970

Category	1950	1960	1970
Total employment	425,619	469,743	542,019
Agriculture, forestry and fisheries	139,182	70,520	44,222
Mining	737	1,370	2,309
Construction	23,122	33,090	39,542
Manufacturing (total)	71,234	95,502	114,890
Furniture, lumber, and wood products	28,902	21,272	16,972
Metal industries	759	2,976	5,078
Machinery except electrical	720	1,329	2,042
Electrical machinery, equipment & supplies	88	739	1,801
Transportation equipment	686	4,510	8,519
Other durable goods	1,355	2,584	6,144
Food and kindred products	6,821	11,564	8,919
Textiles and fabricated products	20,054	32,046	36,503
Printing, publishing & allied industries	1,938	3,194	3,377
Chemical and allied products	3,025	3,745	8,416
Other nondurable products	6,898	11,543	17,117
Railroad and railway express	5,598	4,162	2,936
Trucking service and warehousing	2,271	3,987	4,774
Other transportation	4,101	4,644	9,961
Communications	2,431	4,092	6,934
Utilities and sanitary service	3,507	5,565	8,735
Wholesale trade	8,869	10,612	16,082
Food, bakery and dairy product stores	13,162	13,519	14,938
Eating and drinking places	9,442	11,337	14,112
General merchandise retailing	-	-	11,593
Motor vehicles retailing & service stations	-	-	16,217
Other retail trade	31,381	45,026	30,735
Banking and credit agencies	-	-	7,110
Finance, insurance and real estate	6,430	11,943	10,327
Business and repair services	6,674	8,962	11,891
Private households	25,782	33,922	19,891
Other personal services	9,641	15,490	19,229
Entertainment and recreation services	2,907	2,642	3,016
Hospitals and health services	7,443	9,853	25,666
All educational services	17,764	29,033	48,744
Welfare, religious and nonprofit	-	4,453	6,597
Legal, engineering, and miscellaneous professional services	3,886	6,983	9,088
Public administration	20,236	31,811	42,481
Industry not reported	6,821	11,224	-
Hotels and lodging places	2,989	-	-

U. S. Bureau of Census, Census of Population 1950 and 1960 and General Social and Economic Characteristics, 1970.

Table IV-8. Employment by major industries, Northeast Gulf River Basins and subareas, 1950 and 1970

Industry	Alabama subarea		Florida subarea		Georgia subarea		Northeast Gulf	
	1950	1970	1950	1970	1950	1970	1950	1970
Agriculture, forestry and fisheries	56,513	11,216	41,741	18,150	40,928	14,856	139,182	44,222
Mining	122	643	479	1,185	136	481	737	2,309
Construction	7,432	11,231	11,770	22,064	3,920	6,247	23,122	39,542
Manufacturing	33,579	46,862	22,864	40,644	14,791	27,384	71,234	114,890
Transportation, communications and public utilities	5,077	11,039	8,642	17,155	4,189	5,146	17,908	33,340
Wholesale and retail trade	19,591	27,951	29,345	55,892	13,918	19,834	62,854	103,677
Finance, insurance and real estate	1,929	4,296	3,177	10,061	1,324	3,080	6,430	17,437
Services	30,554	43,330	53,888	114,811	19,711	28,461	104,153	186,602
Total	154,797	156,568	171,906	279,962	98,917	105,489	425,620	542,019

U.S. Bureau of Census, Census of Population, 1950 and General Social and Economic Characteristics, 1970.

Table IV-9. Percent of total 1970 employment by industries, Northeast Gulf River Basins, subareas, selected states, and United States

Category	U.S. total	Northeast Gulf Basins	Alabama Subarea	Alabama State	Florida Subarea	Florida State	Georgia Subarea	Georgia State
Total employment	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Agriculture, forestry & fisheries	3.81	8.16	7.16	3.95	6.48	4.70	14.08	4.40
Mining	.82	.43	.41	.74	.42	.38	.46	.45
Construction	5.97	7.30	7.17	6.88	7.88	8.49	5.92	6.79
Manufacturing (total)	25.90	21.20	29.93	28.61	14.52	14.08	25.96	27.18
Furniture, lumber, & wood prods.	1.28	3.13	4.21	2.57	2.35	.88	3.60	1.94
Metal industries	3.49	.94	.74	5.78	.56	1.58	2.24	1.47
Machinery except electrical	2.60	.38	.52	1.01	.25	.82	.50	.77
Electrical machinery, equip. & supplies	2.49	.33	.28	.97	.47	1.52	.05	.83
Transportation equipment	2.79	1.57	2.04	1.90	1.05	1.33	2.25	3.00
Other durable goods	2.68	1.13	1.55	1.90	.95	1.48	1.00	1.90
Food & kindred products	1.82	1.65	1.66	1.76	1.07	1.50	3.14	2.35
Textiles & fabricated products	2.85	6.73	15.42	7.47	1.26	1.17	8.39	9.76
Printing, publishing & allied inds.	1.56	.62	.52	.76	.72	1.16	.52	.93
Chemical & allied products	1.29	1.55	.42	1.13	2.47	.74	.82	.94
Other nondurable products	3.06	3.16	2.58	3.36	3.37	1.89	3.44	3.28
Railroad & railway express	.83	.54	.41	.76	.48	.52	.91	.79
Trucking service & warehousing	1.41	.88	.99	1.30	.86	1.08	.77	1.48
Other transportation	1.45	1.84	3.03	1.33	1.62	2.46	.65	1.60
Communications	1.40	1.28	.99	1.21	1.53	1.79	1.04	1.43
Utilities & sanitary services	1.68	1.61	1.64	2.05	1.64	1.84	1.50	1.69
Wholesale trade	4.09	2.97	2.79	4.06	3.03	4.49	3.05	4.35
Food, bakery & dairy prod. stores	2.50	2.76	2.86	2.57	2.73	2.85	2.69	2.32
Eating and drinking places	3.00	2.60	1.90	2.08	3.13	3.65	2.24	2.17
General merchandise retailing	2.72	2.14	2.13	2.35	2.29	3.03	1.74	2.86
Motor vehicles retailing & svc. stations	2.22	2.99	2.95	2.72	2.94	2.80	3.18	2.55
Other retail trade	5.54	5.67	5.22	5.19	5.84	6.70	5.90	5.26
Banking and credit agencies	1.69	1.31	1.18	1.37	1.33	1.74	1.47	1.61
Finance, insurance and real estate	3.32	1.91	1.56	2.30	2.27	4.27	1.45	2.96
Business and repair services	3.13	2.19	1.93	2.35	2.44	3.83	1.93	2.69
Private households	1.47	3.67	4.65	3.45	3.05	2.35	3.85	3.09
Other personal services	3.15	3.55	3.05	3.20	3.94	5.26	3.25	3.39
Entertainment & recreation services	.62	.56	.43	.50	.68	1.30	.41	.58
Hospitals and health services	5.54	4.74	3.58	4.92	5.63	5.39	4.09	4.38
All educational services	8.03	8.99	6.61	7.27	11.27	7.46	6.50	6.93
Welfare, religious & nonprofit	1.52	1.22	1.10	1.32	1.35	1.30	1.05	1.35
Legal, engrg. & misc. prof. services	2.55	1.68	1.09	1.76	2.05	2.70	1.47	1.91
Public administration	5.49	7.84	5.24	5.80	10.57	5.58	4.43	5.83

Bureau of Census, General Social and Economic Characteristics, 1970, Washington, D.C., April 1972.

Each state subarea had a smaller percentage employed in wholesale and retail trade and the financial sectors than the state as a whole. The Alabama subarea had a higher percentage employed in construction, transportation, and manufacturing than in Alabama. Almost 30 percent of the Alabama subarea was employed in manufacturing, and over one-half of this was in textiles and fabricated products. The Florida subarea had a higher percentage employed in services than for the state.

Fast growth industries - In the U.S. there were 19 industries that increased employment faster than the national rate for all industries (19.6%) between 1960 and 1970. In 12 of these, the Basins gained at a faster rate than nationally. However, in only six of the nineteen did the Basins have as large a percentage of total employment as nationally. These 19 industries employed 60 percent of the national civilian employment compared with 54 percent in the Basins.

The Alabama and Georgia subareas in both 1960 and 1970 employed a smaller percentage in fast-growth industries than the remainder of the two states, the Basins, Florida or the U.S. (Table IV-10). The prospects for rapid growth in employment in the future look very favorable for the Florida subarea as it had a higher percentage (63%) of its employment in fast growth industries than any area analyzed.

Table IV-10. Percent of total employment in fast growth industries, Northeast Gulf River Basins, subareas, selected states, and United States, 1960 and 1970

Area	1960 1/	1970 2/
Alabama subarea	32	46
Alabama	44	53
Florida subarea	43	63
Florida	47	61
Georgia subarea	35	43
Georgia	41	53
Northeast Gulf Basins	38	54
United States	52	60

1/ Industries with employment growing faster than national average of 14.9 percent from 1950 to 1960.

2/ Industries with employment growing faster than national average of 19.6 percent from 1960 to 1970.

U.S. Bureau of Census, Census of Population 1950 and 1960, and General Social and Economic Characteristics 1970.

Coefficient of industrial specialization - This coefficient is used to guage the degree to which the mix of a region's economy differs from that of the nation as a whole or from that of the same region at an earlier date. A coefficient of zero indicates no specialization at all, with the region's mix being equal to the national mix. The maximum value of the coefficient would be close to 100 percent if work in the Basins were devoted entirely to one industry not present in any other area of the U.S. Specialization in a fast growth industry would correspond with economic growth, but high levels of specialization can also tie the economy of a region to any cyclical patterns of that industry.

The Basins and each state subarea have become more diversified and similar to the U.S. economy each census year since 1950 (Table IV-11). The most specialized subarea in each census year was the Alabama subarea while the Florida subarea was the least specialized. Each state subarea had a higher coefficient than the state in each census year.

Table IV-11. Coefficient of specialization, Northeast Gulf River Basins, subareas, selected states, and United States, 1950, 1960, and 1970 1/

Area	1950	1960	1970
Alabama subarea	39.5	30.9	26.0
Alabama	22.7	16.6	12.9
Florida subarea	28.0	21.2	19.7
Florida	18.7	16.5	13.9
Georgia subarea	36.6	27.6	24.0
Georgia	22.9	16.4	13.2
Northeast Gulf	29.9	23.6	19.3

1/ Calculated using 36 categories shown in Census of Population, 1950 and 1960 and General Social and Economic Characteristics, 1970.

Location quotient - This is an analytical measure used to indicate the relative importance of an industry to a region compared to its national importance. For example, in the Northeast Gulf Basins 8.16 percent of the employment was in agriculture, forestry, and fisheries compared with 3.81 percent in the U.S. Thus the percentage employed in this industry in 1970 was 2.14 times greater than the national average (Table IV-12). If the location quotient is greater than one, then this industry is more important regionally than nationally in terms of employment.

Four employment categories, (1) agriculture, forestry, and fisheries; (2) furniture, lumber, and wood products; (3) textiles and fabricated products; and (4) private households have a location quotient of 2.0 or above, which means these categories represent a percentage of the Basins' employment at least twice that represented nationally. However, the first two categories have been declining substantially in importance during the past two decades. Almost all other employment categories except services have increased.

Table IV-12. Industries with location quotients of 1.0 or higher in 1970 - Northeast Gulf River Basins, 1950, 1960 and 1970

Category	1950	1960	1970
Private households	2.13	2.44	2.50
Furniture, lumber, and wood products - manufacturing	3.19	2.74	2.45
Textiles and fabricated products-manufacturing	1.16	2.09	2.36
Agriculture, forestry and fisheries	2.61	2.23	2.14
Public Administration	1.06	1.37	1.43
Motor Vehicles retailing and service stations	NA	NA	1.35
Other transportation	.63	.72	1.27
Construction	.88	1.19	1.22
Chemical and allied products-manufacturing	.63	.60	1.20
Other personal services	.68	1.10	1.13
All educational services	1.13	1.18	1.12
Food, bakery and dairy product stores	1.04	1.10	1.10
Other nondurable products - manufacturing	.55	.91	1.03
Other retail trade	.80	1.02	1.02
Total employment	1.00	1.00	1.00

U.S. Bureau of Census, Census of Population, 1950 and 1960 and General Social and Economic Characteristics, 1970.

Shift-share analysis - The 1950-70 change in employment totals by industries presented in Table IV-9 does not provide comparison with other areas of the country. If an industry's growth rate is compared with the nation, it is possible to explain the difference in growth rates in terms of national growth, industry mix, and regional shares. This procedure is known as shift-share analysis.

Employment in the U.S. increased 19.6 percent between 1960 and 1970. National growth represents the increase in employment that would have occurred if each industry had grown 19.6 percent. Industrial mix represents an adjustment for industries that have grown at a faster or slower rate nationally than the U.S. average for all industries. It is calculated by determining the national growth rate for a particular industry less the 19.6 percent national growth rate for all industries and applying this rate to the 1960 Basins' employment in that industry.[1/] The regional share represents the total employment change from 1960 to 1970 less the adjustments for national growth and industry mix.

The industries that are located in the basin tend to be those that have failed to increase employment as fast as the national growth rate of 19.6 percent. Although the Basins' employment has not increased as fast as nationally, they have done remarkably well in view of the number of slow-growth industries located here. The area increased employment by 83,500 between 1960 and 1970 (Table IV-13). Employment would have increased 89,900 if the Basins' employment had grown at the national rate for all industries. However, if the industries located here had grown at their national rate, this figure would have been reduced by 18,500. Thus, 12,100 jobs can be attributed to the regional growth of these industries exceeding their national growth. Agriculture declined at a faster rate than nationally. Construction, wholesale and retail trade, and services also failed to grow at the rate of other areas. All other categories showed positive regional increases.

The Florida subarea exhibited employment growth in all three categories (Table IV-14). The Georgia subarea had a regional growth increase despite a very unfavorable industrial mix. The Alabama subarea had a poor industrial mix, and the industries in the region grew at an even slower rate than nationally. The largest regional declines were in agriculture and services.

1/ The industry mix and regional share shown in Table IV-13 were calculated for broad industrial classifications such as manufacturing by summing the industrial mix and regional share of all manufacturing industries listed in Table IV-7.

Table IV-13. Shift-share analysis, Northeast Gulf River Basins, 1960 and 1970

Industry	Civilian employment			National growth	Industry mix	Regional share
	1960 1/	1970 1/	Change 1960-1970			
Agriculture, forestry and fisheries	70,520	44,222	-26,298	13,822	-36,634	-3,486
Mining	1,370	2,309	939	268	-305	976
Construction	33,090	39,542	6,452	6,486	438	-472
Manufacturing	95,502	114,890	19,388	18,720	-13.760	14,428
Transportation, communications and utilities	22,450	33,340	10,890	4,401	67	6,422
Wholesale and retail trade	80,496	103,677	23,181	15,776	8,970	-1,565
Finance, insurance and real estate	11,943	17,437	5,494	2,339	2,877	278
Services	143,148	186,602	43,454	28,059	19,859	-4,464
Total civilian employment	458,519 2/	542,019	83,500	89,871	-18,488	12,117

1/ 14 years and older

2/ Employment of 11,224 in "industries not reported" in 1960 was not included in the analysis.

U.S. Bureau of Census, Census of Population, 1960 and General Social and Economic Characteristics, 1970.

Table IV-14. Components of employment change, Northeast Gulf River Basins and subarea, 1960-1970

Area	National growth	Industry mix	Regional share
Alabama subarea	28,054	-14,143	-471
Florida subarea	43,083	6,647	10,422
Georgia subarea	18,734	-10,992	2,166
Northeast Gulf Basins	89,871	-18,488	12,117

U. S. Bureau of Census, Census of Population, 1960 and General Social and Economic Characteristics, 1970.

Unemployment - In 1970 unemployment totaled 20,700 which represented 3.7 percent of the total civilian labor force (Table IV-15). This is a very low rate and is considered close to full employment because of persons in the process of changing jobs or not actively seeking employment. In 1970 unemployment was lowest in the Georgia subarea and highest in the Florida subarea although all three subareas had an unemployment rate lower than their respective states. However, there were counties with unemployment rates of 5 percent or more in 1970 (Table IV-16).

Underemployment - A person is considered to be underemployed when his capability with respect to age, education, and other attributes exceeds the job requirements. If a low-income area is also an area of underemployment, expanding demand for labor through increased business activity may be met using the local labor force. However, if reported low incomes are about equal to expected incomes, the capacity of the labor force is already being fully utilized. Recent estimates of underemployment are unavailable but other statistics indicate this is a major problem. Estimate of underemployment by counties based on the 1960 Census of Population were made by Kampe and Lindamood.1/ Their estimates were based on the following:

1. Age-color mix - county income is higher when a larger portion of the population is from 20 to 40 years old, and/or the population has a larger percentage of whites than nonwhites.

1/ Ronald E. Kampe and William A. Lindamood, Underemployment Estimates by Counties, 1960, Agricultural Economic Report No. 166, Economic Research Service, USDA, Washington, D.C., October 1969.

Table IV-15. Percent unemployed, Northeast Gulf River Basins, subareas, selected states, and United States, 1950, 1960, and 1970

Area	1950 1/	1960 1/	1970 2/
Alabama subarea	2.7	5.3	3.8
Alabama total	4.2	5.7	4.5
Florida subarea	3.6	4.7	3.9
Florida total	4.5	5.0	3.8
Georgia subarea	2.8	5.0	3.1
Georgia total	3.4	4.5	3.2
Northeast Gulf Basins	3.1	4.9	3.7
United States	4.8	5.1	4.4

1/ 14 years old and over.
2/ 16 years old and over.

U. S. Bureau of Census, Census of Population for 1950, and 1960, and General Social and Economic Characteristics, 1970.

Table IV-16. Counties with high unemployment rates, Northeast Gulf River Basins, 1960 and 1970

County	1960	1970
Conecuh, Alabama	4.6	7.9
Clinch, Georgia	5.8	6.6
Okaloosa, Florida	5.4	6.5
Liberty, Florida	6.1	6.2
Escambia, Alabama	6.6	5.9
Bullock, Alabama	4.4	5.9
Escambia, Florida	5.3	5.2
Atkinson, Georgia	6.6	5.0

U. S. Bureau of Census, Census of Population, 1960, and General Social and Economic Characteristics, 1970.

2. Education status - the higher the educational attainment of the population, the higher the county income.

3. Labor force status - county income is higher when a large percentage of income recipients are in the labor force.

4. Employment factor - county income is higher when a larger percentage of the labor force is employed civilians rather than members of the armed forces or unemployed civilians.

Their estimates indicate that approximately 27 percent of the employed civilians were underemployed in 1960. Underemployment was lowest (21 percent) in the Florida subarea while approximately one-third of those employed were underemployed in the Georgia and Alabama subareas. There were 27 counties in the Basins that had 35 percent or more underemployment.

Income

Personal income is the current income received by residents of an area from all sources. It is measured before deduction of income and other personal taxes but after deductions of personal contributions to social security, government retirement, and other social insurance. Total personal income in the Basins in 1969 was 4.8 billion (Table IV-17). The Alabama, Florida, and the Georgia subareas represented 27, 56, and 17 percent, respectively. Approximately two-thirds of personal income comes from wages and salaries.

Earnings are the sum of wages and salaries, other labor income and proprietors' incomes in each industry. Earnings in the Northeast Gulf totaled $3.8 billion. Earnings in all industries combined accounted for about 80 percent of total personal income (Table IV-18). Earnings are most directly affected by water resource development although earnings affect both property income and transfer payments which are included in personal income.[1/] At the national level, earnings comprise about two-thirds of our gross national product (GNP).

Government provided about 36 percent of the Basins' total earnings in 1969. This source is important because there are several military installations located here and a large number of state employees in Tallahassee. Manufacturing and wholesale and retail trade together represented over one-third of total earnings. Farm earnings accounted for only 7 percent of total earnings in 1969 while in 1950 it represented approximately 20 percent. Counties with earnings of 200 million or more in 1969 included Dale in Alabama and Escambia, Leon, Bay, and Okaloosa in Florida.

1/ U. S. Water Resources Council 1972 OBERS Projections, Volume 1, Washington, D.C., September 1972, p. 23.

Table IV-17. Personal income by source, Northeast Gulf River Basins, 1950, 1959, and 1969

Source	1950	1959	1969
	Million dollars 1/		
Total personal income	1,852	2,765	4,844
Wages and salaries	1,033	1,820	3,260
Other labor income	20	52	115
Proprietors income	455	395	504
Farm	258	158	231
Nonfarm	197	237	273
Property income	177	310	616
Transfer payments	192	242	488
Less: social security	25	54	139

1/ 1972 dollars.

Bureau of Economic Analysis, U.S. Department of Commerce, unpublished data.

Table IV-18. Earnings by major sectors, Northeast Gulf River Basins, 1950, 1959, and 1969

Sector	1950	1959	1969
	Million dollars 1/		
Total earnings	1,508	2,267	3,879
Farm	300	197	269
Nonfarm	1,208	2,070	3,610
Government	346	680	1,405
Federal	210	417	795
Civilian	78	158	290
Military	132	259	505
State and Local	136	263	610
Private nonfarm	862	1,390	2,205
Manufacturing	259	448	782
Transportation	68	85	150
Wholesale and retail trade	239	357	527
Services	146	253	390
Other			

1/ 1972 dollars.

Bureau of Economic Analysis, U.S. Department of Commerce, unpublished data.

One of the major problems in the Basins is low per capita income. Approximately one-fourth of the population is black, many of whom are either very young or old. Those employed are working in many cases as unskilled laborers and as farm hands, receiving low wages. The Basins' real income more than doubled in the 1950-1970 period and increased from 56 to 74 percent of the national average (Table IV-19). Of the 66 counties predominantly in the Basins, eight had per capita incomes less than the national average of $4,235 (Figure IV-3). Dale County, Alabama which has considerable military employment, had an average income that exceeded the national average. Only five counties exceeded the Southeast average ($3,643). Low income and lack of acceptable employment opportunities have contributed to the slow population growth in the area.

Table IV-19. Per capita income, Northeast Gulf River Basins, subareas, selected states, and United States, 1950, 1959, and 1970 1/

Area	1950	1959	1970
Alabama subarea	$1,350	$1,761	$2,888
Alabama	1,531	2,110	3,081
Florida subarea	1,615	2,219	3,307
Florida	2,229	2,788	3,933
Georgia subarea	1,329	1,715	2,906
Georgia	1,799	2,317	3,599
Northeast Gulf Basins	1,460	1,984	3,117
United States	2,603	3,112	4,235
Basin percent of U.S.	56%	64%	74%

1/ 1972 dollars.

Bureau of Economic Analysis unpublished data and Georgia Statistical Abstract.

The median family income in the Basins in 1970 was $7,436, which was 72 percent of the U.S. median (Table IV-20). Family income in each subarea was approximately $1,000 less than the respective state average. The median family income in the Florida subarea was over $1,000 higher than in the Alabama and Georgia subareas.

Table IV-20. Median family income, Northeast Gulf River Basins, subareas, and selected states, 1970[1/]

Area	Subarea	State
Alabama	$6,808	$7,847
Florida	7,987	8,928
Georgia	6,847	8,820
Northeast Gulf Basins	7,436	---

1/ Median county incomes weighted by population. All incomes expressed in 1972 dollars.

U.S. Bureau of Census, General Social and Economic Characteristics, 1970 Washington, D.C., March 1972.

In 1970 there were 406,000 persons including 85,200 families whose incomes were below the poverty level.[1/] The average family income of this group was only $2,177 which based on family size was $1,715 below the poverty level (Table IV-21). There was very little variation in this figure in any state subarea. Each state subarea had a higher percentage of poverty families than the state.

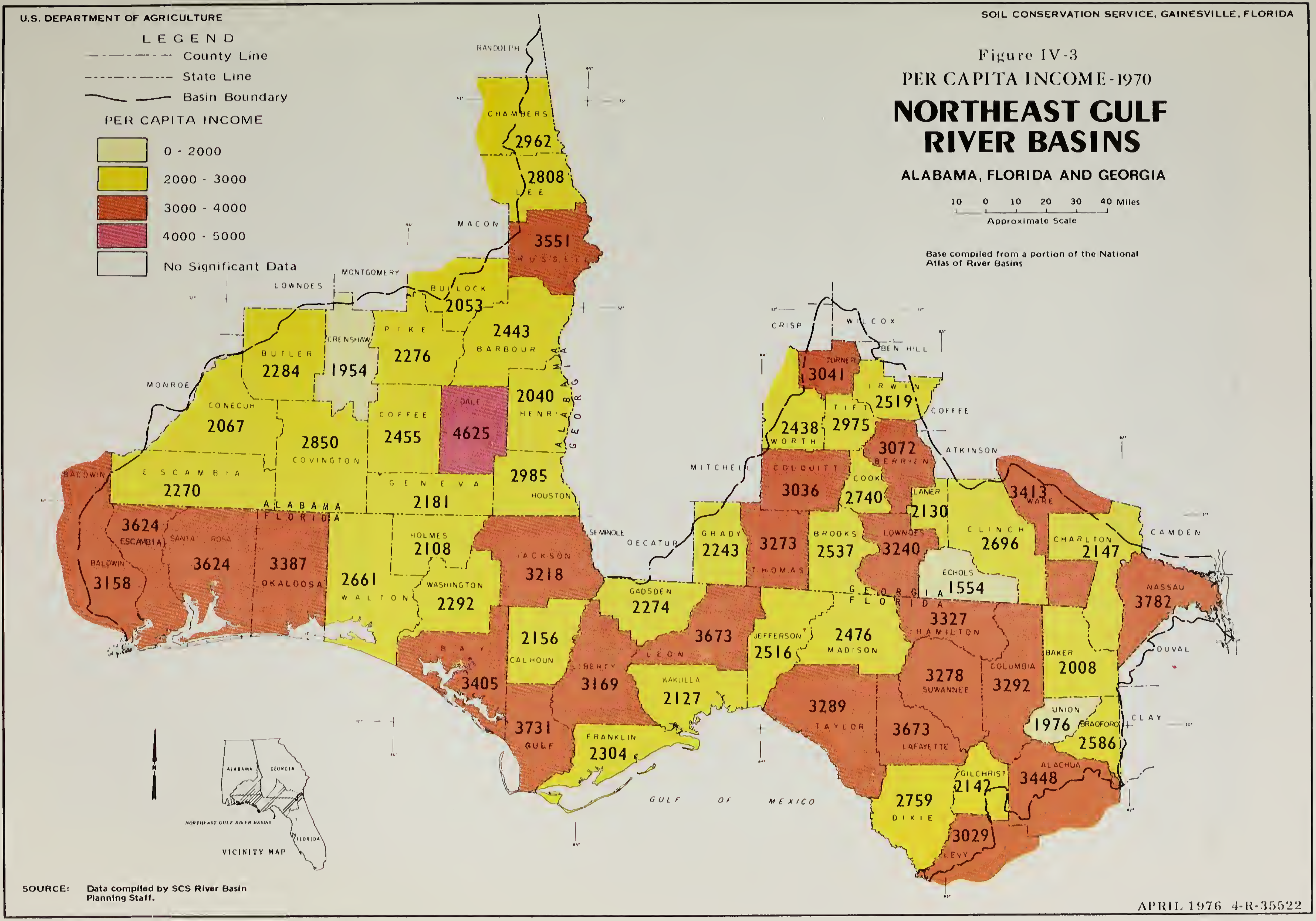
Table IV-21. Families with incomes below poverty level, Northeast Gulf River Basins and subareas, 1970[1/]

Area	Families	Mean family income	Mean income deficit	% of Basins' families below poverty	% of state families below poverty
Alabama subarea	28,489	$2,175	$1,715	25	21
Florida subarea	38,664	2,181	1,701	19	13
Georgia subarea	18,025	2,175	1,746	25	17
Northeast Gulf Basins	85,178	2,177	1,715	22	--

1/ 1972 dollars.

U. S. Bureau of Census, General Social and Economic Characteristics, 1970, Washington, D.C., March 1972.

1/ The correlation coefficient between the percentage of poverty families and (1) population change between 1960 and 1970 and (2) mean family income was -.73 and -.86 for the 77 counties.



USDA-SCS-FORT WORTH, TEXAS 1977

In 1970 there were 112,200 families in the Basins with family income exceeding $10,000. In 1960 there were only 22,400 with incomes exceeding $10,000. However, $10,000 in 1960 was roughly equivalent to purchasing power of $14,000 in 1970. Although the Basins have a larger number of families earning more than $10,000, the percentage earning this amount in each state subarea was less than the percentage statewide (Table IV-22).

Table IV-22. Families with incomes over $10,000, Northeast Gulf River Basins and subareas, 1970

Area	Percent of families over $10,000	
	Subarea	State
Alabama subarea	24	31
Florida subarea	32	39
Georgia subarea	27	38
Northeast Gulf Basins	29	--

U. S. Bureau of Census, General Social and Economic Characteristics, Washington, D.C. 1972.

Value Added by manufacturing is derived by subtracting the total cost of materials from the value of shipments and other receipts and adjusting the resulting amount by the net change in finished products and work-in-progress inventories between the beginning and end of the year.

The 1967 Census of Manufacturing reported that the Basins had a value added of 1.2 billion from manufacturing (Table IV-23). Although this is a sizable figure, the Alabama and Georgia subareas each has a much smaller percentage of the state's total value added than the percentage of the state's manufacturing employment. This generally indicates low value of output per worker, low capital/labor ratios, and unskilled labor. As a result, low wage rates can be expected.

Table IV-23. Value added by manufacturing and percent of state, 1967 and percent of state's manufacturing employment, 1970, Northeast Gulf River Basins and subareas

	Value added, 1967		Percent of state's manufacturing employment, 1970
	Million dollars[1/]	Percent of state	
Alabama subarea	375.6	9	14
Florida subarea	587.4	13	12
Georgia subarea	232.3	4	6
Northeast Gulf Basins	1,195.3	NA	NA

1/ 1972 dollars.

U.S. Bureau of Census, 1967 Census of Manufacturing, Volume 1, 1971 and General Social and Economic Characteristics, 1972, Washington, D.C. March 1973.

Tourism

The Florida Department of Commerce collects data each year relating to the Florida tourist industry.[1/] Most of these data are collected at Florida's official Welcome Stations, although data are obtained from visitors who are not traveling by auto. A tourist was defined as "an out-of-state resident who stays at least one night in the state for reasons other than strictly business transactions." Visitors on shopping trips, those in transit to points outside the U.S., and those visiting Florida for strictly business reasons were not classified as tourists nor were out-of-state military personnel or students.

The survey showed that approximately 9 percent of the automobile tourists entering Florida in 1972 indicated their destination to be within the Basins.[2/] The leading counties in terms of tourists were Bay, Escambia, and Okaloosa, Florida. During 1971, tourism contributed more than $4 billion to Florida's economy and made sizable contributions to tax monies. The north Florida coastline is especially attractive to summer tourists. Based on a 1968 survey, the average summer tourist in Florida stayed 12 days and spent $194 per stay.[3/] These statistics and the fact that all automobile tourists to Florida must pass through the Basins, indicate the importance of tourism to the area.

1/ Comparable data for Alabama were not available.
2/ Florida Department of Commerce, 1972 Florida Tourist Survey, October 1973.
3/ Florida Department of Commerce, Summary of Tourism in Florida 1968, Tallahassee, Florida.

Outdoor Recreation

General - People within the River Basin area, although not quite as affluent as their neighbors to the south, spend a great deal of their time in recreational pursuit. A mild climate, a large supply of open fresh and salt water, beautiful beaches, varied landscapes, and extensive natural areas provide many opportunities for recreational activities.

County and municipal governments provide parks, playgrounds, tennis courts, guarded beaches, boat ramps, picnic grounds, ball fields and other spectator sports areas.

The relatively small population has access to thousands of acres of Federal and state managed lands which are more resource oriented. Hunting, fishing, swimming, hiking, camping, nature observation, horseback riding, boating, and other activities can be enjoyed on these areas.

More than half of the outdoor activities are water related. Swimming, diving, fishing, skiing, boating, and other activities indirectly water oriented such as camping and picnicking are by far the most popular forms of outdoor recreation. The Gulf beaches are among the most attractive in the country and are so extensive that the summer tourists can find crowds or solitude as they desire. Winter visitors from many of the northern states and Canada are finding the beaches to their liking and contribute substantially to the local economies. Salt water fishing, both estuarine and deep sea, is important to Pensacola, Fort Walton, Destin, Panama City, and Fernandina.

The Gulf Islands National Seashore (Figure III-22) which extends from Okaloosa County, Florida to the Mississippi Delta was recently established to preserve in their natural state, the undeveloped dunes, shorelines and estuaries so that they may be enjoyed by all. Included are areas of historical importance such as Fort Pickens, first founded by the Spanish in 1718, and the Naval Live Oaks Reserve established to preserve the trees for timbers for Navy ships.

Aquatic Preserves are state-protected coastal areas below the level of mean high waters. They have unusually outstanding biological, aesthetic, educational or scientific value. These areas have been established by the State of Florida following open hearings in the locality of the proposed preserve. Bulkheading or other disturbances are prohibited, except to enhance the utility of the preserves. Public use such as hunting, fishing, boating, and swimming is permitted.

Over 70 percent of the Basins area is in woodlands; therefore, a large portion of the recreational public finds at least part of its outdoor desires satisfied on the public or private forests. Some of the activities provided for are hunting, fishing, water sports, cycling, horseback riding, nature study and observation, camping and picnicking. Many of these activities are provided for on state and National Forests (Figures III-22 and III-23), while private or corporate woodlands may only provide picnic tables or permit hunting.

There are many state parks, (Table IV-24 and IV-25) which, although not as large as the State and National Forests, are better dispersed and have a large, diverse recreational program. Many parks are near metropolitan areas and become overcrowded at times; however, it would not be economically wise to design for peak use.

The Corps of Engineers manages land along the Chattahoochee River and its impounded areas (Figure III-22) which is accessible to the public for recreation. Improvements on these sites range from primitive to highly developed facilities including campgrounds, picnic areas, and boat ramps, and they are usually located at highly scenic areas.

Private outdoor recreational enterprises provide for more intensive use than do the facilities owned by Federal, state, or local governments; therefore, more of the public satisfy their recreational desires on private lands than on the public lands. Some of the private sector provides facilities which although not directly connected with outdoor resources, are closely associated with them such as beachside motels. Most of the needs for golf courses, marinas, fishing camps, campgounds, and other facilities are provided by commercial enterprises.

Table IV-24. Florida State Parks[1/], State Forests and Historical Sites

Area	County	Sub-Basin	Acres
Oleno S.P.	Alachua	25c	169
Olustee Battlefield H.S.	Baker	16	3
St. Andrews S.P.	Bay	GCAb	1063
Pine Log S.F.	Bay	30	5199
Ichetucknee S.P.	Columbia	25c	1008
Oleno S.P.	Columbia	25c	1547
Cary S.F.	Duval	16	1044
Cary S.F.	Duval	ACa	86
Little Talbot Island S.P.	Duval	Aca	2500
St. George S.P.	Franklin	GCAb	606
John Gorrie H.S.	Franklin	29	1
Ft. Gadsden H.S.	Franklin	29	78
Bear Creek S.P.	Gadsden	28	465
Lake Talquin S.P.	Gadsden	28	6876
St. Joseph S.P.	Gulf	GCAb	2516
Constitution Convention H.S.	Gulf	GCAb	13
Dead Lake S.P.	Gulf	29b	60
Suwannee River S.P.	Hamilton	25	1100

Table IV-24. (Cont.) Florida State Parks[1/], State Forests & Historical Sites

Area	County	Sub-Basin	Acres
Ponce de Leon S.P.	Holmes	30	332
Florida Caverns S.P.	Jackson	29b	1759
Three Rivers S.P.	Jackson	29a	834
Maclay Gardens S.P.	Leon	28	308
Lake Jackson Mounds S.P.	Leon	28	12
San Damian de Escambi H.S.	Leon	28	12
Tallahassee Cascades S.P.	Leon	27	20
Natural Bridge H.S.	Leon	27	8
Lake Talquin S.P.	Leon	28	3578
Cedar Key H.S.	Levy	25	19
Manatee Springs S.P.	Levy	25	2075
Torreya S.P.	Liberty	29	1063
Lake Talquin S.P.	Liberty	28	46
Suwannee River S.P.	Madison	25	31
Ft. Clinch S.P.	Nassau	ACa	1085
Cary State Forest	Nassau	ACa	1072
Cary State Forest	Nassau	16	1211
Fernandina Plaza H.S.	Nassau	ACa	1
Blackwater River S.F.	Santa Rosa	32	122,284
Blackwater River S.P.	Santa Rosa	32	360
Rocky Bayou S.P.	Okaloosa	GCAa	632
John Beasley S.P.	Okaloosa	GCAa	23
Blackwater River S.F.	Okaloosa	32	60,828
Suwannee River S.P.	Suwannee	25	700
Ichetucknee Springs S.P.	Suwannee	25c	1232
Forest Capital H.S.	Taylor	GCAd	14
San Marcos de Apalache H.S.	Wakulla	27	7
Grayton Beach S.P.	Walton	GCAb	356
Ponce de Leon S.P.	Walton	30	38
Basin Bayou S.P.	Walton	GCAa	287
Eden S.P.	Walton	GCAb	12
Falling Waters S.P.	Washington	30	155
Pine Log S.F.	Washington	30	1712

1/ Includes Recreation Areas

Table IV-25. Alabama State Parks, Forests and Recreational Areas

Area	County	Sub-Basin	Acres
Gulf S.P.	Baldwin	34	6160
Blue Springs S.P.	Barbour	30	103
Lake Point Resort S.P.	Barbour	29a	1220
Florala S.P.	Covington	31	35
George Washington S.F.	Covington	31	20
Lightwood Knot Creek S.P.	Covington	31	2050
Panther Creek S.F.	Covington	30a	40
Jeff Davis Jr. College R.A.	Escambia	33a	10
Geneva S.F.	Geneva	30a	7120
Chattahoochee S.P.	Houston	29a	596
Troy State University R.A.	Pike	30a	85

Trails and river systems were the only means of travel in the early days of our country. Indian paths, horse trails, and later wagon trails evolved into the road network we have today. However, a growing awareness of our natural environment along with a national trend toward physical fitness has resulted in many people, young and old, taking to the fields with packs on their backs and binoculars strung from their necks. Nature study or observation and scenery appreciation go hand in hand with hiking. Most hiking occurs on forested lands which make up the major land use within the Basin. Fortunately these woodlands are not far from the population centers. Some of the larger landholding corporations have posted their land because of unpleasant experiences with the public, but many others permit access. Hiking is not always confined to designated trails. Rights-of-way for power lines, pipelines, abandoned railroads, and old logging roads provide many opportunities for the hiker who seeks variety. National and state forests have, or are planning, many miles of hiking trails to meet the increasing demand.

The Florida Trails Association, a non-profit organization consiting of 6000 members, has planned a trail from deep in the Everglades of south Florida to the Alabama state line west of Pensacola. Almost half of this 1000 mile trail has been established and is well marked. Portions of the trail traverse federal and state parks, forests and wildlife management areas which are open to the public. Some private and corporate landowners have given permission for members to cross their properties; however, others having had bad experiences with trespassers are reluctant for anyone to be on their land. Because of this, direct routes are difficult to obtain. The added distance provides even more scenic and natural areas for the enjoyment of the hikers. The members do nothing to jeopardize their privileges and try to leave the trail in better condition than they found it. The hunting season restricts the activities of the club in winter and mosquitos are vicious in some areas in summer. Hardships do not seem to deter many of the members as group hikes are often over-subscribed.

Wm. Bartram,[1/] one of America's foremost naturalists, traveled through the southern states extensively in the Eighteenth Century. There has been a movement in Alabama and Florida to re-establish his trail as a memorial. In the last two Congressional sessions, bills have been introduced to establish the Bartram Trail as a national scenic trail for hiking, similar to the Appalachian Trail (Figure V-4). Because much of the land is relatively the same as it was when Bartram first saw it, dedication of the trail as soon as possible would prevent any further alteration. Backers of the bill have attempted to have the trail established for the Bicentennial Celebration.

Horeseback riding is also experiencing an upsurge in popularity with increased income and more leisure time. Most riding occurs on little used roads or private trails. Riding clubs usually provide their own trails. Stables with rental horses also generally provide facilities. When stables are operated as concessions on public lands, the trails then become important to the land manager.

Trails used by hikers are not normally suited for horseback riding, nor would horseback trails be appropriate for hikers. Hiking trails could be on slopes and land unsuited for horses while horse trails across streams and marshes would not be satisfactory for hikers.

Nature trails are also quite different from hiking trails in that the terrain is not so rough nor challenging, and they may be located on small tracts of land. Nature trails will often have features such as varied vegetation, outstanding geologic formations, assorted birds, or other natural features. These trails usually provide an educational experience. Nature trails may be along small portions of hiking trails and frequently circle back to the starting area. These trails can be found in towns, suburbs, parks, and forests.

Canoe trails, as designated by the Florida Department of Natural Resources, are on rivers noted for outstanding scenery and almost pristine condition. Several can be navigated by canoe or kayak only. Campsites, most of which are primitive, are located on the longer trails. Camps can be set up on sand bars when the rivers are not high. Fishing is average to excellent, with bass and bream the favorites. Deep holes and rapids provide variety and excitement for the canoeist. Wildlife can be approached rather easily by canoes as compared to any other method. Cameras should be taken on these trips to enhance the outdoors experience. Many of the larger, more well known streams and rivers have not been designated as canoe trails, although they are ideal for canoeing except for the traffic of large motor boats.

1/ Travels of William Bartram; Dover Publications, Inc., New York City

Picnicking is one of the most popular forms of outdoor recreation. While many people would not undertake a trip solely to go picnicking, it usually is associated with some other outdoor activity such as sightseeing, boating, hiking, camping, pleasure driving, fishing and others. For instance, in Alabama it was estimated that 90 percent of the boating public also picnicked. This infers that as people become more affluent and have more leisure time, picnicking will increase. Many tourists, while passing through on their way to a distant destination, stop at wayside parks to eat and otherwise refresh themselves. The picnic sites along the interstate highways are among those most heavily utilized. Other popular sites are those which have an attractive woodlands atmosphere or a scenic feature such as a lake or mountain overlook.

Picnic facilities should include tables, barbecue grills, trash cans, restrooms, and water and should be located close to other recreational facilities. Policing is necessary to prevent vandalism or theft. Sites which are well maintained encourage people to be more considerate of those who follow them. When crowding occurs, places other than designated picnic areas are used with resultant overcrowding, littering, and degradation of the environment. The quality of the outdoor experience also suffers, which is probably more harmful than the other effects.

Camping has probably increased faster than any other outdoor recreational activity in the past 10 years. In addition to the outdoor experience, the savings generated by camping as compared to motel and hotel costs make camping an enjoyable pastime. Three types of campgrounds must be considered: transient, recreational, and primitive. Campers cover a wide range of personalities. Some are satified to spend the night in a sleeping bag while others desire all the conveniences of home - television, air conditioning, sewer hookups, and other facilities.

Transient campgrounds are usually located adjacent to the major highways. They provide electrical and water hookups and have conveniences such as stores, laundries, and dumping stations. Many provide swimming pools and playgrounds for the children. These areas are usually occupied one night as a stopover on the way to another destination.

The recreational camper wants facilities close to the kind of activity in which he wishes to engage. The surfer wishes to be near the ocean, the fisherman near fishable waters, the hunter near the woods, etc. The requirements for this type of campground are somewhat less than the transient camps. Electricity and water are desired as are centrally located toilet facilities. The camp serves only as a place to eat and sleep.

Primitive campgrounds are usually in remote areas and sometimes only the site is provided. Other areas may have water and latrines. This type of campground is not a profitable venture so is usually found on public lands. Many campers who use these primitive sites do so in connection with hiking, and their needs are few as they bring their necessities (sleeping bag, cooking utensils, water, etc.) with them.

Boating, as considered in this report, consists of sailing and cruising under power. Skiing, fishing, and canoeing are discussed elsewhere since the requirements for those activities are different from boating requirements. While boating can occur on small bodies of water, the very nature of boating requires long stretches of river or large lakes. Boating is much like driving for pleasure in that a changing scene is desired.

This activity is more income-oriented than canoeing or fishing, and more sophisticated facilities are required. Marinas, docks, channel dredging and marking, and launching ramps are expensive adjuncts to this fast-growing sport; which are paid in part by marine fuel taxes.

The Basin as a whole has many water areas suitable for boating. Large natural lakes, impoundments created by the Corps of Engineers, the hundreds of navigable rivers and streams, the miles of Gulf and bay frontage, and the intracoastal waterway provide ample space for this activity; however, local shortages of open water do exist. Where there are excessive conflicting uses such as power boating, canoeing, sailing, water skiing, and fishing, the available water may not be sufficient for all uses.

Hunting and fishing are important to the active outdoorsman of northern Florida and southern Alabama. Approximately 25 percent of the population hunts or fishes or does both. Considering that male adults comprise the great majority of the license holders, this is a very high figure. The large amounts of open land and water in the Basin provide sufficient opportunities for most to enjoy their favorite pastime. Wildlife management areas, large timber tracts, fish management areas, and the many other lakes and streams are easily accessible to almost everyone within the Basins.

Deer, turkey, dove, squirrel, duck, and quail are the most popular game animals, while bass, bream, crappie (speckled perch), and catfish are the preferred fresh water fish. Sea trout, redfish, drum, cobia, red snapper, grouper, mackerel, mullet, flounder, and the billfish are important salt water species.

Large acres of land are required for wildlife habitat and for hunter safety. A rabbit may only need one acre to provide for his needs, but a turkey may require 200 acres for food, water and shelter. Hunter crowding leads to destruction of the habitat, over-exploitation of the animals, and a decline in the quality of the hunting experience.

While the numbers of hunters have increased at about the same rate as the population, fishermen are increasing much faster than the population rate. The fishermen have access to some of the better fishing waters in the country. Large, productive reservoirs and natural lakes are abundant as are the streams and rivers. Although there are thousands of small farm ponds within the areas, these affect the sports fishing very little, but they do relieve the pressure on public fishing waters. Inshore or estuarine waters which include the salt and brackish bays, creeks, and marshes, and the offshore waters up to 20 to 30 miles out provide many opportunities for the sports fishermen.

Water sports in this report denote surfing, swimming, scuba and skin diving, and water skiing. Surfing generally requires a high-energy beach as may be found on the Atlantic coast; however, surfers are found on the Gulf Coast even with its mild surf and gently sloping beaches. Surfing is usually not compatible with swimming for safety reasons; therefore, surfing areas are often so designated on public beaches.

Swimming in fresh, sheltered waters of lakes and streams is limited within the Basins although there are thousands of acres of open water. Lack of suitable beaches, presence of stumps and vegetation along the shoreline, and limited access precludes this kind of swimming.

Salt water swimming is the most popular activity along both coasts. Prolonged good weather and many miles of excellent beaches make the area a mecca for tourists. Substantial income is generated by the natural attractions at Pensacola, Panama City, and Fernandina beaches.

Skin and scuba diving require such attractions as clear water; deep springs, caves and sinks; offshore reefs, platforms, and wrecks. The Basins have many such areas. Cave diving has cost many lives because of untrained or ill-equipped divers. Cave diving is dangerous at any time but without proper training it is deadly. One scuba association specializes in cave diving and intensely trains the members. It has been proposed that many caves be closed except to highly qualified divers.

Water skiing is relatively expensive and physically demanding and therefore appeals to the affluent and younger segment of society. Large areas of water are required for this sport, ranging from 15 to 50 acres for each boat[1/]. This high use makes it incompatible with swimming, canoeing, sailing, and fishing. The projected increase in skiing will make use zoning a necessity in order to avoid conflicts with the other activities. Some areas have already implemented such zoning with great success.

1/ Participation in Outdoor Recreation in Alabama, 1970
Outdoor Recreation in Florida, 1971

Current supply - Recreational resources and facilities identified in the respective state outdoor recreation reports[1/] were reviewed to determine kinds and quantities of facilities now existing and the general nature of recreational uses. Five classes of recreational activities were selected for review: picnicking, camping, hiking, water use, and hunting (Table IV-26).

Public and private agencies both share in providing recreational facilities for the populace. Picnicking, hiking, hunting, and fishing opportunities are predominantly under public sponsorship. Camping and beach facilities are largely operated as private enterprises. Each state, however has its own characteristic development of facilities. Alabama, for example, provides more hunting opportunities on private lands than does Florida; whereas, Florida depends heavily upon public ownership for hunting facilities.

Basin-wide recreational facilities are meeting demands for most outdoor experiences. An imbalance of certain facilities, however, may occur within a district or county; planning districts within the respective states can determine these conditions through the use of the state recreation reports. Physical conditions within any of the districts or counties may also preclude development of certain types of recreational facilities, hence, the need for coordinated regional planning.

Current demand - The States of Alabama and Florida have both conducted comprehensive studies of recreation needs. The general approach was to collect primary data on present and anticipated future use rates. These data were applied to present and future population figures to develop demand in activity occasions (Table IV-27). The activity occasions were converted to a demand for physical facilities based upon a use standard and compared to supply to establish facility needs.

Additional data concerning use rate for peak days were computed. Recreational facilities developed for peak loads would result in high inefficiencies with unused facilities during other periods. The peak day use data was used, however, as a base to compute an economically suppliable level of facilities. This level of facilities was referred to as "design demand" and was recommended as the basis for planning rather than the aggregate activity occasion data.

The existence of these detailed state studies limits the need for a supply-demand analysis by USDA and emphasizes the need for a coordinated effort in recreation planning. Variations in the USDA study area boundaries and guideline population projections necessitated the reorganization of the state study data to be compatible with the USDA planning framework. The minor differences in state recreation study procedures were maintained to make the USDA analysis compatible with the ongoing state recreation planning effort. USDA programs and planning efforts have a potential for helping meet some of the recreational facility needs and only these activities are considered.

1/ Alabama Statewide Comprehensive Outdoor Recreation Plan, Agricultural Experiment Station, Auburn, 1975.
Outdoor Recreation in Florida, Florida Department of Natural Resources, 1976.

Table IV-26. Selected available recreational facilities[1/]

Facilities	Alabama Subarea (1974)			Florida Subarea (1976)			Basin Total		
	Public	Private	Total	Public	Private	Total	Public	Private	Total
Picnic Tables	1550	370	1920	2705	305	3010	4255	675	4930
Campsites	825	885	1710	1605	7960	9565	2430	8845	11275
Hiking Trails (miles)	95	60	155	50	120	170	145	180	325
Horseback Riding Trails (miles)	3	25	28	96	64	160	99	89	188
Hunting Habitat (1000 acres)	275	705	980	2582	344	2926	2857	1049	3906

1/ Outdoor Recreation in Florida, Florida Department of Natural Resources, 1976
Alabama Survey of Outdoor Recreation Sites, 1974

Table IV-27. Annual recreation demand in activity occasions, Northeast Gulf River Basins[1/]

Activity	Demand (1000 activity occasions) Alabama (73-74)	Florida (75)	Total
Fishing, freshwater	3,494	17,925	21,419
Picnicking	2,551	10,503	13,054
Hunting	1,695	6,954	8,649
Swimming, freshwater	1,388	13,028	14,416
Boating, Sail & Power freshwater	956	7,192	8,148
Camping	657	7,538	8,195
Water Skiing	243	5,325	5,568
Horseback Riding	55	5,879	5,934
Hiking	45	5,143	5,188

Source: OBERS Series "C" population projections and Comprehensive Outdoor Recreation Plan, Alabama Department of Conservation.

Economic effects - The recreation industry in the Basins has a substantial impact on the economy, especially in the Florida subarea, this is reflected in the data on activity occasions of recreation supplied in the Basins and employment figures for recreation and related services. Beneficial effects result from a variety of sources.

Most explicit are the revenues from entrance fees and charges for specific activities both in the public and private sectors. Hotels, motels, and food service industries flourish in dominant recreation centers, providing revenue and employment. The transportation and related service industries also benefit from the recreation industry. State revenues paid by tourists for taxes on gasoline, air, and rail

1/ Alabama Statewide Comprehensive Outdoor Recreation Plan, Agricultural Experiment Station, Auburn 1975
Outdoor Recreation in Florida, Florida Department of Natural Resources, 1976

transportation, hunting and fishing licenses, and even fines for traffic violations should be reflected as benefits in accounting for the economic effects of recreation.

On the cost side, construction, operation and maintenance of public facilities are the most obvious, and they generally exceed the revenues collected from use of these facilities. Many public facilities need expanding as the recreation industry grows and the permanent residents incur these costs. Monetary costs are also associated with traffic congestion, natural resource use pressures, and pollution resulting from growth of the recreation sector.

The recreation industry tends to be cyclical and works against the economic stability goals of the community. This happens because recreation activity generally peaks when the economy is expanding and people feel affluent. In hard times when the economy needs strengthening, recreation expenditures are being contracted. Not all of these costs and benefits are easily quantifiable, but they reflect additional information beyond conventional supply and demand data which need to be considered in developing an outdoor recreation plan.

Health Facilities

Residents of the Basins have indicated a need for more health care--doctors, dentists, nurses, and facilities. A few counties do not have doctors. The 1970 Census of Population indicates there are 2,369 doctors, dentists, and related practitioners in the Basins. This would be approximately 1.5 per 1,000 population which was lower (1970) than the ratio for any of the three states (Table IV-28).

There were 110 general hospitals located in the 77-county area in 1967 with a capacity of slightly over 10,000 beds.[1/] These included 50 hospitals in Florida, 42 in Alabama, and 18 in Georgia counties. A large number of nursing homes are also located in the area.

1/ U. S. Department of Health, Education and Welfare, Hospitals, A County and Metropolitan Area Data Book, Rockville, Maryland, November 1970.

Table IV-28. Number of Physicians, Dentists, and Related Practitioners per 1,000 population, Northeast Gulf River Basins, Subareas and selected states, 1970

Area	Subarea	State
Alabama	1.4	1.8
Florida	1.6	2.4
Georgia	1.4	2.1
Northeast Gulf Basins	1.5	--

U. S. Bureau of Census, General Social and Economic Characteristics, 1970, Washington, D.C. March 1972.

Education

One of the factors responsible for low incomes in the Basins has been the number of unskilled workers. In 1950 the average person in the Basins over 25 years old had completed only 7.6 years of school. This had increased to 10.6 years by 1970. Although this was a larger improvement, each state subarea still lagged the remainder of the state in years of education completed (Table IV-29). Only 42 percent of the residents 25 years and older had completed high school. This percentage was lower for each state subarea than for the remainder of each state. In 1950 only 3.5 percent of those 25 years old and older had completed college. This had increased to 7.9 percent by 1970. There are several colleges and vocational training centers located in the Basins.

Table IV-29. Educational levels of those 25 years old and older, Northeast Gulf River Basins, Subareas and selected states, 1970

Area	Years of school completed	Percent high school graduates
Alabama	10.8	41.3
Alabama subarea	10.0	36.3
Florida	12.1	52.6
Florida subarea	11.2	48.1
Georgia	10.8	40.6
Georgia subarea	9.8	32.3
Northeast Gulf Basins	10.6	41.7

U. S. Bureau of Census, General Social and Economic Characteristics, 1970, Washington, D.C., March 1972.

Transportation

Highways are an important link between producers, manufacturers, and markets. Highways in the Basins are generally adequate but some need widening, paving, or other changes to correct conditions considered unsafe by local residents. A major north-south route in north Florida, Interstate Highway 75, covers approximately 180 miles between Gainesville, Florida and Ashburn, Georgia. This road supports heavy traffic during tourist seasons and a major north-south toll road has been proposed. Interstate 10 which will cover approximately 400 miles between Jacksonville to west of Pensacola is open in sections. This will help alleviate east-west traffic problems in Florida when completed. It will also provide a better access to markets in New Orleans and Jacksonville and should increase economic activity along its route. Other major highways in the Basins are U.S. 82, U.S. 84, U.S. 27, U.S. 441, U.S. 41, and U.S. 280. A need exists for better land transportation to the Atlanta markets. There are several small airports but the major airports are located in the SMSA's just outside the Basins. Port facilities are available in Pensacola, Panama City, Port St. Joe, and Fernandina Beach, Florida. However, larger ports are located in Jacksonville and Mobile, Alabama, which are just outside the Basins. Rail service is extremely limited.

Housing Quality

There is no universally accepted measure of housing quality.[1/] Various measures, such as durability of structure, adequacy of plumbing, size of dwelling, amount of living space per person, adequacy of heating, and other criteria have been used. In 1967, the Bureau of the Census found that 87 percent of the structures that were rated as dilapidated in rural areas lacked complete plumbing.[2/] Therefore, in the next survey, questions relative to the quality of housing were replaced by questions on plumbing.

In 1970 each state subarea had a higher percentage of houses lacking some or all plumbing than did the remainder of the state. In the Basins, 89,900 houses or 17.6 percent lacked complete plumbing compared to 6.9 percent in the U.S. (Table IV-30).[3/] The percentage of occupied houses

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1/ W. Charles Walden, Differences in the Quality of Housing Occupied by Black and White Households in Rural Areas of South-Central Tennessee, 1968, USDA, ERS Agricultural Economic Report No. 221, Washington, D.C., 4/72.

2/ U. S. Bureau of Census, Measuring the Quality of Housing: an Appraisal of Census Statistics and Methods, working paper no. 25, 1966.

3/ The percentage of housing with inadequate plumbing had a correlation coefficient of .90 with percent of families in poverty, -.66 with percent population change between 1960 and 1970 and -.76 correlation coefficient with 1970 mean family income in the 77 counties.

with 1.01 or more persons per room, which gives an indication of the degree of overcrowding, was higher than the remainder of the state in each state subarea. Approximately 11.1 percent of the houses in the Basins had densities this high.

Table IV-30. Percent of houses with inadequate plumbing and with 1.01 or more persons per room, Northeast Gulf River Basins, subareas, selected states and United States, 1970

Area	Percent of year-round housing units lacking some or all plumbing	Percent of occupied housing units with 1.01 or more persons per room
Alabama subarea	22.9	11.5
Alabama	16.9	11.1
Florida subarea	13.2	9.9
Florida	5.1	9.0
Georgia subarea	21.9	14.0
Georgia	16.9	11.1
Northeast Gulf	17.6	11.1
United States	6.9	8.2

U.S. Bureau of Census, Census of Housing: 1970 General Housing Characteristics, Washington, D.C., August 1971.

Agriculture, Forestry and Fisheries

Farm Characteristics

Land in farms declined from 12.4 million acres in 1949 to 9.0 million acres in 1969 (Table IV-31). Much of this land became commercial forestland. During this twenty-year period the number of farms decreased even faster, declining from 89,500 to 35,700. Average farm size increased from 139 acres to 252 acres which was still considerably below the U.S. average of 390 acres. Farms in the Florida subarea averaged 266 acres while those in Alabama and Georgia subareas averaged 235 and 260 acres, respectively (Table IV-32).

Table IV-31. Land in farms, number of farms, and average farm size, Northeast Gulf River Basins, 1949, 1959, and 1969

Item	Unit	1949	1959	1969
Land in farms	Thousand acres	12,398	10,839	8,981
Farms	Number	89,472	53,885	35,702
Average size	Acres	139	201	252

U.S. Bureau of Census, Census of Agriculture, 1949, 1959, and 1969, Washington, D.C.

Table IV-32. Land in farms, number of farms, and average farm size, Northeast Gulf River Basins, and subareas, 1969

Item	Land in farms	Number of farms	Average farm size
	Thousand acres		Acres
Alabama subarea	3,405	14,499	235
Florida subarea	3,150	11,860	266
Georgia subarea	2,427	9,343	260
Northeast Gulf Basins	8,982	35,702	252

U. S. Bureau of Census, Census of Agriculture, 1969, Washington, D.C.

Declining farm numbers have been the trend in the past years. These reductions have been a result of consolidation of small farms into larger and more efficient operating units, the retirement of elderly and long-time farm operators, urban expansion around towns, and the construction of highways and recreational facilities. The decline in farm numbers has leveled off in the 1970's in each Basin state. This reflects the number of part-time farmers near suburban areas producing enough agricultural products to qualify as a farm under the present definition.

The value of land and building in 1969 totaled almost 2.0 billion dollars (Table IV-33). This represents an average of $56,100 per farm. In addition to this, investment in machinery and equipment represented $284 million or almost $8,000 per farm.

Table IV-33. Value of land, buildings, machinery and equipment, Northeast Gulf River Basins and subareas, 1969 1/

Area	Value of land and buildings		Value of machinery and equipment		Value of land, buildings, machinery, and equipment	
	Total (mil.)	Per farm	Total (mil.)	Per farm	Total (mil.)	Per farm
Alabama subarea	$ 631	$43,520	$ 96	$ 6,621	$ 727	$50,141
Florida subarea	682	57,504	90	7,588	772	65,092
Georgia subarea	690	73,852	97	10,382	787	84,234
Northeast Gulf Basins	$2,003	$56,103	$283	$ 7,927	$2,286	$64,030

1/ 1972 dollars

U. S. Bureau of Census, Census of Agriculture, 1969, Washington, D.D.

Farm Sales

Sales of agricultural products increased from $323 million in 1949 to $513 million in 1969 (Table IV-34). During this period there was a large change in the source of these sales as a result of declining cotton acreage and the shift of cropland to other uses. In 1949 about three-fourths of the total sales were from crops (Table IV-35). In 1969 livestock sales exceeded crop sales. This decline in the relative importance of crop sales has occurred in each state subarea.

Table IV-34. Value of all farm products sold, Northeast Gulf River Basins and subareas, 1949, 1959, and 1969

Area	1949	1959	1969
		Million dollars 1/	
Alabama subarea	123.2	114.6	150.1
Florida subarea	87.9	114.1	193.5
Georgia subarea	112.2	129.9	169.3
Northeast Gulf Basins	323.3	358.6	512.9

1/ 1972 dollars.

U. S. Bureau of Census, Census of Agriculture, 1949, 1959, and 1969, Washington, D.C.

Table IV-35. Percent of total farm product sales represented by crops and livestock, Northeast Gulf River Basins and subareas, 1949, 1959, and 1969

Area	Crops			Livestock		
	1949	1959	1969	1949	1959	1969
		Percent			Percent	
Alabama subarea	73	55	44	27	45	56
Florida subarea	68	51	42	32	49	58
Georgia subarea	82	73	60	18	27	40
Northeast Gulf Basins	75	60	48	25	40	52

U. S. Bureau of Census, Census of Agriculture, 1949, 1959, and 1969, Washington, D.C.

In 1969 the Georgia subarea received the most income from crops of the three subareas while the Florida subarea had the largest amount of livestock sales. The Alabama and Florida subareas received about three-fifths of their income from livestock while Georgia received about three-fifths from crops. The percentage of state crop sales was higher than the share of state livestock sales in the Alabama and Georgia subareas while the opposite was true in the Florida subarea. Gadsden County, Florida, an important tobacco county, led the Basins in both crop sales and total farm sales (Table IV-36). Many of the top ranking counties in crop and livestock sales are adjoining counties.

Table IV-36. Top ten counties in crop, livestock and total farm sales, Northeast Gulf River Basins, 1969 1/

	Crop sales	Livestock sales	All farm sales
1.	Gadsden, FL	Coffee, GA	Gadsden, FL
2.	Baldwin, AL	Duval, FL	Coffee, GA
3.	Colquitt, GA	Nassau, FL	Colquitt, GA
4.	Worth, GA	Montgomery, AL	Baldwin, AL
5.	Mitchell, GA	Bradford, FL	Jackson, FL
6.	Tift, GA	Jackson, FL	Mitchell, GA
7.	Houston, AL	Alachua, FL	Worth, GA
8.	Jackson, FL	Randolph, AL	Houston, AL
9.	Irwin, GA	Lowndes, AL	Grady, GA
10.	Grady, GA	Colquitt, GA	Alachua, FL

1/ Based on data for entire county.

Sales per farm increased consideraly between 1949 and 1969 because of increased production and larger farms. The Basins' sales per farm increased from $3,613 in 1949 to $14,371 in 1969 (Table IV-37). Sales per farm were highest in Georgia while those in the Alabama subarea were about three-fourths of the Basins' average.

In 1969, 371 farms had income from hunting, fishing and other recreational services. Approximately half of these were located in Alabama. These farms reported a total of $544,000 in income from recreational services.

Table IV-37. Value of sales per farm, Northeast Gulf River Basins and subareas, 1949, 1959, and 1969

Area	1949	1959	1969
		Dollars 1/	
Alabama subarea	3,008	4,912	10,362
Florida subarea	3,308	6,864	16,321
Georgia subarea	5,106	9,315	18,119
Northeast Gulf Basins	3,613	6,656	14,371

1/ 1972 dollars.

U. S. Bureau of Census, Census of Agriculture, 1949, 1959, and 1969, Washington, D. C.

Farms with sales of $2,500 or more annually were classified as commercial farms. Approximately 57 percent were so classified in 1969. This indicates that almost half of the farms were part-time or retirement farms. There were 19,000 operators or 53 percent who reported off-farm work. Approximately 14,900 of these reported working off the farms 100 days or more. Only 70 percent of the farmers lived on the farms they operated. Approximately 66 percent owned the farm they operated. The average age of the farm operator in 1969 was 52, the same as in 1964.

The total number of commercial farms changed very little between 1964 and 1969, but the number of farms with sales of $40,000 or more increased from 1,300 in 1964 to 2,300 in 1969 (Table IV-38). This still means that the number of farms that could be expected to have net incomes of approximately $10,000 or more represented only a small percentage of all farms in 1969. Only 26 percent of all farms had gross sales exceeding $10,000 in 1969. Thus, despite the increase in farm size and amount of capital investment, it appears that the majority of farms were too small to be efficient.

Table IV-38. Number of farms by economic class, Northeast Gulf River Basins and subareas, 1969

Type of farm	Alabama subarea	Florida subarea	Georgia subarea	Basins
Sales of $40,000 and over	631	852	833	2,316
Sales of $20,000 to $39,999	998	795	1,203	2,996
Sales of $10,000 to $19,999	1,517	1,018	1,561	4,096
Sales of $5,000 to $9,999	2,124	1,516	1,570	5,210
Sales of $2,500 to $4,999	2,333	1,821	1,413	5,567
Total commercial farms	7,603	6,002	6,580	20,185
Sales less than $2,500	1,692	1,187	685	3,564
Part-time	3,570	3,417	1,388	8,375
Part-retirement	1,627	1,243	686	3,556
Other	7	11	4	22
Total number of farms	14,499	11,860	9,343	35,702

U. S. Bureau of Census, Census of Agriculture, 1969, Washington, D.C.

Farm Production Expenses

Total farm expenditures for production items in 1969 in the Basins totaled 388.9 million dollars (Table IV-39). This represented 76 percent of farm sales or an average expense of $10,887 per farm. Expenditures for livestock and poultry increased considerably between 1964 and 1969.

Table IV-39. Farm production expenses, Northeast Gulf River Basins, 1964 and 1969

Item	1964	1969
	Thousand dollars 1/	
Livestock and poultry	27,206	51,214
Feed for livestock and poultry	57,725	95,969
Seed bulbs, plants and trees	14,774	18,235
Commercial fertilizer	56,292	56,639
Lime	NA	3,102
Other agricultural chemicals	NA	12,827
Gasoline and other fuel oil	8,292	7,434
Hired farm labor	11,328	9,902
Contract labor, machine hire, and custom work	12,934	14,781
All other production expenses	NA	118,797
Total	NA	388,900

1/ 1972 dollars.

Expenditures of this magnitude have a large impact on the economy of the Basins. However, the total impact of agricultural sales and the associated expenditures depend on whether purchases are made within the Basins. This further indicates the need for markets, processing facilities, and agricultural supplies to be available within the Basins if income is to increase from the secondary effects of agricultural spending.

Cropland Acreage & Production

The amount of total cropland and cropland harvested has declined considerably during the past two decades (Table IV-40). Much of the cropland has been marginal and has shifted to pasture and woodland. The total acreage of cropland reported in the Census of Agriculture declined from 4.9 million acres in 1949 to 3.8 million in 1969. The acreage harvested has declined in each census period since 1949. In 1969 there were 2.1 million acres harvested which was only 62 percent of the acreage harvested in 1949. The largest decline in cropland harvested in 1969 was less than half that harvested 20 years earlier (Table IV-41).

Table IV-40. Total cropland, Northeast Gulf River Basins, 1949, 1959, and 1969

Item	1949	1959	1969
		Thousand acres	
Cropland harvested	3,355	2,690	2,080
Cropland pastured	777	661	948
Cropland not harvested and not pastured	782	598	807
Total cropland	4,914	3,949	3,835

U. S. Census Bureau, Census of Agriculture, 1949, 1959, and 1969, Washington, D.C.

Table IV-41. Cropland harvested, Northeast Gulf River Basins and subareas, 1949, 1959, and 1969

Area	1949	1959	1969
		Thousand acres	
Alabama subarea	1,523	1,099	741
Florida subarea	864	726	630
Georgia subarea	968	865	709
Northeast Gulf Basins	3,355	2,690	2,080

U. S. Bureau of Census, Census of Agriculture, 1949, 1959, and 1969, Washington, D. C.

The large decline in cropland acreage since 1949 indicates that there is a large amount of marginal land that could be brought into production if needed. The present food situation has pushed prices of several commodities produced in the Basins to record highs (Table IV-42). These prices may be high enough to cause farmers to bring some of this marginal land back into crops or pastures.

Table IV-42. Average prices received by farmers for farm products August 15, 1973, with comparisons, United States

Commodity	Unit	August 15, 1969	August 15 1972	August 15, 1973
Corn	bu.	$ 1.18	$ 1.15	$ 2.68
Cotton	cwt.	20.53	30.67	36.72
Hay	ton	22.10	29.30	39.00
Peanuts	cwt.	12.00	13.00	14.90
Soybeans	bu.	2.51	3.36	8.99
Wheat	bu.	1.19	1.51	4.45
Beef cattle	cwt.	27.00	33.60	51.70
Hogs	cwt.	26.00	28.00	56.50
Milk	cwt.	5.37	5.99	6.88
Broilers	lb.	.146	.146	.378

Statistical Reporting Service reports.

Corn acreage has declined during the past two decades from 1.2 million acres in 1949 to 938 thousand in 1972 (Table IV-43). However, based on Statistical Reporting Service reports, acreage has remained relatively constant during the past ten years at slightly under a million acres. Production has increased from 16.2 million bushels in 1949 to 46.5 million bushels in 1972 (Table IV-44). Corn is by far the most important crop in terms of acreage in each state subarea. Acreage is largest in the Georgia subarea (Table IV-45). Acreage of corn used for silage or other purposes declined from 314,000 acres in 1949 to 82,000 in 1969.

Table IV-43. Crop acreage, Northeast Gulf River Basins, 1949, 1959, 1969, and 1972

Crop	1949	1959	1969	1972
	-------------Thousand acres------------			
Corn for grain	1,233	1,160	930	938
Corn for silage, fodder, hogged or grazed	314	430	82	NA
Cotton	462	263	129	105
Hay	32	77	141	NA
Oats	17	49	34 1/	NA
Peanuts	535	333	333	361
Sorghum for grain	NA	5	20	NA
Sorghum for silage	NA	NA	8	NA
Soybeans	19	63	252	454
Tobacco	63	50	40	35 2/
Tree fruits, nuts, and grapes	96	89	64	NA
Vegetables	128	74	50	NA
Wheat	NA	18	46	90

1/ 1964 latest data available.

2/ Does not include small acreage of shade tobacco.

U. S. Bureau of Census, Census of Agriculture, 1949, 1959, and 1969 and Statistical Reporting Service reports for 1972.

Table IV-44. Crop production, Northeast Gulf River Basins, 1949, 1959, 1969, and 1972

Crop	Unit	1949	1959	1969	1972
Corn	million bushels	16	34	32	46
Cotton	thousand bales	176	185	96	85
Hay	thousand tons	NA	137	317	NA
Oats	thousand bushels	306	1250	NA	NA
Peanuts	million pounds	440	315	519	826
Sorghum for grain	thousand bushels	NA	NA	590	NA
Soybeans	thousand bushels	403	1418	6010	7919
Tobacco	million pounds	69	67	70	72
Wheat	thousand bushels	NA	339	1379	1399

U. S. Bureau of Census, Census of Agriculture, 1949, 1959, and 1969 and Statistical Reporting Service reports for 1972.

Table IV-45. Crop acreage and percent of state acreage, Northeast Gulf River Basins and subareas, 1972

Crop	Alabama subarea		Florida subarea		Georgia subarea		Northeast Gulf Basins	
	1,000 acres	Percent of Alabama	1,000 acres	Percent of Florida	1,000 acres	Percent of Georgia	1,000 acres	Percent of U.S.
Corn for grain	275	50	288	93	375	26	938	1.6
Cotton	37	6	11	100	57	13	105	.8
Fruits and nuts	16	33	25	3	23	16	64	1.5
Hay 1/	71	16	44	31	26	8	141	.7
Oats 2/	8	22	16	91	9	8	34	.2
Peanuts	194	98	50	93	118	23	361	24.3
Sorghum for grain 1/	5	29	9	54	6	29	20	.1
Soybeans	147	20	219	95	87	13	454	1.0
Tobacco 1/	-	-	10	98	26	45	35	4.2
Vegetables 1/	9	24	20	7	20	36	50	1.5
Wheat	30	27	41	98	19	13	90	.2

1/ 1969

2/ 1964

Statistical Reporting Service reports for 1972 and U.S. Bureau of Census, Census of Agriculture, 1969, Washington, D.C.

Soybeans are the second leading crop in terms of acreage, increasing from 19,000 acres in 1949 to 454,000 acres in 1972. Production in 1972 was 7.9 million bushels, about 20 times the 1949 production. Acreage is largest in the Florida subarea.

Peanuts are the most important crop in terms of sales but each state subarea had more acreage in 1949 than in 1972. Approximately one-fourth of the U. S. acreage is grown in the Basins. Peanut acreage is allotted and in 1972 there were 361,000 acres harvested. Allotments have been in effect for 35 years and are capitalized into land values. Future programs have been proposed to reduce the Government's cost in the peanut program and at the same time expand acreage to allow peanuts to move in world markets. Production of peanuts increased from 440 million pounds in 1949 to 826 million pounds in 1972. The Alabama subarea is the largest producing area.

Cotton acreage declined more than any other crop. In 1949 there were 462,000 acres grown in the Basins while in 1972 there were only 105,000 acres. Cotton allotments have been sold or leased to farmers outside the Basins where yields are higher. Cotton production declined from 176,000 bales in 1949 to 85,000 bales in 1972. Since 1971 the Georgia subarea has been the leading cotton area.

Tobacco, another allotted crop, was the second leading cash crop grown in 1972 although only 38,400 acres were grown. This represents almost 5 percent of the U. S. total. Acreage declined slightly during each of the past four census years from 1954 to 1969. Flue-cured production in 1972 was 72.3 million pounds which was approximately 5 percent higher than the amount produced in 1940. Tobacco production is principally flue-cured except for about 3,000 acres of shade tobacco grown in Gadsden and Madison counties, Florida, and Decatur County, Georgia. Shade tobacco production is very expensive and despite average gross returns of over $4,200 per acre the acreage is declining. In 1972 acreage was only 60 percent of that grown five years earlier. Almost all the flue-cured toaacco is produced in the Georgia and Florida subareas.

Vegetable production declined from 128,000 acres in 1949 to 50,000 in 1969. A decline in acreage was registered in each census period. Vegetable production is principally watermelons and snapbeans with limited acreage of pepper, squash, cucumbers, tomatoes, and sweet corn. Production is generally secondary to other crops and competition with other vegetable-producing areas is often severe.

There was a decline in orchards from 96,000 acres in 1949 to 64,800 in 1969. Pecans are the largest crop in this category although there are a few thousand acres of peach trees.

1/ Flue-cured tobacco is allotted but shade tobacco is not. However, contracts with the purchaser are made prior to production.

Hay acreage has increased each census year since 1949. Acreage in 1969 was 141,000 compared to 32,000 in 1949. Most of the hay produced is Coastal Bermudagrass or Bahiagrass. A large amount of it is grown on land used primarily for pasture and as a result hay yields are low. Curing problems resulting from high humidity and summer rains also limit hay production.

The acreage of small grains harvested fluctuates from year to year but is generally minor and consists of wheat, oats, barley, rye, and grain sorghum. Wheat was grown on 90,000 acres in 1972. In 1969 there were 20,000 acres of grain sorghum grown in the Basins, and the acreage has been increasing. Much of the small grain acreage is used for winter grazing and for cover and green manure crops.

Less than 2 percent of the Basins Cropland is irrigated, but irrigated acreage has increased while total Cropland acreage has declined (Table IV-46). In 1969 there were 2,600 farms that irrigated a total of 74,200 acres, the majority of which was in Georgia.

Table IV-46. Acreage irrigated, Northeast Gulf River Basins and subareas, 1949, 1959, and 1969

Area	1949	1959	1969
Alabama subarea	71	2,433	2,564
Florida subarea	5,644	11,848	29,145
Georgia subarea	1,288	12,569	42,445
Northeast Gulf Basins	7,003	26,850	74,154

U. S. Bureau of Census, Census of Agriculture, 1949, 1959, and 1969, Washington, D.C.

Livestock and Poultry

There were approximately one million head of cattle and calves on Basins' farms in 1964 and 1969. However, from 1959 to 1969 sales increased from 329,000 to 499,000 head (Table IV-47). Feeder calf production has become very important. The Alabama subarea was the leading subarea representing about 41 percent of both cattle sales and inventory in 1969 and approximately 23 percent of Alabama's cattle sales and inventory (Table IV-48). Counties with large numbers include Houston (38,000) and Pike (41,000) in Alabama, Jackson (40,000) in Florida, and Colquitt (37,000) in Georgia.

Table IV-47. Numbers of livestock and broilers sold and on farms, Northeast Gulf River Basins, 1949-1969

Item	Unit	1949	1959	1969 Number	1969 Percent of U.S.
Cattle & calves					
on farms	Thousand	542	765	988	.9
Sold	"	175	329	499	.7
Hogs & pigs					
On farms	Thousand	1,149	1,262	949	1.7
Sold	"	911	1,172	1,317	1.5
Broilers					
Sold	Million	NA	15	54	2.2
Milk cows					
On farms	Thousand	132	82	54	.5

U. S. Bureau of Census, Census of Agriculture, 1949, 1959, and 1969, Washington, D.C.

Table IV-48. Number of livestock on farms, Northeast Gulf River Basins and subareas, 1969

Area	Cattle & calves		Hogs & pigs		Milk cows	
	Number (1000)	Pct. of state	Number (1000)	Pct. of state	Number (1000)	Pct. of state
Alabama subarea	391	22	322	37	15	13
Florida subarea	363	18	254	90	29	16
Georgia subarea	234	13	373	24	10	8
Northeast Gulf Basins	988	-	949	-	54	-

U. S. Bureau of Census, Census of Agriculture, 1969, Washington, D.C.

The number of hogs sold increased from 911,000 in 1949 to 1.3 million in 1969. However, during this period inventories declined. This indicates improved management and higher number of pigs saved per litter in 1969. The Georgia subarea was the leading subarea and produced about 42 percent of the hogs sold in the Basins and one-fourth of those in Georgia. Each state subarea produced a large share of state production. Colquitt County, Georgia, had the largest number of hogs in 1969 (65,000). Other counties with large numbers (40-45,000) included Covington and Houston, Alabama, and Brooks and Grady, Georgia. The typical operation is from farrow to finish. However, in 1969 approximately 138,000 feeder pigs were sold.

The number of milk cows in the Basins have declined steadily in each state subarea since 1949. In 1969 there were only 54,000 head, or about 40 percent as many as two decades earlier. Nassau County, Florida, which produces for the Jacksonville area, had the largest number of milk cows in 1969. Numbers in each state subarea indicate milk production is also relatively unimportant in relation to the rest of the state.

In 1969 there were 53.8 million broilers sold compared to 5.4 million in 1954 (Table IV-49). The number of broilers sold has almost doubled in each five-year period since 1954. The Florida subarea sold over one-half the broilers produced in the Basins in 1969. Suwannee County was the leading broiler county. Georgia has been the leading broiler state in the United States, but only about one percent of its production has been located in the Basins. Although data on laying hens was not available, the Census of Agriculture in 1969 reported 8.8 million chickens over three months old on farms. Laying hens have been a relatively more important part of state numbers in the Alabama and Georgia subareas and less in the Florida subarea.

Table IV-49. Livestock and broilers sold, Northeast Gulf River Basins and subareas, 1969

Area	Cattle & calves		Hogs and pigs		Broilers	
	Number (1000)	Pct. of state	Number (1000)	Pct. of state	Number (Mil.)	Pct. of state
Alabama subarea	193	22	435	34	21	6
Florida subarea	192	18	325	82	28	85
Georgia subarea	114	13	557	24	5	1
Northeast Gulf Basins	499	-	1,317	-	54	-

U. S. Bureau of Census, Census of Agriculture, 1969, Washington, D.C.

Forestry

Approximately 13.6 billion cubic feet of timber are growing in the Basins; this includes more than 40.8 billion board feet of sawtimber (Figure IV-4a). Annual growth produces 733.6 million cubic feet of growing stock of which 2.6 billion board feet are sawtimber (Figure IV-4b).

Timber harvesting and land clearing remove 550 million cubic feet of growing stock annually. Sawlogs produced from this harvest yield 1.4 billion board feet (approximately 6 bd. ft. per cu. ft.). Principal products converted from the remaining volume are pulpwood, piling, and posts.

Timber growth in the Basins exceeds annual harvest by a favorable margin of 184 million cubic feet of growing stock; however, in a portion of the Georgia subarea of the Basin, the annual removal of pine logs exceeds growth.

Timber stands throughout the Basins, can produce an average of 70 cubic feet of wood per acre annually. Current growth rates are between 60 and 80 percent of that capacity. Improved management of private forest tracts can bring about better utilization of the growing capacities of these forest stands over the next 20 to 30 years.

Forest industries in the Basins contribute materially to employment, earnings, and personal wages. Of the Nation's total work force in the furniture, lumber, and paper industries, 32 percent are employed by southern manufacturers. Georgia, Florida, and Alabama are among the states whose employment rates in the paper and allied industries exceeded the national average during the period 1950-1969. Annual wages and salaries paid to workers in the forest products industry during 1972 amounted to more than 195 million dollars (Table IV-50).

Primary products (sawlogs, pulpwood, veneer, logs) harvested annually are valued at $158.4 million. Harvesting and hauling of raw material to processing plants require 1,100 workers who earn wages of $5,700,000 annually. Primary manufacturing employs about 11,000 workers who are paid wages and salaries of $63,500,000. An additional 17,000 workers are required in the secondary manufacturing chain. Salaries and wages paid to these workers amount to over 126 million dollars each year. The location of pulp mills, large sawmills, and pine plywood mills is shown in Figure IV-5.

The naval stores industry also makes a contribution to the Basins' economy. The current annual production of 118,000 barrels of oleoresin yields about $7.5 million to producers. This production, however, is only 4.6 percent of potential capacity. In the Basins there are 84.9 million longleaf and slash pine trees (trees over 11 inches in diameter) capable of yielding 2.5 million barrels of oleoresin annually. At the current rate (1973) of $65 a barrel, naval stores production would yield $162.5 million. A labor force of 25,470 workers is required to reach this potential production. Such employment would provide annual wages in the amount of $76.9 million.

Table IV-50. Activities of forest-based industries, Northeast Gulf River Basins and subareas, 1972[1/]

Activity	Alabama subarea	Florida subarea	Georgia subarea	Northeast Gulf Basins
<u>Harvesting and hauling</u>				
Number of workers employed	210	412	492	1,114
Wages and salaries earned	$ 771,960	$ 2,259,408	$ 2,730,600	$ 5,761,968
<u>Primary industries</u>				
Number of pulp mills	2	7	3	12
Daily pulp capacities--tons	1,775	3,975	7,030	12,780
Number of other mills and plants*	83	44	62	189
Number of workers employed	2,105	4,112	4,917	11,134
<u>Secondary industries</u>				
Number of mills and plants	55	72	117	244
Number of workers employed	4,847	3,170	9,029	17,046
Wages and salaries earned	$33,880,000	$23,471,000	$68,801,000	$126,152,000

1/ Florida Division of Forestry; Alabama Forestry Commission; Southern Forest Experiment Station, USDA; Georgia Forestry Commission; <u>Forest Farmers Manual, 1972</u>.

* Numbers and types of mills and plants reported here are too numerous to include on a map. Mills and plants shown on map (Figure IV-5), represent only major installations whose production capacities are significant.

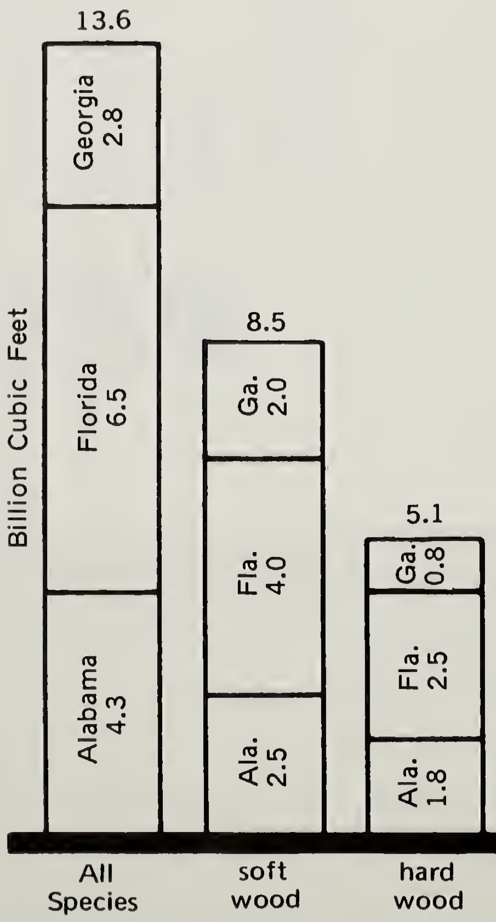


Figure IV-4a Growing Stock Volume

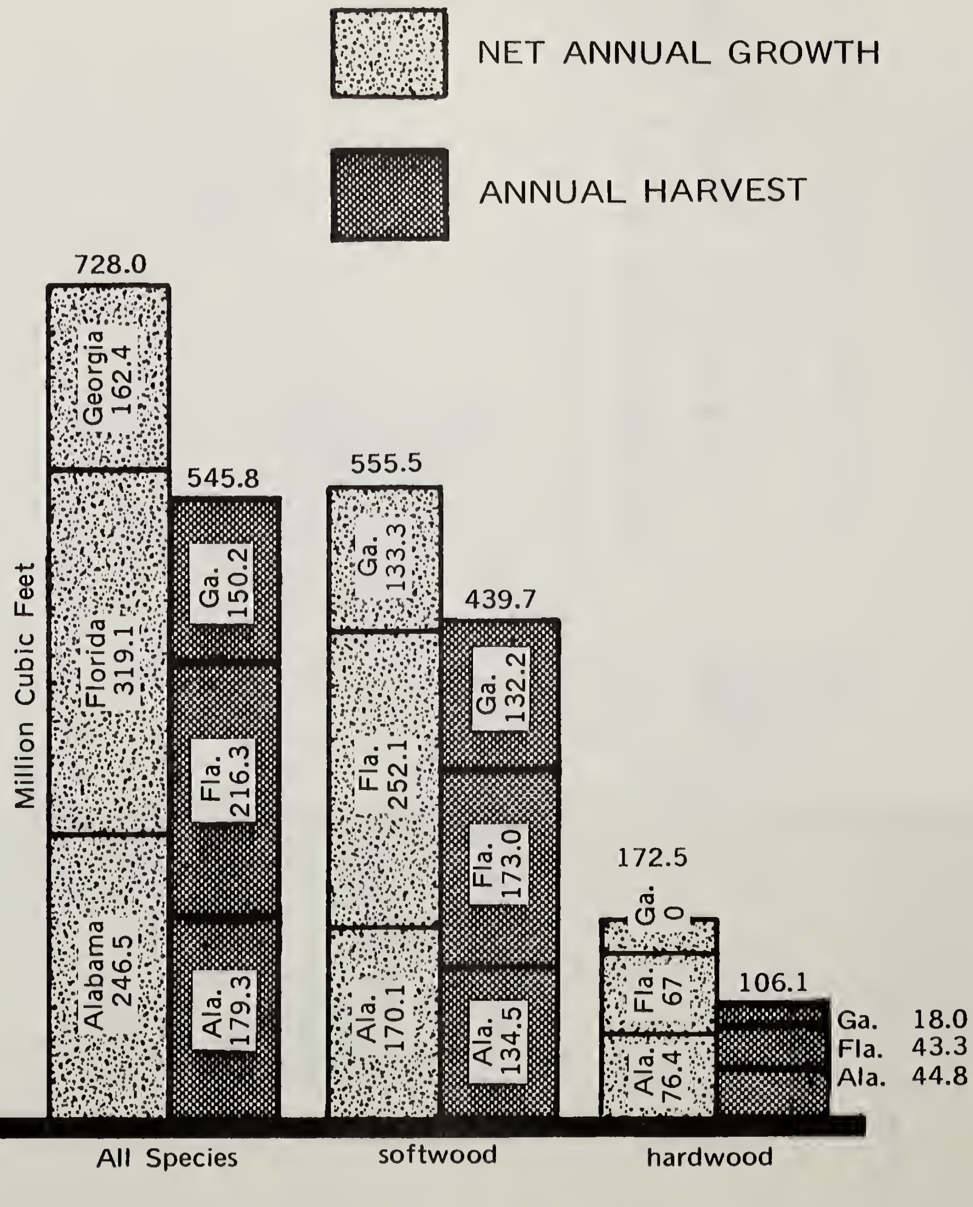


Figure IV-4b Growth - Harvest

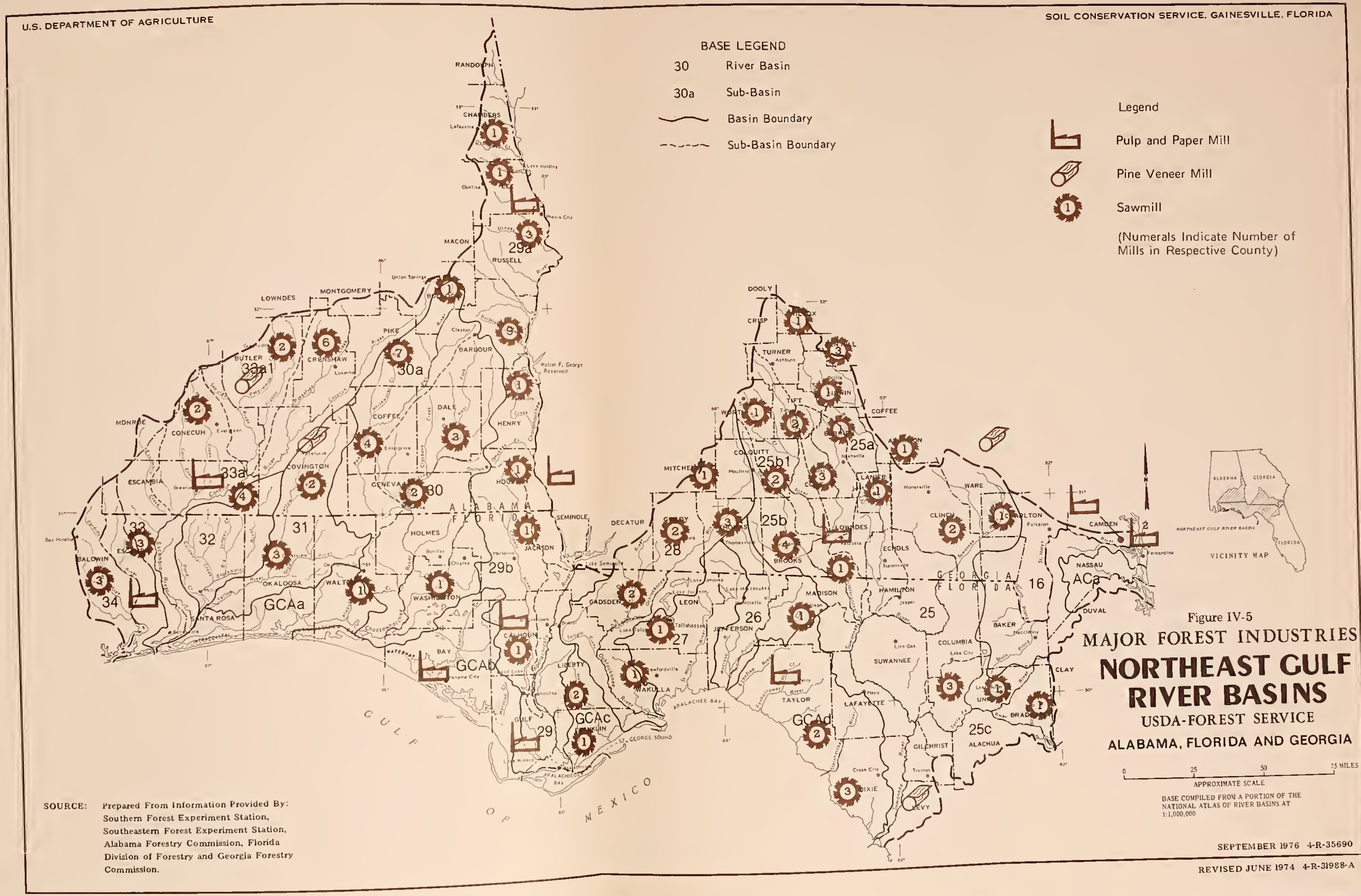


Figure IV-5

MAJOR FOREST INDUSTRIES

NORTHEAST GULF RIVER BASINS

USDA-FOREST SERVICE

ALABAMA, FLORIDA AND GEORGIA

0 25 50 75 MILES
APPROXIMATE SCALE

BASE COMPILED FROM A PORTION OF THE NATIONAL ATLAS OF RIVER BASINS AT 1:1,000,000

SOURCE: Prepared From Information Provided By: Southern Forest Experiment Station, Southeastern Forest Experiment Station, Alabama Forestry Commission, Florida Division of Forestry and Georgia Forestry Commission.

SEPTEMBER 1976 4-R-35690

REVISED JUNE 1974 4-R-31988-A

Another effect of forest-based industrial activities upon the Basins' economy can be seen in the value added by manufacturing of primary products and the subsequent distribution and retailing. For 1972 the value added by all forest products amounted to $243.9 million.

Forage found in the basins occurs in two vegetative communities -- bluestem and wiregrass, each with its key grasses and a number of lesser species. Under appropriate management this resource can be used to supplement beef production throughout the basins.

The carrying capacity of range for beef production depends upon such factors as soil productivity, age, stocking of trees, and time of year. As an average for range conditions in the Northeast Gulf Basins, one animal unit (AU) can be carried on each 24 acres throughout the Longleaf-slash and Loblolly-shortleaf timber areas. There are 1,995,100 acres of suitable range in Alabama and 5,036,100 acres in the Florida subarea.

Experiments carried out by the Georgia Agricultural Experiment Station[1/] point to a weight gain of 185 pounds for each animal unit during an 8-month grazing period. The Basins' total potential beef production, assuming a 65 percent use of available range, can yield an annual supply of 45,225,500 pounds of beef. Alabama subarea share of this potential production is 9,996,300 pounds of beef and the Florida subarea 35,229,200 pounds. Although no accurate figures exist on number of animals supported by the present forage range, it appears that this resource is under utilized.

Commercial Fishing

Commercial fishing is not a large industry in the study area, but it is of major importance in some seaboard counties and constitutes the backbone of the economy of some coastal communities. Essentially all of the commercial fishing industry in the Basins is located in the Florida subarea. This subarea's commercial landings of fish and shellfish for food, bait, and miscellaneous purposes amounted to 62.4 million pounds worth $12.1 million at dockside in 1972 (Table IV-51).

Over one-third of the total weight was nonfood fish species, but their economic value amounted to only 3 percent of the value of all landings. Food fish represented 42 percent, shrimp 38 percent, and other shellfish 17 percent of the total value at dockside.

1/ Range Resources of the South, Georgia Agricultural Experiment Station, 1955.

Table IV-51. Commercial fish and shellfish landings, Florida subarea, Northeast Gulf River Basins, 1972

County	Pounds	Dollars
Bay and Washington	8,412,311	2,877,978
Dixie	1,518,811	167,767
Escambia	4,968,878	1,757,793
Franklin	9,421,342	3,405,858
Gulf	5,407,896	899,667
Levy	1,722,802	231,215
Nassau	22,452,721	1,437,392
Okaloosa	2,893,498	748,827
Santa Rosa	217,477	43,915
Taylor	615,705	67,480
Wakulla	4,569,755	446,441
Walton	186,174	43,176
Total	62,387,370	$12,127,509

Florida Department of Natural Resources, Division of Marine Resources, Bureau of Marine Science and Technology, Summary of Florida Commercial Marine Landings, 1972.

Sport Fishing

Sport Fishing is generally considered to be more important economically than commercial fishing, but data to establish importance is not readily available by county or for the study area. The U. S. Department of Commerce publishes data for U.S. regions, one of which includes the entire east half of the Gulf Coast. In this area in 1970 1.5 million anglers caught over 185 million salt water fish weighing approximately 335 million pounds. The Northeast Gulf River Basins represents approximately 35 percent of the east half of the Gulf area. Using this factor and a Department of Interior estimate of expenditures of Gulf Coast salt water fishermen, a rough estimate of 117 million pounds of catch and gross expenditures in the area of $92 million were developed. Sports fishing activity in the Panama City - Pensacola area is very intense and these figures probably represent a conservative estimate.

Catfish Farming

In the sixties the U. S. Bureau of Sports Fisheries and Wildlife and several universities conducted research on raising channel catfish commercially. With the knowledge available to the farmers as a result of those intensive studies, the production of catfish became a supplement to many farm enterprises. Idle land not suited for crops or livestock but having a good supply of water was converted to catfish ponds. The Southern Mississippi Valley became the leader in this new enterprise which spread across the southern states. Profits were made even by inefficient operators. This created high interest throughout the South. Farmers who processed and sold their own fish, grew fingerlings for sale to others, or provided fish-out facilities were able to make more money than they could from conventional farming.

After a relatively short period of growth, the glamour of raising catfish suddenly wore off. Large processing plants paid minimum prices, and the small producer was working for marginal profits. The cost of feed has practically tripled in recent years causing many operators to get out of the business or drastically reduce their operations.

Several farmers within short distances of large metropolitan areas are still finding it profitable to permit fee-fishing where the customers are charged by the pound for catfish caught. These operators usually provide bait, picnic areas, and other amenities in order to attract clientele.

There were, in 1973, approximately 960 surface acres of commercial catfish ponds in the Basins (Table IV-52). Nearly three-fourths of these acres are in the Alabama subarea.

Table IV-52. Commercial Catfish Operations, Northeast Gulf River Basins (1973)

County	Surface Acres	No. Owners
ALABAMA		
Baldwin	29.5	5
Barbour	95.0	2
Bullock	93.0	4
Coffee	112.0	9
Conecuh	42.0	2
Covington	63.0	2
Dale	105.0	3
Escambia	37.5	4
Geneva	29.0	8
Pike	28.0	2
Randolph	44.0	9
Russell	21.0	3
Subtotal - Alabama	699.0	53
FLORIDA		
Calhoun	2.5	1
Escambia	11.0	4
Gadsden	115.0	6
Jackson	2.0	1
Liberty	2.0	1
Okaloosa	74.0	4
Walton	36.0	4
Washington	19.0	3
Subtotal - Florida	261.5	24
TOTAL -	960.5	77

Economic and Resource Development Relationships

Economic development is based on efficient use of human and natural resources. Development of these resources has the potential of generating increased economic activity, but a wide range of factors concerning human and natural resource characteristics and emotional and physical impacts should be taken into consideration in resource development decisions. All of the factors need to be analyzed before an appropriate economic development strategy is identified.

A detailed analysis of basic employment data suggests that the Basins' human resource has historically been oriented towards employment activities which have been declining or growing at a slow rate and which paid low wages.1/ Future growth industries need to be examined in terms of natural and human resource availability and the physical and emotional impact associated with industrial expansion. Coordination of the development of natural resources to attract selected growth industries would help the Basins gain economic stature relative to the rest of the nation.

1/ For further discussion see report by Gene Harris--Historical Economic Conditions in the Northeast Gulf River Basins.

CHAPTER V. PROJECTIONS, PROBLEMS, AND OPPORTUNITIES

The primary objective of Federal agencies involved in natural resource planning is to assist in an orderly, efficient use of our natural resources for the purpose of improving human welfare. This task is generally predicated upon two basic ingredients: an inventory of the existing situation and a conditional forecast of what can be expected without accelerated development of the scope considered herein.

The existing situation in the basins was presented in Chapter III and the expected conditional future is outlined in this chapter. Projection of the general economic and agricultureal setting without accelerated resource development is based upon the 1972 Series "C" OBERS projections. They follow the same general assumptions about population, employment, income, technology and foreign conflict delineated in the OBERS report.

The historical relationship of the Florida and Alabama subarea with the respective states, economic areas, and water resource areas was examined as a basis for making subarea projections. Reliability levels for the projections cannot be stated in statistical terms. Differing levels of reliability characterize the various elements of the OBERS projections, and the reliability of the subarea projections have been further reduced in the process of refining data for smaller areas. The projections, however, reflect the best available estimate of what can be expected in the Northeast Gulf River Basins without accelerated development, and are consistent with the OBERS projection methodology prepared for use by public agencies in comprehensive planning.

Economic

Agricultural Projections

Expected future production without accelerated development[1/] and the associated land use has been projected for the Alabama and Florida subareas. Past and present trends within the subarea and OBERS Series "C" projections of production for the major agricultural commodities in the States of Alabama and Florida (Table V-1) served as the basis for making projections within the State subareas.

1/ "Without development" was defined for this study to include existing developments and projects authorized and funded but with no accelerated type of development resulting from proposals in this or other studies.

Land use - Linear programming was used as an aid in analyzing agricultural land use and production possibilities in more depth, but initially urban and other land used were projected to determine what land would be available in future time periods for agricultural crop production. Population densities for the urban and built-up areas in the Basins presently range from four or more persons per acre in large growing metropolitan areas to less than one person per acre in small towns. Most of the population growth is expected to occur in the metropolitan areas thereby increasing the density even with the expansion of the larger cities. Construction of reservoirs and dredge and fill operations can make minor modifications in the land base, but the land resources of the Basins are essentially finite. Strong competition from the nonagricultural sector will draw some of these resources away from agriculture as population continues to grow.

Other demands that compete for land are related to recreational needs and to preserving environmentally important areas, such as marshes, swamps, and forests. These special activities carried out by state and Federal agencies, generally do not involve prime agricultural land, but do reduce available land for other uses.

The agricultural land base was reduced on the basis of projected growth of urban population to account for the above competing uses. The agricultural base was reduced by 3/4 acre per capita increase in urban population. This amounts to a 2 percent decline in the Basin's agricultural land base by 1990 and a 6 percent decline by 2020.

Projected agricultural production for the Florida subarea was computed from the OBERS state projections and historical trends of relationships between state and subarea production. A linear programming model for the Florida subarea was used as an aid in making projections of land use within that area. Projected agricultural production and land use for the Alabama subarea was estimated after analyzing state and subarea production possibilities with the aid of a statewide linear programming model of Alabama agricultural land use.

Present and projected land use is given in Table V-2. "Cropland" in this table includes improved pasture and idle cropland. The distinction between "improved" pasture included in the cropland category and "permanent" pasture included in the pasture category is somewhat arbitrary. Some, but not all, cropland pasture acreage is included in a rotation with other crops to minimize soil loss and maintain soil fertility. With higher fertilizer costs and intensified emphasis on erosion control, this practice may become even more prominent in the future. Approximately 950,000 acres of cropland was pastured in 1972, and this is projected to increase to support expansion of the beef industry. Additional idle acres are in bushy or grassy cover which could be utilized for pasture.

Much of the pasture acreage is presently under-utilized, but a substantial increase in the beef industry will require development of additional pasture acreage in the Alabama subarea. In the Florida subarea, pasture acreage is projected to increase more than livestock production needs would dictate with moderate increases in the level of management.

The number of additional acres needed to sustain the beef industry is very sensitive to the level of technology and management applied. If future wood product prices increased substantially relative to beef, some of the pasture acreage would be expected to shift to forest use. Such a shift is not anticipated, however, and limited conversion to forest acreage is expected.

Acreage currently in forest cover is adequate to meet present needs for wood fiber, forage, recreation, wildlife habitat, and watershed protection. However, a look into the future by means of OBERS projections1/ indicates that problems can be expected in meeting the demands for wood fiber. The other forest resources, although not expected to be in short supply, nevertheless, will be available only under controlled use.

Presently, the Alabama and Florida subareas, with 14,096,000 acres of commercial timber stands, are adequately supplied with wood fiber. Beginning in the 1980's, however, forest acreage will begin to decline enough to cause problems in meeting the anticipated demands for wood fiber. Alabama can meet its wood fiber requirements only until the late 1990's; Florida's capacity to supply its requirements will be severely strained by the early 1980's.

Under present levels of management the basin will require 16.6 million acres in 1990 to meet anticipated markets demands; forest acreage will have declined to 13.8 million acres by that time - a shortage of 2.8 million acres. The year 2020 will present a more critical situation when forest acreage will fall short by 7.8 million acres of the required amount of forest land capable of producing 1.2 million cubic feet of wood—the demand anticipated in 2020.

The "other" land use category is expected to decline in the future and permanent pasture acreage projections partially reflect a residual category. Pasture acreage projections for the Basins reflect a gradual increase from 1,301,000 acres in 1972 to approximately 1,916,000 acres in 2020.

1/ All projections are based on assumption that the price of wood will remain constant relative to the price of other goods and services.

The cultivated crops included in the linear programming models account for approximately 90 percent of the cropland harvested in 1972. Inputs required for the analysis include yields, current detailed land use, expected production, and production costs. Commodity specialists at agricultural colleges and within USDA were consulted in developing these inputs. The output of the model is in terms of economically efficient land use patterns under alternative sets of assumptions about agricultural production practices, product demands, and potentials for farmers to adjust to changing conditions. The model is very useful for analyzing future conditions "without" and "with" accelerated resource developments because all other factors affecting future production can be held constant.

Projected subarea production and acreage are presented in Tables V-3 and V-4. The projections reflect what is expected to take place without accelerated development and are based upon specific assumptions. Yields are projected to increase approximately 50 percent by 1990 and double by 2020. Efficiency gains through land use shifts are expected, but institutional factors, tradition, and other non-economic affects implicitly included in the model, are assumed to limit these changes.

Beef production is expected to increase, particularly in the Alabama subarea. Production levels of crops other than pasture and hay will probably stabilize or decline in the Alabama subarea.

In the Florida subarea, peanuts, soybeans, wheat, vegetables, and hay are expected to increase almost 100 percent by 2020. However, yield increases are generally expected to more than account for projected increases in production, thus resulting in acreage declines of most field crops. This is true in both subbasins, so it is very likely that OBERS crop and livestock production levels can be attained on the existing open agricultural land base.

Emerging energy and environmental problems cast considerable uncertainty upon future input prices and use. Fertilizer and chemicals may become relatively more expensive than they are now, and pollution abatement standards may become more stringent than has been assumed in this analysis. Nevertheless, 1990 OBERS production levels could be obtained with yield increases of less than 10 percent (compared to the 50 percent increase that commodity specialists now consider reasonable).

There are approximately 720,000 acres of classes I and II land presently in forestland use in the Florida subarea and another 700,000 acres in the Alabama subarea. No substantial shift of these acres to openland uses is expected with the projected economic setting. Under conditions of food and fiber needs much higher than those reflected by the OBERS projections, these lands could be shifted into crop production. Crop and livestock production in the Basins could be increased to nearly three times the projected 1990 production level under these conditions. A considerable amount of the forest production capacity would have been

Table V-1. Agricultural production - Alabama and Florida - state totals 1972 and projected to 1990 and 2020

Commodity	Units	Alabama 1972	Alabama 1990	Alabama 2020	Florida 1972	Florida 1990	Florida 2020
		Thousand					
Crop							
Corn	bu.	26160	15073	10000 1/	14122	22710	18618
Cotton	bale	567	327	195	14	7	4
Soybeans	bu.	16000	40000 1/	50000 1/	4872	8454	11203
Peanuts	lbs.	368390	468776	566687	137700	162037	236612
Tobacco	lbs.	926	1320	1848	23424	34993	45109
Wheat	bu.	2200	3956	6035	630	1486	2032
Vegetables	cwt.	1978	2855	3282	47244	48195	67665
Hay	tons	814	761	935	311	442	724
Livestock							
Beef & Veal	lbs.	616585	900000 1/	1400000 1/	473580	698612	1077029
Pork	lbs.	330715	350826	461561	91310	89950	88693
Broilers	lbs.	1437386	2594352	4568098	209624	69022	53948
Eggs	doz.	237667	382538	656067	236667	348606	608917
Milk	lbs.	820000	460500	285300	1843000	2293052	3772400
Timber							
Sawlogs, Veneer, etc.	cu.ft.	335000	559000	800000	145000	243000	340000
Pulpwood	cu.ft.	383000	761000	1160000	247000	465000	700000

1/ State OBERS projections were modified to reflect recent historical trends

Source: Statistical Reporting Service, USDA State Data and OBERS series "C" projections

Table V-2. Present and projected land use, Northeast Gulf River Basins and State subareas, 1972, 1990, and 2020

Land Use[1]	Alabama Subarea			Florida Subarea			Northeast Gulf River Basins		
	1972	1990	2020	1972	1990	2020	1972	1990	2020
	--1000 Acres--								
Agricultural Land	6,818	6,772	6,652	11,848	11,658	11,270	18,666	18,430	17,922
Cropland	1,510	1,410	1,452	1,379	1,250	1,000	2,889	2,660	2,452
Pasture	674	827	868	627	762	1,048	1,301	1,589	1,916
Forest	4,484	4,415	4,232	9,613	9,466	9,072	14,097	13,881	13,304
Miscellaneous	150	120	100	229	180	150	379	300	250
Non-Agricultural	234	280	400	333	523	911	567	803	1,311
Total Land Area	7,052	7,052	7,052	12,181	12,181	12,181	19,233	19,233	19,233

1/ Based on OBERS Series "C" projections.

Table V-3. Agricultural production of major crops and pasture by subarea, 1972 and projected, 1990 and 2020

Item	Units	1972 Normal	Projected 1/ 1990	Projected 1/ 2020
		Thousand		
Florida Subarea				
Corn	bu.	16,291	20,211	16,570
Cotton	bales	13	7	4
Peanuts	cwt.	1,202	1,458	2,130
Soybeans	bu.	5,377	8,116	10,455
Wheat	bu.	820	1,456	1,992
Tobacco	cwt.	258	343	442
Vegetables	cwt.	1,822	2,410	3,383
Hay	tons	97	133	217
Improved Pasture	AUM's	2,590	4,568	7,042
Alabama Subarea				
Corn	bu.	9,501	4,743	1,698
Cotton	bales	35	15	23
Peanuts	cwt.	3,296	4,592	4,243
Soybeans	bu.	3,058	3,968	2,199
Wheat	bu.	721	917	1,588
Hay	tons	148	153	474
Improved Pasture	AUM's	1,017	2,576	8,456

1/ Based on series "C" OBERS projections

Table V-4. Agricultural land use without accelerated development, major crops and pasture, by subarea, 1972 and projected 1990 & 2020

Item	1972	Projected 1/ 1990	2020
	Thousand Acres		
Florida Subarea			
Corn	310	340	217
Cotton	11	4	2
Peanuts	51	40	31
Soybeans	241	163	180
Wheat	32	29	36
Tobacco	13	9	6
Vegetables	21	17	13
Hay	47	26	34
Major Crops	726	629	519
Improved Pasture	434	575	775
Alabama Subarea			
Corn	271	81	14
Cotton	37	13	12
Peanuts	193	181	140
Soybeans	146	128	60
Wheat	29	18	31
Hay	70	29	57
Major Crops	746	448	310
Improved Pasture	253	501	1015

1/ Based on series "C" OBERS Projections sacrificed and production of wood products would fall substantially below the OBERS projection. Wood product prices would increase with reduced supply and possibly become competitive enough to limit the woodland acreage shift to cropland and pasture.

Water - The water resources of the Basins are among the primary natural assets of the area and are expected to be increasingly valuable in the future as agricultural production expands. Salt water intrusion problems will become more serious along the coastal areas as more water is withdrawn for agriculture and other purposes. Ground water supplies will have to be supplemented or even eliminated from use in those areas where the water quality becomes unsuitable for irrigation or other uses. Ground water supplies in the northern part of the Alabama subarea are limited due to geologic conditions but should provide adequate water for most individual farm homes.

Surface water runoff is generally of good quality except during floods when there is considerable sediment in the water. This is especially true during the spring months when runoff occurs from large acreages of freshly plowed fields on soils with high erosion rates. Runoff averages about 15 to 20 inches per year for the entire Basins area, varying considerably from stream to stream (Fig. III-18) and from year to year. With proper planning for the future and the wise utilization of ground and surface water supplies, there should be sufficient water to meet the needs of agriculture through the projected time period of this study, even with expected increases in irrigation demands. This will require the construction of reservoirs to store water during times of excess rainfall for use during prolonged dry periods.

Flooding - Most of the flood plains in the Alabama subarea are well defined and are predominantly in natural stands of timber. Flood damages to these areas are slight due to the short period and infrequency of flooding.

Several field examination reports were prepared for small watersheds in Alabama during the inventory phase of the Northeast Gulf study. Based on land use data from these reports, about 10 percent of the watershed areas are in the flood plains, and about 10 percent of the flood plains are being used for crop production. A summary of floodprone data developed for the entire Alabama subarea reveals that only 1.3 percent of the floodprone area is in cropland, 3 percent is in pasture, and over 95 percent is in forestland (Table III-8). Damages to crops occur one to three times each year, but the short period of inundation and the small area involved result in relatively minor damages, even though the individual farmer who owns the land may have suffered considerable monetary loss and inconvenience. Improved pasture acreage in the flood plains is also minor, and in most cases the forage plants are able to withstand the short periods of flooding without appreciable damages.

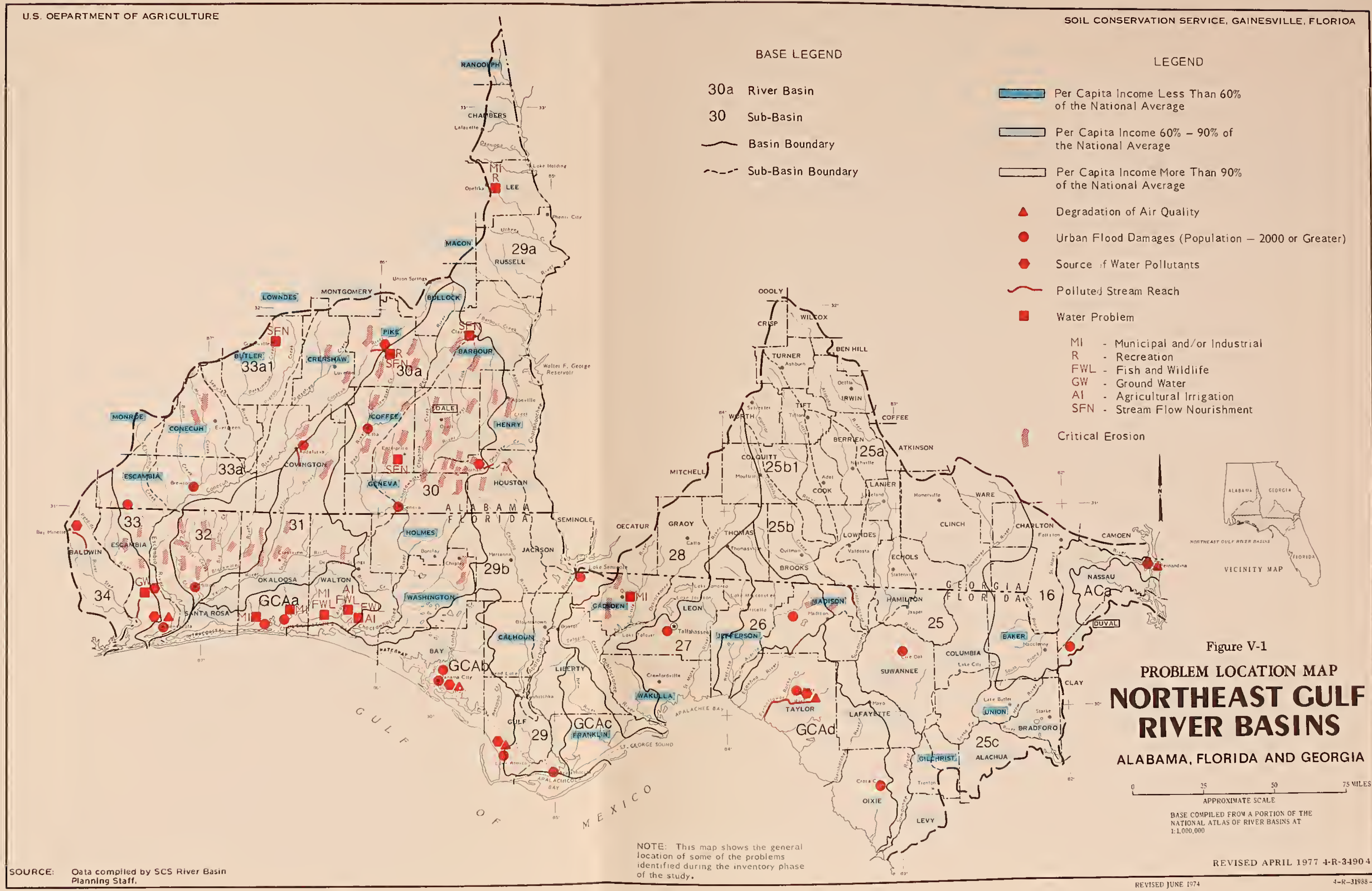
In the Florida subarea, land use in the flood plains is similar to Alabama in that the predominant use is for timber (Table III-7). As the streams approach the Gulf and Atlantic coasts, however, the flood plains become less well-defined and comprise a larger portion of the total watershed area. Use in the coastal areas is almost entirely for timber, except for urban and other non-agriculture uses.

Some of the flood plains were formerly used for crops and pasture but have reverted back to woods. This is due to increased flood hazards and to the fact that these areas are often narrow and difficult to farm with the larger machinery used today. Opportunities may exist, however, for use of these and other areas in the flood plain for food and fiber production if future conditions indicate the need and if flood protection can be provided. Some of the flood plain soils have the capability to produce high yields of crops and pasture.

The areas designated as floodprone include stream valleys and depression-like areas far removed from the streams. These low, depressed areas may be located within large fields of cultivated crops. During flood periods they overflow and cause damage to crops and pasture. These areas add to the cost of farming operations in that they interfere with cultural practices and are often left idle or in low value uses except in dry years. Some of the depressions may be in woods or provide wildlife habitat. With proper water management facilties they may become valuable for agricultural uses or for improved timber production or wildlife habitat. Many of the depressions have no outlets, and drainage would involve cutting through surrounding ridges which may result in the loss of productive land.

Erosion - Soil erosion is the most serious resource problem facing agriculture in much of the Alabama subarea and the portion of the Florida subarea just south of the Alabama line (Figures V-1 & V-2). The degree of erosion hazard varies from none or slight sheet erosion to serious gully erosion. In some areas the productive agricultural soils are bounded by highly erodable sands and loamy sands that occur on steep slopes. The better soils are intensively row cropped and therefore have high rates of runoff water. This concentrated water flowing over steep erodable soils causes gully erosion. The caving gullies move uphill cutting into valuable agricultural land. These large, caving gullies disrupt farming operations by cutting fields into smaller units that are difficult or impossible to farm with modern machinery. This makes it necessary to abandon these gullied areas or to put them to other less productive uses. In the Wiregrass Resource Conservation and Development District of Alabama, which is in the Basins, it is estimated that there are 2950 of these large gullies which affect or threaten one-half million acres of farmland and millions of dollars worth of improvements, such as roads, buildings, fences, and terraces.

Natural, or geologic erosion on undisturbed forest land is negligible. Erosion rates, however, on forest land disturbed by logging or reforestation activities are as high as 29 tons per acre per year. Spur roads used for logging are responsible for the high rate.



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
BASE LEGEND
30a River Basin
30 Sub-Basin
Basin Boundary
Sub-Basin Boundary
LEGEND
Per Capita Income Less Than 60% of the National Average
Per Capita Income 60% – 90% of the National Average
Per Capita Income More Than 90% of the National Average
Degradation of Air Quality
Urban Flood Damages (Population – 2000 or Greater)
Source of Water Pollutants
Polluted Stream Reach
Water Problem
MI - Municipal and/or Industrial
R - Recreation
FWL - Fish and Wildlife
GW - Ground Water
AI - Agricultural Irrigation
SFN - Stream Flow Nourishment
Critical Erosion
Figure V-1
PROBLEM LOCATION MAP
NORTHEAST GULF RIVER BASINS
ALABAMA, FLORIDA AND GEORGIA
0 25 50 75 MILES
APPROXIMATE SCALE
BASE COMPILED FROM A PORTION OF THE NATIONAL ATLAS OF RIVER BASINS AT 1:1,000,000
VICINITY MAP
ALABAMA
GEORGIA
FLORIDA
NOTE: This map shows the general location of some of the problems identified during the inventory phase of the study.
SOURCE: Data compiled by SCS River Basin Planning Staff.
REVISED APRIL 1977 4-R-34904
REVISED JUNE 1974
4-R-31988-A
GULF OF MEXICO
ALABAMA
FLORIDA
GEORGIA
RANDOLPH
CHAMBERS
LEE
MACON
RUSSELL
MONTGOMERY
LOWNDES
BULLOCK
BUTLER
CRENSHAW
PIKE
BARBOUR
MONROE
CONECUH
COFFEE
DALE
HENRY
ESCAMBIA
COVINGTON
GENEVA
HOUSTON
BALDWIN
SANTA ROSA
OKALOOSA
WALTON
HOLMES
WASHINGTON
JACKSON
CALHOUN
BAY
GULF
LIBERTY
FRANKLIN
GADSDEN
LEON
WAKULLA
JEFFERSON
MADISON
TAYLOR
LAFAYETTE
DIXIE
GILCHRIST
LEVY
ALACHUA
UNION
BRADFORD
BAKER
CLAY
DUVAL
NASSAU
COLUMBIA
SUWANNEE
HAMILTON
SEMINOLE
DECATUR
GRADY
THOMAS
BROOKS
LOWNDES
ECHOLS
CLINCH
WARE
CHARLTON
CAMDEN
MITCHELL
COLQUITT
COOK
LANIER
BERRIEN
ATKINSON
TIFT
TURNER
WORTH
IRWIN
COFFEE
BEN HILL
CRISP
WILCOX
DOOLY
29a
30a
33a1
33a
33
34
32
31
30
29b
29
GCAa
GCAb
GCAc
GCAd
28
27
26
25b
25b1
25a
25
25c
16
ACa

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA

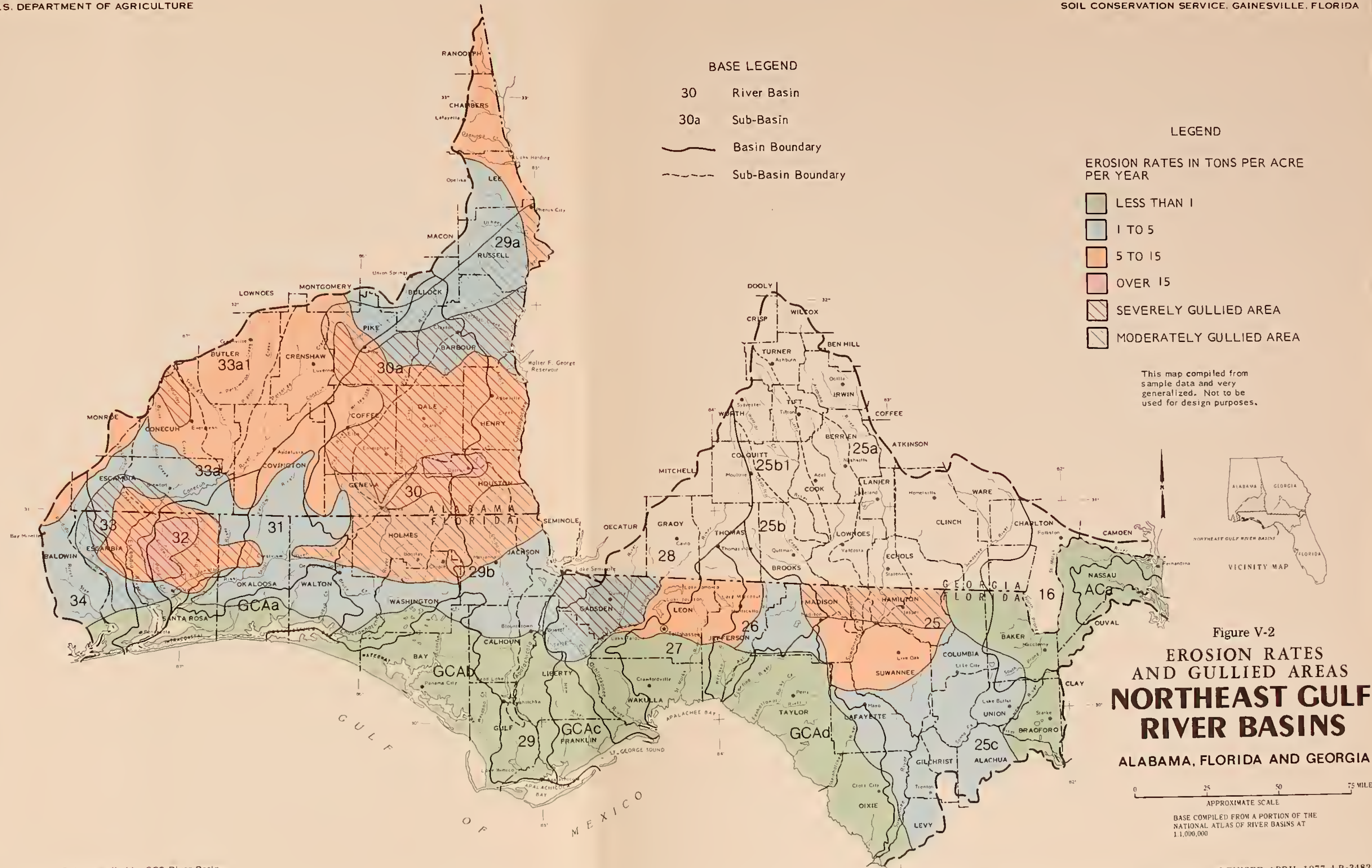


Figure V-2

EROSION RATES AND GULLIED AREAS

NORTHEAST GULF RIVER BASINS

ALABAMA, FLORIDA AND GEORGIA

0 25 50 75 MILES

APPROXIMATE SCALE

BASE COMPILED FROM A PORTION OF THE NATIONAL ATLAS OF RIVER BASINS AT 1:1,000,000

SOURCE: Data compiled by SCS River Basin Planning Staff.

REVISED APRIL 1977 4-R-34822

REVISED JUNE 1974 BASE 4-R-31988-A

USDA-SCS-FORT WORTH, TEXAS 1977

Much progress has been made over the years in installing land treatment measures to help minimize the rate of erosion from farmland. In recent years, however, the use of larger farm machinery has in some cases been detrimental to the erosion control program. Many of the terraces have been eliminated in order to obtain longer, more efficient rows. This practice has accelerated erosion rates on large areas of cropland in the Basins. In the Alabama subarea, about 40,000 acres of land classified as cropland have severe erosion hazards, over 730,000 acres are moderately erosive, and approximately 710,000 acres have slight or no erosion hazards. The Florida subarea has 20,000 acres of cropland in the severe hazard group, 295,000 acres on the moderate to severe group, and 1,064,000 with only slight or no erosion hazard. These erosion hazard classifications were based on characteristics of the principal soils in each soil association as delineated on the general soils map for the Basins.

Sheet erosion, while not as obvious nor as awesome as the erosion which creates large gullies is nevertheless a serious problem on upland farming areas. Spring floods are especially damaging in that they cause losses of fertilizer, seed, and insecticides as the soil moves in suspension across freshly prepared cropland. The added expense of reworking the land and replanting crops following these floods places a severe financial burden on the farmer. The loss of fine soil particles from the fields results in decreased crop yields over the years.

The current on-going soil conservation programs are not adequately solving the problem of critically eroding areas, due either to a lack of public funding, to financial inability of landowners, or to policy restrictions in evaluation procedures. Existing programs should be accelerated or new programs initiated that will contribute more effectively toward a reduction in erosion rates by stabilizing critical and gullied areas in the Basins.

Sedimentation - Large quantities of sediment are delivered to the streams in the Basins (Table V-5) with the exception of portions of the Suwannee and its tributaries (Figure V-3). Sediment adversely affects water quality.

Sedimentation is not extremely damaging to agriculture in the Basins because there is very little crop production in the flood plains where most of the sediment is deposited. Most of the flood plains are in natural hardwood forests. Current studies indicate there is very little damage to forest stands by sediment deposition.

Localized small areas within cultivated fields are sometimes severely damaged by deposits of soil that have washed from higher parts of the field. These deposits are usually the coarser particles; the finer particles are usually carried off the field. The deposited materials are very damaging to growing crops, but the longer term effects are usually alleviated through normal farming operations. Although sediment damages may be relatively small in specific locations, they become significant when considered collectively.

Table V-5. Sediment yield at mouths of selected rivers

Rivers	Annual Sediment Yield	Average Suspended Sediment Concentration
	(Tons)	(Parts Per Mil.)
Suwannee(25)	1,949,000	118
Alapaha(25a)	598,000	246
Withlacoochee(25b)	1,718,000	685
Santa Fe(25c)	43,000	17
Aucilla(26)	550,000	50
Chipola(29b)	564,000	192
Choctawhatchee(30)	2,900,000	510
Pea(30a)	998,000	410
Yellow(31)	876,000	350
Blackwater(32)	542,000	290
Escambia(33)	2,299,000	280
Conecuh(33a)	2,594,000	415
Sepulga(33al)	1,029,000	528
Perdido(34)	220,000	22

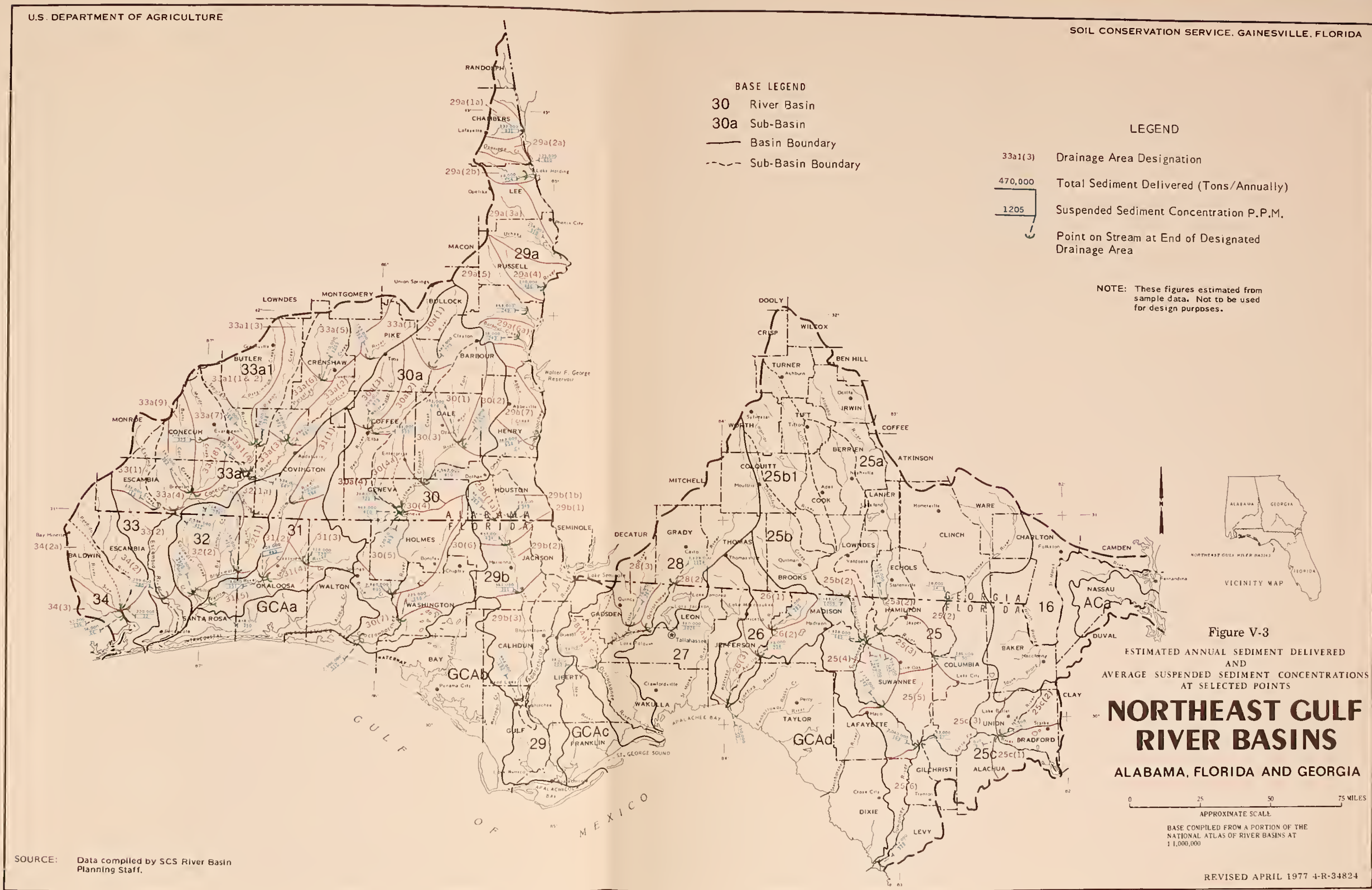


Figure V-3

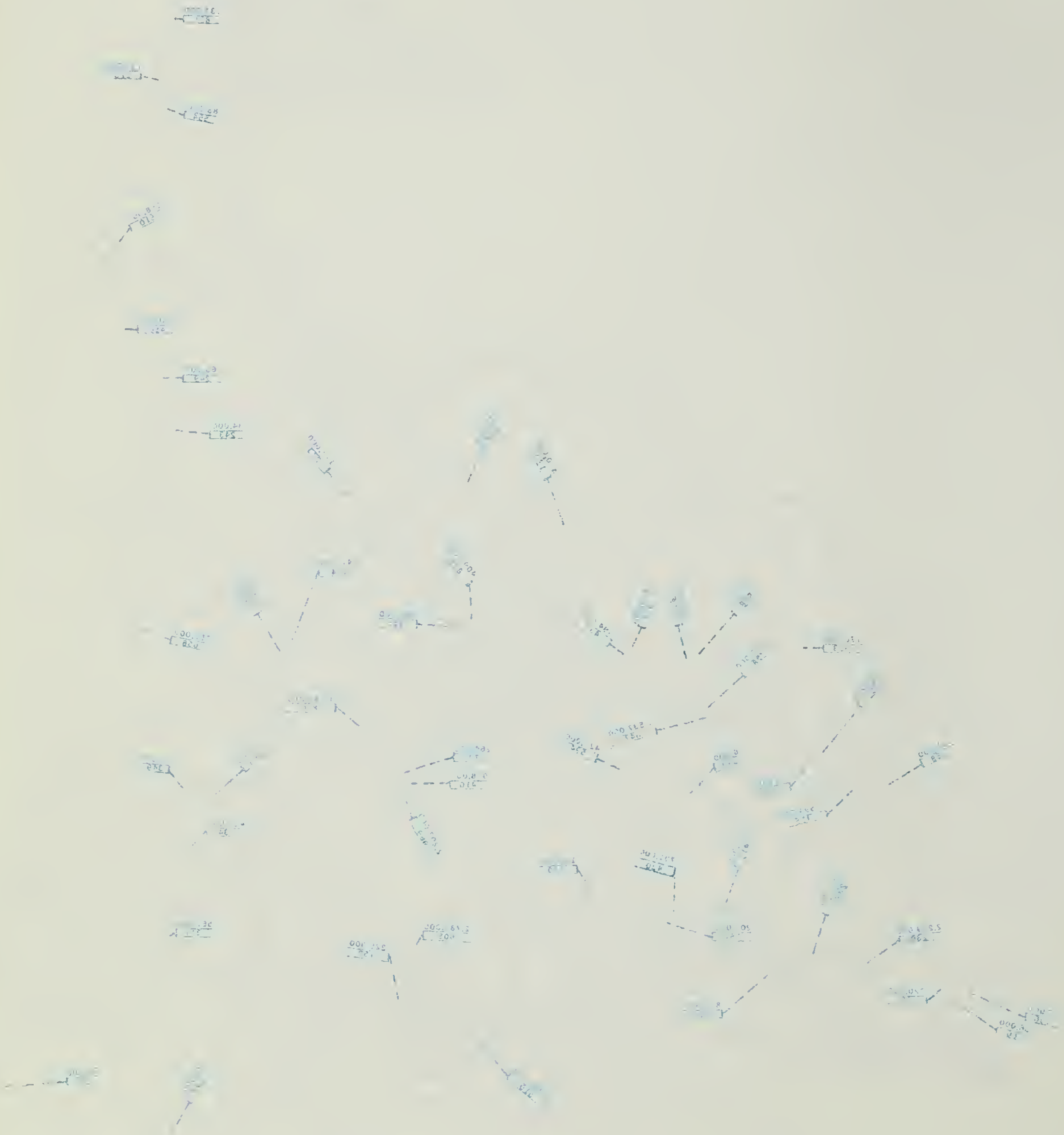
ESTIMATED ANNUAL SEDIMENT DELIVERED AND AVERAGE SUSPENDED SEDIMENT CONCENTRATIONS AT SELECTED POINTS

NORTHEAST GULF RIVER BASINS

ALABAMA, FLORIDA AND GEORGIA

USDA-SCS-FORT WORTH, TEXAS 1977

REVISED JUNE 1974 4-R-31988-A



Conservation treatment measures are necessary in the effort to reduce erosion and sedimentation in the Northeast Gulf Basins. According to the 1967 Conservation Needs Inventory, there are about 887,000 acres in the Alabama subarea of "Cropland in tillage rotation" requiring measures to treat or protect the soil. These measures range from using crop residues or cover crops on soils with minimum erosion hazards, to the use of permanent cover such as grass or trees on areas where erosion hazards are greater. In the Florida subarea, approximately 845,000 acres require similar measures (Table V-6).

Table V-6. Conservation treatment needs - cropland in tillage rotation (1967) - Alabama and Florida subareas1/

Treatment Need	Alabama	Florida	Total Basins
	1000 Acres		
Residue and Annual Cover	313	422	735
Sod in Rotation	234	68	302
Contouring	111	18	129
Strip Cropping, terracing, diversions	186	276	462
Permanent Cover	43	61	104
Total	887	845	1732

1/ Conservation Needs Inventory

Since 1967, considerable changes have taken place in cropping patterns. Cotton acreages have decreased greatly in some counties, but increases in soybean acreages have offset these losses so that total crop acreage and treatment needs have not changed greatly since the CNI data were developed. The use of larger farm machinery which is not compatible with some of the older contour and terrace systems has increased the need for more treatment measures in some counties of Alabama and Florida.

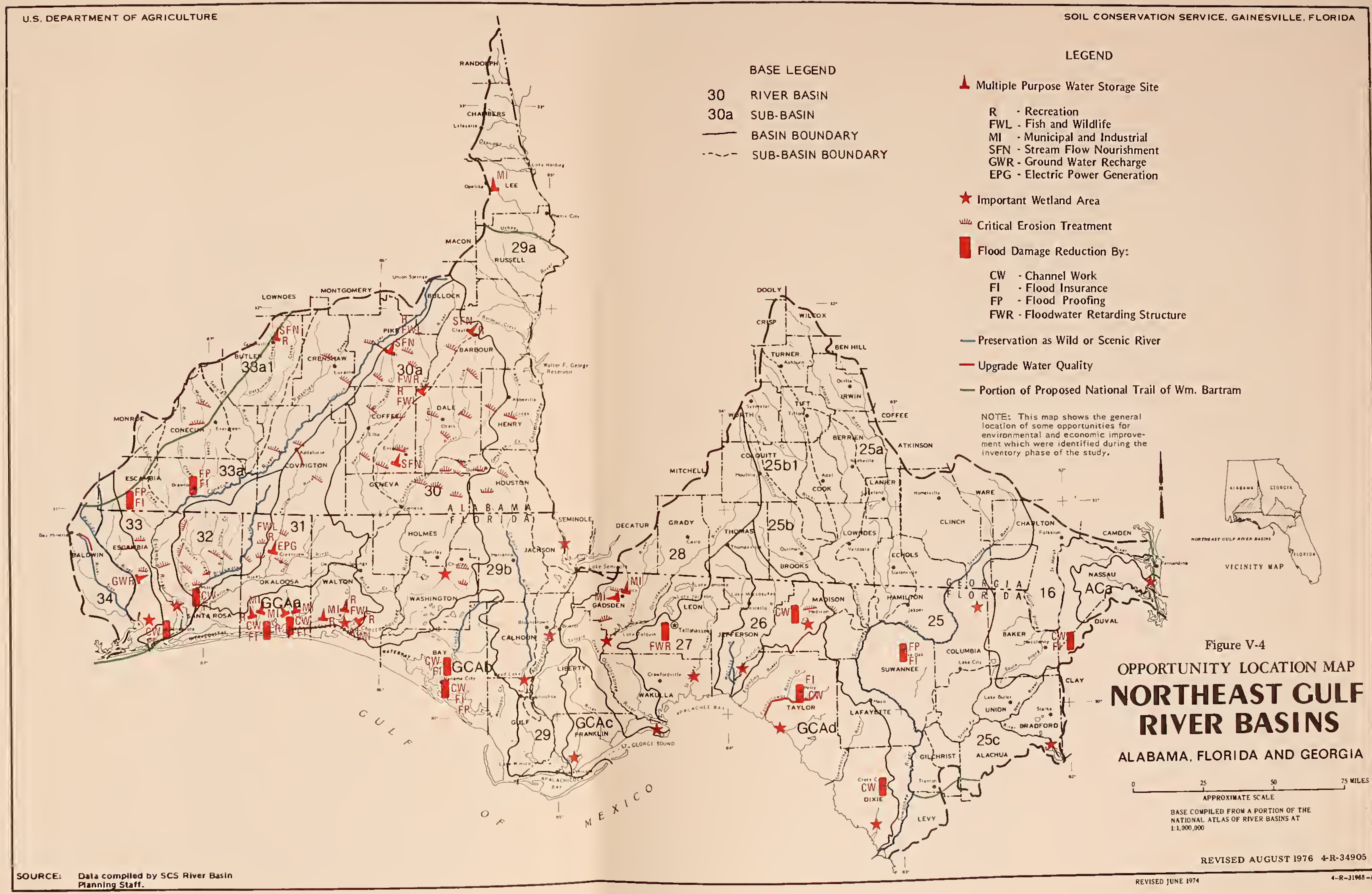
The 1975 spring and summer floods did much to emphasize the serious nature of the erosion problem on farmland. Many of the gullies in the Basins have progressed to the point where they are beyond the capabilities of individual farmers to correct using land treatment practices alone. Treatment of these larger gullied areas will require structural measures in combination with land treatment at the site as well as soil conservation management systems in the watershed above the critical area (Figure V-4). Often the measures used to treat these areas must be individualized to fit each problem area due to variations in length and steepness of slope, outlets, soil conditions, ground cover in the drainage area, and other factors. A considerable amount of knowledge has been gained by SCS conservationists, other professional agricultural workers, and farmers in the design of structural and land treatment methods for solving erosion problems in the Basins. This knowledge could be a valuable source of information to be used in a concerted effort to get needed treatment measures installed.

As national and world food requirements increase and the amount of available farmland decreases, more intensive use of marginal soils with increased erosion hazards will result. Serious consideration should be given to the acceleration of programs and practices to maintain productive capacity of farmland and to minimize the volume and effects of soil erosion. Rising costs of fuel, labor and other production items make it imperative that productivity of the soil resources be sustained through good conservation treatment to maintain adequate incomes in agriculture.

Drainage - Inadequate drainage of agricultural land is not a major problem under current land use patterns. Throughout the Basins, however, there are areas where inadequate drainage outlets result in lower yields or inefficient farm operations. In some cases, these areas are depression-like spots in larger fields or flood plains of streams. Most of the soils which have internal drainage problems are now being used for pasture, timber, or wildlife habitat. If future crop production requirements substantially exceed current projections, then some of these soils could be used to help fill this need. Drainage would be necessary for crop production on these areas. Data in the 1967 Conservation Needs Inventory indicate that 25,000 acres of cropland in tillage rotation in the Alabama subarea and 30,000 in the Florida subarea are in need of drainage. Some of these low-lying soils may be better suited for crop production than upland areas, provided excess water problems are resolved. Some of the bottom land areas nearer the Gulf Coast are large enough to be easily farmed with the large present-day equipment; these lands have little erosion hazard and may have less need for supplemental irrigation.

Water needs - Water requirements for irrigation, livestock, and rural domestic use are projected to increase in the future, but the need is not so great that any area will experience major difficulties in meeting these demands (Tables V-7 and V-8). Increased expenditures will be required for additional wells, dams, and other water control features.

Irrigation water requirements in the Alabama subarea are projected to increase from 2.6 million gallons per day (mgd) in 1970 to 5.9 mgd in 1990, and to 8.3 mgd by 2020. The 2020 projected irrigation water use in Alabama is less than one half of either the domestic water use or the livestock water use projected for 2020. Peanuts are expected to have the most potential for future increases in irrigation with corn and soybeans expected to have a slight increase.



USDA-SCS-FORT WORTH, TEXAS 1977

Table V-7. Projected rural water requirements by Alabama counties in the Northeast Gulf River Basins, by source, 1990 and 2020

County	1990							2020**				
	Domestic	Livestock		Irrigation		Catfish Farming		Domestic	Livestock		Irrigation	
	Ground[1/]	Ground	Surface	Ground	Surface	Ground	Surface	Ground[2/]	Ground	Surface	Ground	Surface
	Million gallons per day											
Baldwin*	1.9	0.1	0.3	0.6	0.6			3.2	0.2	0.5	0.9	0.9
Barbour	0.9	0.1	0.7		0.2	0.2	0.1	0.7	0.4	1.0		0.3
Bullock*	0.4	0.2	0.3		0.1	0.1	0.1	0.6	0.3	0.5		0.1
Butler*	0.9	0.2	0.3		0.1	0.1	0.1	0.9	0.3	0.6		0.1
Chambers*	0.7		0.3		0.1		0.1	0.4	0.1	0.4		0.1
Coffee	1.3	0.2	0.7		0.3	0.1	0.1	1.2	0.4	1.0		0.4
Conecuh	1.1	0.2	0.5		0.1	0.1		0.9	0.4	0.7		0.1
Covington	1.2	0.2	0.8		0.3	0.1		1.0	0.5	1.1		0.4
Crenshaw*	1.0	0.1	0.5		0.2	0.1	0.2	1.1	0.2	0.8		0.3
Dale	1.8	0.1	0.4		0.3	0.2		2.6	0.2	0.7		0.4
Escambia*	1.7	0.2	0.4	0.1	0.2	0.1	0.1	1.3	0.4	0.7	0.2	0.3
Geneva	1.0	0.3	0.7	0.1	0.3	0.1	0.1	0.7	0.5	1.2	0.2	0.4
Henry	0.8	0.2	0.4		0.8		0.1	0.9	0.3	0.7		1.1
Houston	1.4	0.4	0.8	0.5	0.8	0.1	0.1	1.0	0.6	1.5	0.7	1.1
Lee*	1.2	0.1	0.2				0.1	1.0	0.2	0.3		
Lowndes*			0.1						0.2	1.0		
Macon*	0.1							0.1		0.1		
Monroe*	0.2		0.1					0.2		0.1		
Montgomery*	0.5	0.1	0.3					0.6	0.2	0.5		
Pike	1.1	0.3	0.9		0.2			0.7	0.4	1.6		0.3
Randolph*	0.2		0.1					0.2		0.1		
Russell*	2.1	0.1	0.4			0.1		2.3	0.2	0.5		
Total	21.5	3.1	9.2	1.3	4.6	1.4	1.2	21.6	6.0	15.6	2.0	6.3

* Partial County
** Water requirements for catfish farming for 2020 were not estimated
1/ Estimated at 120 gpd per capita
2/ Estimated at 140 gpd per capita

Table V-8. Projected rural water requirements by Florida counties in the Northeast Gulf River Basins, by source, 1990 and 2020

County	1990					2020				
	Domestic	Livestock		Irrigation		Domestic	Livestock		Irrigation	
	Ground1/	Ground	Surface	Ground	Surface	Ground2/	Ground	Surface	Ground	Surface
	Million gallons per day									
Alachua*	1.7	0.3	0.2	4.9		2.2	0.4	0.3	5.7	
Baker	1.0	0.2	0.1	0.4	0.3	1.6	0.3	0.2	0.5	0.4
Bay	1.6	0.0		1.6		1.4			1.8	
Bradford	1.0	0.1	0.1	0.3	0.5	1.2	0.1	0.1	0.3	0.6
Calhoun	0.6	0.1	0.1	0.7	0.4	0.8	0.1	0.1	0.8	0.5
Columbia	1.3	0.3	0.2	4.5	2.0	0.7	0.4	0.3	5.2	2.5
Dixie	0.4			0.5		0.6	0.1		0.6	
Duval*	2.3	0.4	0.2			4.1	0.5	0.3		
Escambia	4.3	0.4	0.2	3.0	0.8	1.7	0.5	0.3	3.5	1.0
Franklin	0.3					0.2				
Gadsden	1.9	0.5	0.4	0.6	3.0	1.7	0.7	0.5	0.7	3.8
Gilchrist*	0.3	0.2	0.1	2.0	0.6	0.4	0.3	0.2	2.3	0.7
Gulf	0.5	0.6	0.3	0.6		0.5	0.1		0.7	
Hamilton	0.5	0.1	0.1	5.0		0.5	0.2	0.1	5.8	
Holmes	1.1	0.3	0.2	3.0	1.1	1.6	0.4	0.3	3.5	1.4
Jackson	2.2	0.8	0.4	9.5	2.6	1.9	1.0	0.6	11.0	3.2
Jefferson	0.8	0.4	0.2	3.5	1.5	1.1	0.6	0.3	4.0	1.9
Lafayette	0.3	0.5	0.2	3.8	0.3	0.4	0.6	0.3	4.4	0.4
Leon	3.9	0.2	0.1	2.5	0.2	3.6	0.2	0.2	2.9	0.2
Levy*	0.2	0.1	0.1	2.9	0.5	0.2	0.2	0.1	3.3	0.6
Liberty	0.4			0.5		0.7			0.6	
Madison	1.0	0.3	0.2	4.9	1.7	1.2	0.4	0.3	5.7	2.1
Nassau	1.2	0.7	0.4	0.1		0.7	1.0	0.5	0.1	
Okaloosa	2.4	0.1	0.1	1.8	1.2	0.7	0.1	0.1	2.1	1.5
Santa Rosa	2.8	0.1	0.1	4.2	1.0	2.5	0.2	0.1	4.8	1.2
Suwannee	1.0	0.4	0.3	8.0	1.3	1.2	0.5	0.4	9.1	1.6
Taylor	0.9			0.1		1.6	0.1	0.1	0.1	
Union	1.1	0.1	0.1	0.6	0.3	1.8	0.2	0.1	0.7	0.4
Wakulla	1.0			0.5	0.4	1.8			0.6	0.5
Walton	1.3	0.2	0.2	6.0		1.5	0.2	0.1	6.9	
Washington	1.1	0.2	0.2	2.0	0.4	1.6	0.4	0.2	2.3	0.5
Total	40.4	7.6	4.8	78.0	20.1	41.7	9.8	6.1	90.0	25.0

* Partial County 1/ Estimated at 120 gpd per capita 2/ Estimated at 140 gpd per capita

For the Florida subarea, the 1970 irrigation requirements of 35.9 mgd are expected to increase to 98.1 mgd by 1990 and to 115 mgd by 2020. The 2020 projection for irrigation is more than two and one-half times the 41.7 mgd projected requirement for domestic use and more than seven times the 15.9 mgd projected for livestock requirements. Where surface water is to be used for irrigation, storage during periods of excess will be necessary in order to have adequate supplies during the period of use. Projections of irrigation water demands were based on the anticipated acreage of crops irrigated and the water requirements for each crop. The crops generally irrigated are corn, peanuts, soybeans, vegetables, and tobacco - each of which has approximately the same supplemental water requirement of nine inches per growing season.

The water requirements for livestock were established at 15 gallons per day for beef cattle and 135 gallons per day for dairy cattle. The latter figure includes 20 gallons for drinking and the remainder for cleaning purposes. The rural domestic water requirement was estimated at 120 gallons per day per capita in 1990 and 140 gallons per day per capita in 2020. Most domestic water requirements are expected to be met by ground water sources.

It is not anticipated that there will be any severe water shortages in either the Florida or Alabama parts of the Basins through the year 2020 as far as rural water needs are concerned. Irrigation water requirements are difficult to project because of the many factors involved that could influence the number of irrigated acres. The present trend toward more irrigation is expected to continue through the year 2020, but even then it is anticipated that the majority of crops produced in the Basins will be without the benefit of irrigation.

Resource management - Proper resource management is essential to maintain a viable level of agriculture in the Basins. The problems of soil erosion, sediment, flooding, impaired drainage, improper land use, and other types of resource abuse cannot be solved in an area as large as the Northeast Gulf Basins without widespread knowledge and application of adequate resource management systems. Many farmers and forestland managers in the Basins are actively following the recommended management practices, but there remain a large number whose enterprises are only partially under good resource management or are without such management at all. Combinations of land treatment practices are required to develop adequate resource management plans. According to the 1967 Conservation Needs Inventory, many acres in the Basins are in need of various kinds and degrees of treatment, so the need for overall resource management is correspondingly great.

Much work needs to be done in applying the most suitable crops to a particular soil, and in applying management practices that will maintain production while preserving the soil resource. Land use changes could be a means of accomplishing better resource management. There are many areas being used for pasture or woods which have the capability for producing higher value crops with less soil erosion than some present cropland. Land ownership and economic considerations greatly influence land use in relation to the soil resources. As these influences change over time, it is anticipated that land use changes will reflect a more efficient pattern of resource utilization.

Water management is a vital part of the total resource management program. Water may be excess, either during heavy rainfall periods or in perennially wet areas, which may or may not be considered as a liability, depending on the desires of the landowner or farmer. Improved water disposal systems are needed in many areas of the Basins to receive the excess flow and direct it to points where it can be safely stored or spread to avoid additional erosion problems. The low, wet areas may need drainage systems if they are to be used for crop production, or they may be left in their natural state as habitat for wildlife or as catch basins for water diverted from upland areas.

An adequate resource management plan cannot be developed for one specific practice to the exclusion of all other alternatives. An inventory of all resources must be made along with the intended use of the resources. This could help serve as a basis for development of a management system that would put each resource - soil, vegetation, water - to its fullest, most efficient use. Many varied combinations of conservation practices must be utilized in developing each resource management plant. Each conservation plan must fit the unique combination of natural features in the area for which it is designed, whether it is for an individual farm or for a large watershed.

Forestry Projections

During the past fifty years land used for growing trees has undergone many changes: from timber to agricultural use and back to timber; from timber to permanent cropland; and from trees to urban and commercial development. Since World War II, however, reforestation efforts, encouraged by state and Federal programs, have been instrumental in restoring some of the lost acreage. Planting of idle, abandoned land and poorly-stocked timberlands accounts for this improvement in forest resource production.

Currently there are 14 million acres in forest cover; by 2020 this acreage will have dropped to less than 13.5 million acres (Table V-9).

Table V-9. Commercial forest land, Northeast Gulf River Basins

	1972	1990	2020
	-------- Thousand Acres	---------	
Alabama	4,483	4,415	4,232
Florida	9,613	9,446	9,072
Total	14,096	13,861	13,304

Production of wood fiber will be influenced by two factors: the amount of forested acreage and the employment of modern management techniques. Although forest acreage will decline gradually over the decades ahead, more intensive management by forest landowners and their adoption of improved technology in production and utilization will yield a gradual increase in timber volumes.

The supply of raw wood in the Basins is expected to meet demand for timber products well into the 1980's. Currently (1972) 590 million cubic feet of annual timber growth is well ahead of present demand of 305 million cubic feet. Under current levels of management the supply will fall short of meeting the 1990 demands by 12 percent; by 2020 the shortage will be 57 percent (Figure V-5).

The condition of timber stands in the Basins has been improving over the past decades, especially in stocking levels and volume growth. However, there is still room for improvement: 40 to 50 percent of the Basins' forested tracts are still understocked or non-stocked. The Alabama subarea has 1.7 million acres that need restocking; 3.6 million acres in the Florida subarea require the same treatment. Stands with adequate stocking can be improved through timber stand improvement (TSI). In the Florida subarea 3.6 million acres would benefit from TSI. The Alabama subarea has 1.7 million acres that can be improved through this treatment. Reforestation and timber stand improvement, if continued under present programs, could double the current growth rates of 33 cubic feet per acre per year in Florida; in the Alabama counties the average growth rate could be increased from 54 cubic feet to 65 cubic feet per acre per year.

Markets for primary forest products in Alabama and Florida are active in purchasing raw material made available by timber producers. Every county has at least one sawmill; there are 49 major sawmills and 2 pine veneer mills located along 16 counties in Alabama; in Florida 31 sawmills and 1 pine veneer mill are found among 30 counties. Three paper mills provide markets for pulpwood growers in Alabama; pulpwood growers in Florida have access to 7 paper mills in their state.

Timber growers have only to carry out sound management practices to produce standard grades of pulpwood, sawlogs, and veneer logs acceptable to the existing markets.

Current wood utilization practices produce much waste, particularly before logs reach the primary mills (sawmills, veneer plants). Based on estimates made by Knight and McClure[1/] annual logging residues and woods waste account for 71.2 million cubic feet that are not converted into products. At least 25 percent of this amount, 17.8 million cubic

1/ Authors of publication, Opportunities for Increasing Timber Supplies in the Southeast, USDA--Forest Service, April 1974, pages 8 and 9.

feet, should be recoverable through increased efficiency in harvesting. Other sources of recoverable wood fiber are rough and rotten trees left in timber stands after harvesting. Knight and McClure suggest that 50 percent of the volume in these trees could be utilized. This would yield an additional 450 million cubic feet of wood fiber within the Basins.

Current technology permits recovery of large amounts of wood fiber created as residue by forest products mills. Advent of the particle board and whole tree chipping have made it economical to utilize waste material. Also, the energy crisis has encouraged mills to utilize residues as fuel to operate machinery and other equipment. Further utilization of residues at forest products mills will depend entirely upon economic factors that encourage implementation of technological advances.

It is estimated that out of 38 million cubic feet of wood fiber residue, 85 percent, or 32 million cubic feet is currently recovered and made into forest products or used as fuel.

Mortality resulting from such factors as wildfires, insect and disease attacks, and climatic conditions account for a reduction of 10 percent in the gross volume produced in the Basins, representing a loss of 53.2 million cubic feet of wood annually. Improvement in current programs and new technology expected from current research should produce a reduction of at least 15 percent in mortality, principally through more effective wildfire control and insect and disease control.

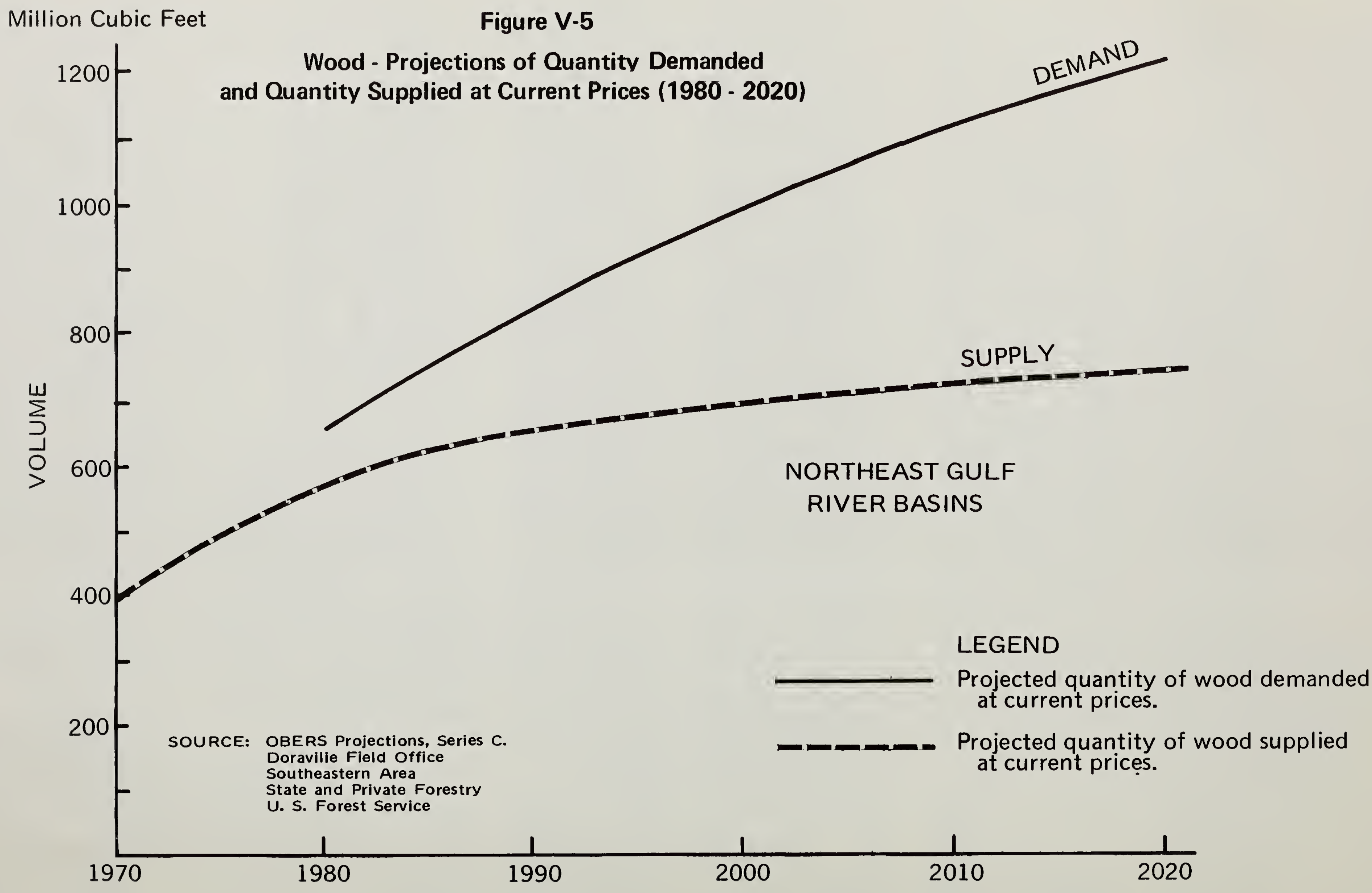
During the ten-year period (1963-1972) the average occurence of 2,896 fires in the Florida subarea burned an average of more than 34,000 acres of forest land. In the Alabama subarea, the average annual occurrence (1969-1973) of 2,196 fires damaged 33,678 acres of timber. The Florida Division of Forestry and the Alabama Forestry Commission maintain fire fighting forces capable of controlling wildfires. Both states as members of the Southeastern Forest Fire Compact Commission are prepared to assist each other when extreme weather conditions create unusually high fire danger. Currently the Alabama Forestry Commission has reduced its annual fire burn to 0.75 percent; Florida Division of Forestry maintains a fire burn of 0.35 percent.

Forest insects and diseases of significance in Basins are southern pine beetle, annous root rot, and fusiform rust. Together these destructive factors account for 9 percent of the total mortality.

During the past twenty years there has been a steady growth in the production of pulpwood in the Basins. Increases have varied from year to year in response to cyclic business conditions, but the average pulpwood production increase has been 5 percent. Currently 52 percent of the wood products demand is for pulpwood. This rate is expected to increase to 59 percent by the year 2020. In 1972, 153 million cubic feet of wood went into pulpwood; by 2020 the expected demand for pulpwood will reach 900 million cubic feet.

Figure V-5

Wood - Projections of Quantity Demanded and Quantity Supplied at Current Prices (1980 - 2020)



Current demands for oleoresin portend a strong future for the naval stores industry. Markets are accepting all gum delivered or offered for sale by gum producers. This industry is not highly mechanized and depends principally upon hand labor. Current production of 118,000 barrels is accomplished with a labor force of 1,500 workers. The potential annual productive capacity of pine stands is estimated at 2.5 million barrels; this would support a labor force of 25,470 workers.

Municipal and Industrial Projections

Projections of major economic indicators were developed from the state and regional OBERS projections (Table V-10). The projections reflect the Series C population estimates which assume a national growth rate of 1.3 percent per year. Expansion of urban and industrial needs for water and land resources are indicated, but no serious constraint to such growth is envisioned if resource use shifts are appropriately appraised and planned for.

Population - The Basins have historically been a rural area and have experienced limited growth. This rural influence is projected to gradually decline, but subarea population and employment are not projected to grow as fast as the respective states. The Gulf Coast area is one exception where intensified urban growth pressures are expected in the future.

The urban sector became dominant in the Florida subarea during the 60's, and the Alabama subarea is projected to have more urban than rural residents before 1990. Basin population is expected to almost double by 2020 increasing from 1,303,000 to approximately 2,295,000 (Figure V-6). The Alabama subarea has 35 percent of the population of the Basins, and this is expected to decline to 32 percent by 1990 and to 29 percent by 2020.

Employment - The percent of the population employed in the Basins has historically been below the national average. Some, but not all, of the deviation is expected to be eliminated with employment ratios of .37 and .39 projected for the Florida subarea and .35 and .38 projected for the Alabama subarea in 1990 and 2020. Total employment based upon these employment ratios is projected to increase from the 1970 level of 337,000 to 630,000 by 1990 and to 873,000 by 2020.

Agricultural employment is expected to continue to decline in the future but at a slower rate than in the past (Table V-11). All other employment categories are projected to increase in absolute numbers employed. The largest category, service employment, is expected to increase in proportion to total employment in the future.

Table V-10. Population, total employment and per capita income, United States, Alabama, Florida, Alabama subarea and Florida subarea, 1970 and projected 1990 and 2020

Area	Population			Employment			Per Capital Income 1/		
	1970	1990	2020	1970	1990	2020	1970	1990	2020
	Thousands								
United States	203,858	269,759	399,013	76,554	106,917	163,622	$3,476	$6,166	$14,260
Alabama	3,451	4,176	5,821	1,193	1,620	2,326	2,657	4,883	12,101
Florida	6,845	9,913	16,437	2,550	3,756	6,490	3,236	5,414	12,845
Alabama Subarea	460	522	680	157	189	259	2,368	4,492	11,496
Florida Subarea	843	1,097	1,615	280	441	614	2,712	4,710	11,560
Northeast Gulf River Basins	1,303	1,619	2,295	337	630	873	2,555	4,645	11,541

1/ 1967 Dollars

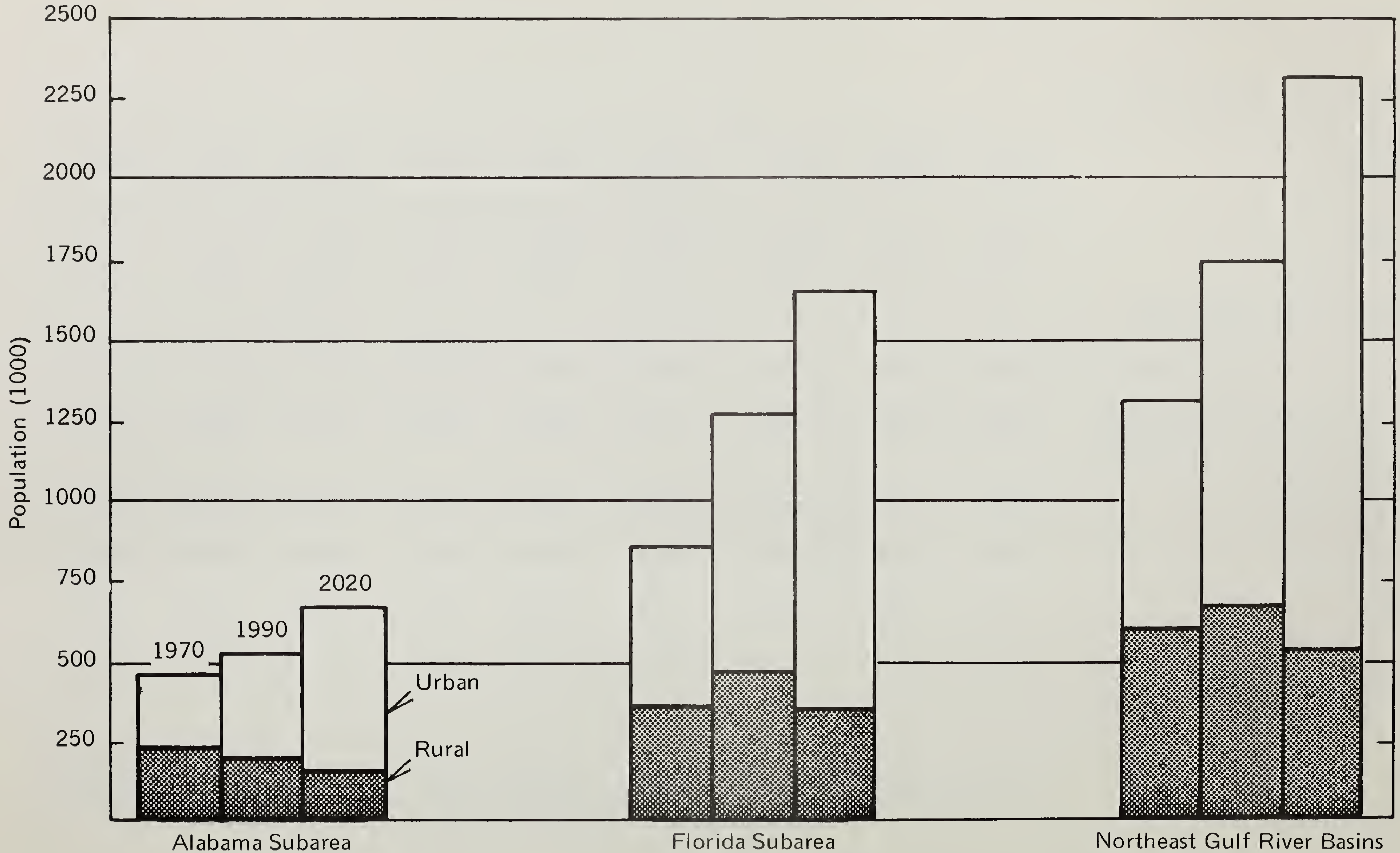


Figure V-6. Population Projections, Northeast Gulf River Basins and Subareas.

Table V-11. Projected employment by major industry, Northeast Gulf River Basins and subareas, 1970 and projected 1990 and 2020

	Alabama Subarea			Florida Subarea			Northeast Gulf RB		
	1970	1990	2020	1970	1990	2020	1970	1990	2020
	Thousands								
Agriculture, forestry and fisheries	11216	9450	10360	18150	18963	18420	29366	28413	28780
Mining	643	1134	2331	1185	2205	3070	1828	3339	5401
Construction	11231	13230	16835	22064	35280	46050	33295	48510	62885
Manufacturing	46862	56700	77700	40644	72324	110520	87506	129024	188220
Transportation, communications & public utilities	11039	13608	18648	17155	29988	42980	28194	43596	61628
Wholesale & retail trade	27951	34587	47138	55892	79380	110520	83843	113967	157658
Finance, insurance, and real estate	4296	5670	8288	10061	19845	30700	14357	25515	38988
Services	43330	54621	77700	114811	183015	251740	158141	237636	329440
Total	156568	189000	259000	279962	441000	614000	436530	630000	873000

Projections are ERS estimates

Income - Per capita income levels have historically been below state and national averages. The Basins are expected to more nearly reflect the states' per capita income levels in the future, but the gap is not expected to be closed entirely. Projections to 2020 indicate both subareas will be at least 5 percent below state levels, and each state is projected to be 10 percent or more below the national figure.

Substantial gains in per capita income, however, are projected for the Basins. A constant dollar increase from $2,555 in 1970 to over $11,000 per capita by 2020 is projected for the Basins (Table V-10).

Municipal and industrial water - The municipal water demand in 1990 will be almost double the amount used in 1970 and is projected to double again by 2020 (Tables V-12 & V-13). These municipal projections are based on projected future populations, along with a gradual increase in per capita consumption of approximately 1.25 percent per year. Although 2020 municipal demands are projected to be approximately 435 mgd for the Basins in comparison to the 1970 municipal demands of 125.9 mgd or almost four times as much, this is still less than ten percent of the 2020 total water needs of 5137 mgd.

The source of the municipal water supplies is expected to remain at about the same ratio of ground to surface water. An exception to this is in coastal areas where salt water intrusion will be an increasing problem as more ground water is used in the future. More study will be required to lcate additional reservoir sites that can be developed to store surface water for areas where the ground water supplies are limited.

Self-supplied industrial water for 1990 and 2020 is projected to increase gradually from the inventoried use in 1970. This does not reflect the total increase in industrial water use, but much of the new industry is expected to use city or county water supplies. It is anticipated that many counties will install county-wide water supply systems, and this water would be available for industry at rates competitive with self-supplied water. In Alabama, most of the larger water-using industrial plants are supplied from surface sources, and this is expected to remain true in the future even though ground water sources will supply a larger proportion than at present. In Florida, the self-supplied industrial water comes mainly from ground water sources with about one-fourth of the total demand being supplied by surface water sources.

Projections indicate that thermoelectric power plants will continue to require more water than all other users (Tables V-14 and V-15), as they do at the present time. In the future, however, an increasing number of plants are expected to use sea water for cooling. The thermoelectric generating plants will be located along the major streams or near the coasts because of the large quantities of water involved. Thermoelectric plants that use sea water for cooling will have an inexhaustible supply and are not included in these projections of water use.

Table V-12. Projected 1990 and 2020 municipal and industrial water use by Alabama counties in the Northeast Gulf River Basins

County	1990 Municipal Supply: Ground	1990 Municipal Supply: Surface	1990 Self-Supplied Industry: Ground	1990 Self-Supplied Industry: Surface	2020 Municipal Supply: Ground	2020 Municipal Supply: Surface	2020 Self-Supplied Industry: Ground	2020 Self-Supplied Industry: Surface
	Million Gallons per day							
Baldwin*	2.4		1.2		6.0		2.2	1.7
Barbour	2.3		0.1	1.5	4.2		0.2	
Bullock*	0.1				0.2			
Butler*	2.1		0.9	1.3	3.3		1.6	1.5
Chambers*		3.4		6.9		4.3		7.8
Coffee	5.6		0.2		12.9		0.4	
Conecuh	0.6				0.8			
Covington	2.9		0.2		4.4		0.4	
Crenshaw*	0.4		0.1	1.5	0.7		0.2	1.7
Dale	7.4				14.9			
Escambia*	4.0		0.9	50.4	9.0		1.6	57.4
Geneva	1.6		0.1		2.6		0.2	
Henry	0.9		0.1		1.7		0.2	
Houston	7.8		0.8		17.3		1.4	
Lee*			0.1				0.2	
Lowndes*	0.2				0.2			
Macon*								
Monroe*								
Montgomery*								
Pike	2.1		0.3	0.6	4.0		0.5	0.7
Randolph*								
Russell*	0.1	5.2	0.5	34.5	0.8	9.0	0.9	39.2
Total	40.5	8.6	5.5	96.7	83.0	13.3	10.0	110.0

*Partial County

Table V-13. Projected 1990 and 2020 municipal and industrial water use by Florida counties in the Northeast Gulf River Basins

County	1990				2020			
	Municipal Supply		Self-Supplied Industry		Municipal Supply		Self-Supplied Industry	
	Ground	Surface	Ground	Surface	Ground	Surface	Ground	Surface
	Million gallons per day							
Alachua*	2.4		0.6		4.6		0.6	
Baker	1.0				2.1			
Bay	2.0	58.2	2.3	0.1	4.0	74.3	2.4	0.3
Bradford	1.6		1.6		4.1		1.7	
Calhoun	0.5				1.5			
Columbia	3.4				9.4			
Dixie	0.8		1.0		1.9		1.0	
Duval*	0.5		3.5		0.9		3.6	
Escambia	32.3		55.0	49.3	64.5		57.1	52.2
Franklin	1.1				3.1			
Gadsden	1.7	3.0	0.1	2.4	4.0	9.5	0.1	2.5
Gilchrist*	0.3				0.8			
Gulf	0.3	0.8	21.9	41.4	1.1	2.0	22.7	43.9
Hamilton	0.8		21.2		2.2		22.0	
Holmes	0.6				2.0			
Jackson	3.5		1.4		11.0		1.5	
Jefferson	0.8		0.2		2.4		0.2	
Lafayette	0.2				0.5			
Leon	23.8		32.1		59.5		33.1	
Levy*	0.8				2.2			
Liberty	0.3		0.9	0.6	0.6		0.9	0.6
Madison	1.0				3.3			
Nassau	4.6		57.5		12.1		59.6	
Okaloosa	14.8		5.4		30.8		5.6	
Santa Rosa	4.6		11.8		11.2		12.2	
Suwannee	1.3		8.2		3.5		8.5	
Taylor	1.5		61.8		3.4		64.2	
Union	0.2		0.7		0.6		0.7	
Wakulla	0.2		0.8	0.5	0.5		0.8	0.5
Walton	0.9		1.4		2.1		1.5	
Washington	0.9				2.7			
Total	108.7	62.0	289.4	94.3	252.6	85.8	300.0	100.0

*Partial County

Nuclear powered generating plants require much more cooling water than do fossil fueled plants. Most generating plants installed after 2000 are expected to be nuclear; however, at the time of this report there is considerable controversy as to their safety, which has resulted in a marked slowdown in construction.

Since 1965 the demand for electric power in the United States has increased at an annual average compounded rate of approximately 8 percent.[1/] Demand in the Basins is expected to increase accordingly, and in West Florida the demand for electricity is projected to grow much faster because of the expected rapid rate of population increase.

The pulp and paper industry is the second largest industrial user of water in the State of Florida; Alabama's paper industry ranks third among industrial water users in that state. The seven papermills in the Florida subarea and 2 in the Alabama subarea use a total of 51 billion gallons of water annually in the production of pulp. By 2020, this consumption is expected to reach 191 billion gallons annually when production reaches 3.6 million tons of pulp. Currently, the nine papermills produce approximately 956 thousand tons of pulp annually.

Reservoirs - There are many potential reservoir sites where surface water runoff could be stored to meet water needs in the Basins. The Alabama subarea is especially endowed with good reservoir sites due to its topographic relief. Several potential reservoir sites have been identified (Figure V-4) and others will be considered in phase II of the Basins' study.

Adequate reservoir sites are available in most of the areas where shortages of municipal and industrial water are expected in the future. The Alabama Geological Survey under contract with the Alabama Development Office has identified 19 potential reservoir sites in the Alabama subarea that are capable of meeting a demand of at least 10 million gallons per day in 19 out of 20 years. These reservoir sites were located primarily for water supply, but many of them could be used for recreation, irrigation, fish and wildlife, and other uses where needed. All of these sites could function as flood control by sacrificing some degree of water supply capability. The Corps of Engineers have identified a potential reservoir site on the Choctawhatchee River in the Alabama subarea and another on the Yellow River in the Florida subarea. In phase I of the Northeast Gulf Study, four sites were identified and evaluated in the Alabama subarea. Their feasibility for meeting a predetermined low flow requirement has been determined by a water budget analysis. Ten reservoir sites in the Florida subarea were evaluated by water budget analysis to determine the maximum demand that these reservoirs could meet 100 percent of the time. Other reservoir sites will be evaluated for the final Northeast Gulf River Basins Report.

1/ Electrical World, 22nd Annual Electrical Industry Forecast, September 15, 1972.

Table V-14. Summary of rural, municipal and industrial water requirements by Alabama counties in the Northeast Gulf River Basins - 1990 and 2020

County	1990 Subtotal Ground	1990 Subtotal Surface	1990 Total	2020 Subtotal Ground	2020 Subtotal Surface	2020 Total
	----------------	Million gallons	per day	----------------		
Baldwin*	6.2	0.9	7.1	12.5	1.4	13.9
Barbour	3.6	2.5	6.1	5.5	3.0	8.5
Bullock*	0.8	0.5	1.3	1.1	0.6	1.7
Butler*	4.2	1.8	6.0	6.1	2.2	8.3
Chambers*	0.7	10.8	11.5	0.5	12.6	13.1
Coffee	7.4	1.1	8.5	14.9	1.4	16.3
Conecuh	2.0	0.6	2.6	2.1	0.8	2.9
Covington	4.6	1.1	5.7	6.3	1.5	7.8
Crenshaw*	1.7	2.4	4.1	2.2	2.8	5.0
Dale	9.5	0.7	10.2	17.7	1.1	18.8
Escambia	7.0	51.1	58.1	12.5	58.4	70.9
Geneva	3.2	1.1	4.3	4.2	1.6	5.8
Henry	2.0	1.3	3.3	3.1	1.8	4.9
Houston	11.0	1.7	12.7	21.0	2.6	23.6
Lee*	1.4	0.3	1.7	1.4	0.3	1.7
Lowndes*	0.2	0.1	0.3	0.4	1.0	1.4
Macon*	0.1		0.1	0.1	0.1	0.2
Monroe*	0.2	0.1	0.3	0.2	0.1	0.3
Montogmery*	0.6	0.3	0.9	0.8	0.5	1.3
Pike	3.8	1.7	5.5	5.6	2.6	8.2
Randolph*	0.2	0.1	0.3	0.2	0.1	0.3
Russell*	2.9	40.1	43.0	4.2	48.7	52.9
Subtotal	73.3	120.3	193.6	122.6	145.2	267.8
Thermoelectric Generating Plants	3.0	630.0	633.0	6.0	1100.0	1106.0
Total	76.3	750.3	826.6	128.6	1245.2	1373.8

*Partial County

Table V-15. Summary of rural, municipal and industrial water requirements by Florida counties in the Northeast Gulf River Basins - 1990 and 2020

County	1990 Subtotal Ground	1990 Subtotal Surface	1990 Total	2020 Subtotal Ground	2020 Subtotal Surface	2020 Total
	Million gallons per day					
Alachua*	9.9	0.2	10.1	13.5	0.3	13.8
Baker	2.6	0.4	3.0	4.5	0.6	5.1
Bay	7.5	58.3	65.8	9.6	74.6	84.2
Bradford	4.6	0.6	5.2	7.4	0.7	8.1
Calhoun	1.9	0.5	2.4	3.2	0.6	3.8
Columbia	9.5	2.2	11.7	15.7	2.8	18.5
Dixie	2.7		2.7	4.2		4.2
Duval*	6.7	0.2	6.9	9.1	0.3	9.4
Escambia	95.0	50.3	145.3	127.3	53.5	180.8
Franklin	1.4		1.4	3.3		3.3
Gadsden	4.8	8.8	13.6	7.2	16.3	23.5
Gilchrist*	2.8	0.7	3.5	3.8	0.9	4.7
Gulf	23.9	42.5	66.4	25.1	45.9	71.0
Hamilton	27.6	0.1	27.7	30.7	0.1	30.8
Holmes	5.0	1.3	6.3	7.5	1.7	9.2
Jackson	17.4	3.0	20.4	26.4	3.8	30.2
Jefferson	5.7	1.7	7.4	8.3	2.2	10.5
Lafayette	4.8	0.5	5.3	5.9	0.7	6.6
Leon	62.5	0.3	62.8	99.3	0.4	99.7
Levy*	4.0	0.6	4.6	5.9	0.7	6.6
Liberty	2.1	0.6	2.7	2.8	0.6	3.4
Madison	7.2	1.9	9.1	10.6	2.4	13.0
Nassau	64.1	0.4	64.5	73.5	0.5	74.0
Okaloosa	24.5	1.3	25.8	39.3	1.6	40.9
Santa Rosa	23.5	1.1	24.6	30.9	1.3	32.2
Suwannee	18.9	1.6	20.5	22.8	2.0	24.8
Taylor	64.3		64.3	69.4	0.1	69.5
Union	2.7	0.4	3.1	4.0	0.5	4.5
Wakulla	2.5	0.9	3.4	3.7	1.0	4.7
Walton	9.8	0.2	10.0	12.2	0.1	12.3
Washington	4.2	0.6	4.8	7.0	0.7	7.7
Subtotal	524.1	181.2	705.3	694.1	216.9	911.0
Thermoelectric Generating Plants	80.0	2000.0	2080.0	120.0	3000.0	3120.0
Total	604.1	2181.2	2785.3	814.1	3216.9	4031.0

*Partial County

Needed reservoir sites should be identified, and steps should be taken to preserve them for future water storage. If no action is taken in this regard, the water storage potential of many of the sites will be lost to other uses.

Streamflow - Streamflow for the Basins is usually of good quality but contains large amounts of sediment at the higher stages especially in the spring when many of the fields are freshly plowed. The total annual surface runoff is usually high and averages 15 to 20 inches for the entire Basins. The flow of some streams is not dependable enough for most purposes unless reservoirs are constructed to help regulate the low flow.

Only the larger streams have enough low flow to meet the needs for cooling water for a major nuclear generating plant. The two units proposed for the Farley nuclear generating plant require a minimum of 140 cfs flow for cooling purposes.

Figure III-6 shows the median seven day low flows for the Basins' streams. This information is most valuable for determining irrigation potential but can be useful in determining an area's potential for meeting municipal and industrial needs. Low flows are critical to both municipal and industrial developments since they require an assured supply of water 100 percent of the time. In areas that are questionable as to whether or not the stream can meet the low flow requirements, it is better to plan a reservoir on the stream and work a water budget analysis to be sure the needs can be met all the time. The water budget takes into account rainfall, runoff, storage, demand, evaporation, seepage, and minimum release rate to determine the maximum damand that can be met 100 percent of the time.

Ground water - The Northeast Gulf River Basins generally have large quantities of good quality ground water. Exceptions are the Piedmont section of the Alabama subarea and some areas along the coasts where excessive withdrawals have caused or are increasing the threat of salt water intrusion. In the Piedmont, clay and rock in the aquifer limit the amount of water than can be withdrawn; however, this area has many streams and potential reservoir sites that can be developed when the need arises. The coastal cities will have to develop their well fields inland or utilize surface water supplies.

Artificial recharge of the aquifers is not necessary where natural recharge equals or exceeds the withdrawals. This condition prevails over most of the area, the exceptions being the Pensacola-Cantonment area of Escambia County, Florida; the Ft. Walton Beach area; the Panama City area; and the Brunswick, Georgia, and Jacksonville, Florida, areas which extend into the St. Marys Basin on the Atlantic Coast.

Additional areas of excessive withdrawal will develop in the future unless the wells of large water users are dispersed properly. Regulation of water wells is in the public interest. Metropolitan areas should anticipate their future water needs and take the necessary actions to assure future supplies.

Erosion - Soil erosion in urban areas, though not so widespread as erosion in farming areas, is of major concern in the Northeast Gulf Basins. Rapidly expanding population centers such as Dothan, Panama City, Pensacola, and Tallahassee are experiencing increasing problems related to building construction, expansion of utilities, and street and highway construction.

Construction of shopping centers, parking lots, residential subdivisions, and industrial complexes exposes large areas of soil at one time and creates serious problems when located on erodable soils. Urban construction is often near natural streams or storm sewers, and the large volume of sediment from the construction site clogs these outlets, creating flood hazards and adding to maintenance costs of property owners or public street and utility departments. There is a definite need for improved land treatment procedures during and after construction of all types of improvements in order to hold the soil in place. Replacement of native vegetation with asphalt parking lots and buildings accelerates runoff and creates a continuing erosion problem. This problem will increase as urban areas grow.

Flooding - The size of the study area along with the complexity of its shape and uneven rainfall distribution all tend to keep widespread flooding throughout the study area to a minimum. The storm of March 1929 was the largest storm of record to hit the Alabama part of the Basins and covered most of southern Alabama with record rainfall. Another record breaking flood occurred in April 1975 and, although not as widespread as the 1929 flood, covered much of the same area in southern Alabama. Rainfall records must be compiled for much longer periods before a determination can be made as to whether this area in southern Alabama is so located that it can expect these very large storms on a relatively frequent basis. It appears that climatic conditions for record-breaking storms are most favorable during the spring as this is when most of the large storms occur. The storm of March 1929 produced a peak of 206,000 cubic feet per second (cfs) on the Choctawhatchee River at Caryville, Florida or almost 60 cfs per square mile from a drainage area of 3499 square miles.

The largest storm of record for the Suwannee River Basin occurred in March and April 1948 which was a period of above average rainfall followed by a 3-day period of intense rainfall. During peak stages, the Suwannee River was out of its banks from the Gulf to an area north of the Georgia-Florida state line, and its width varied from about 0.5 to 6 miles. The flooded area comprised almost 500 square miles along the river and its tributaries. Floodwaters remained for about 30 days, and many homes and commercial establishments in small towns that border the river were flooded. Another large storm occurred in March 1959 when over 350 square miles along the Suwannee and its tributaries were flooded. Still another flood occurred in April 1973 which produced flood stages as high or higher than the 1948 flood in the upper reaches of the Suwannee. Stages on the lower reaches were about three feet lower than in 1948. There was an estimated $8 million damages to homes, businesses, and roads from this storm. Zoning of floodprone land to prevent further development appears to be a feasible alternative to limiting future flood damages along the main stem of the Suwannee.

Tidal flooding has a potential of doing extensive damage along the coast in a short time. Most of this type of flooding is the result of hurricanes near the coast in such a direction as to cause on-shore winds for several hours. The Corps of Engineers has projected tides as high as 10 to 12 feet above mean sea level for a 100-year frequency storm for many coastal areas of the Basins. Storm surge is the most deadly feature of a hurricane, and is influenced by a combination of factors such as wind, lower barometric pressure, off-shore depths, astronomical tide, and fetch. The only means of protection against the high water caused by storm surge is massive dikes or zoning. There are many drawbacks to dikes such as costs, loss of ocean view, and difficulty of providing openings for normal streamflow and runoff.

Many of the towns and cities in the Basins were built on ridges along the old military or Indian trails, but many others sprung up near the banks of streams to take advantage of water transportation. Some of the cities in the flood plains have dikes which provide a degree of protection from stream overflow when flood gates and other appurtenances are in proper working order; however, damages during severe floods are widespread. In 1975, three separate heavy concentrations of rainfall covered large portions of the Alabama and Florida subareas over the periods of February 16-19, April 10-11, and the last week in July. Damages were incurred on residential, commercial, and public property, and on roads, bridges, and utilities.

The U. S. Army Corps of Engineers documented damages from the February and April 1975 floods in a report entitled "Post Disaster Report on Spring Floods of 1975 in the Mobile District". Seven counties in Alabama and five in Florida were affected by the April storm which covered more of the Northeast Gulf Basins than did the February storm (Table V-16). The February flood caused damages along the Pea River and Whitewater Creek near Elba, Alabama. The remainder of the damages from this flood was mostly outside the Basins. The most severe urban damages resulting from the April flood occurred in Brewton, East Brewton, and Geneva, Alabama. Several other towns and communities received lesser damages. Florida towns that suffered major floodwater damages are Caryville, Marianna, Blountstown, Ft. Walton, Bonifay, and Milligan. The levee around Geneva, Alabama, is credited by the Corps of Engineers with preventing additional damages of $200,000. Total urban damages as compiled in the Corps' report amount to $4.7 million in Alabama and $3.2 million in Florida.

Table V-16. Summary of Damages Caused by the April 1975 Flood in Alabama and Florida1/

County	Damages (Dollars)2/
Alabama	
Coffee	$ 813,000
Conecuh	1,021,000
Covington	2,800,000
Dale	1,302,000
Escambia	4,900,000
Geneva	2,553,000
Houston	2,550,000
Alabama Total	$15,939,000
Florida	
Washington	$ 590,000
Holmes	3,958,000
Okaloosa	344,000
Jackson	1,830,000
Calhoun	1,205,000
Florida Total	$ 7,927,000

1/ Source: "Post Disaster Report on Spring Floods of 1975 in the Mobile District", U. S. Army, Corps of Engineers.

2/ Includes agricultural and non-agricultural damages. Also includes erosion damages.

Flood cost reduction - Flooding of municipal and industrial areas can be prevented by either structural or non-structural measures. One of the non-structural measures is flood plain regulation which prohibits or limits development in the flood plain to low-value developments. Another is flood insurance which is available to many communities that agree to practice flood plain regulation. This program is being administered by the Federal Insurance Administration (FIA) of the Department of Housing and Urban Development (HUD) and is an incentive for communities to initiate flood plain management. This program is expected to expand to most areas that have urban flood problems. Under this program, all floodprone communities become eligible for the Federal program, and flood insurance is made a prerequisite for obtaining mortgages on property in the delineated flood plains. It is not known at present how many communities in the Basin will eventually be eligible for this flood insurance, but there are over 15,000 nationwide that meet the requirements of the National Flood Insurance Act. Several years will be required to accurately map the eligible communities and delineate the flood plains.

Another non-structural method of reducing flood damages is flood forecasting. This involves predicting flood stages at some point on a stream based on rainfall measured, or on flood stages at some upstream point. The time, duration, and peak stage expected at any particular point on a stream can all be included in a flood forecast. Flood forecasting can be effective in flood damage reduction by giving advance warning so that buildings can be protected, levees made higher, cattle moved to higher ground, and homes evacuated. Sometimes only a few hours' notice can be given for some streams whereas for others such as the Suwannee River, many days and sometimes weeks of advance notice can be given. The National Oceanic and Atmospheric Administration has primary responsibility for making flood forecasts, but other agencies such as the Corps of Engineers, U. S. Geological Survey, and state and local civil defense units are all involved in flood forecasting.

Flood hazard analysis is used to determine the frequency and depth of flooding at certain locations. This procedure may be useful in evaluting the alternatives of risking the chance of flooding or building on higher elevations. Personal preference may cause homeowners to be willing to risk flooding at certain intervals of time in order to enjoy a better view, or to have waterfront access. The frequency of occurrence largely determines the degree of risk involved.

Often the problem is that people do not know that they are building in an area that is subject to such frequent flooding. A flood hazard analysis is an excellent method for making the prospective buyer aware of which areas have been designated as floodprone. This gives him a better basis for making his own decision as to the risk involved.

Flood-proofing is a method of preventing or reducing floodwater damage by waterproofing buildings so that they will not be extensively damaged during floods even though floodwaters may surround them. This practice is difficult to justify except where there are high value buildings in the flood plain. Flood-proofing requires that all windows, doors, and other openings be made water-tight in a rapid manner in advance of flood peaks. Sump pumps must be provided to remove any seepage that may get into the building. An emergency power supply needs to be provided to operate the sump pumps, lights, or other electric appliances that may be needed during the passage of a flood. Most homes are not designed for flood-proofing, and in most instances moving the house to higher ground is more economical than flood-proofing.

There are several structural measures that can be used to prevent flooding of municipal and industrial areas. Reservoir storage can be very useful for flood prevention if suitable sites are available and are properly located in relation to areas needing protection. A high percentage of the drainage area must be upstream from the structure in order to be most effective in reducing peak flows. There are many potential reservoir sites in the Basins that could be effective in reducing flooding. Single purpose flood prevention reservoirs have wide ranges of fluctuation due to the storage allowances needed to retard the runoff from storm events. Reservoirs act as sediment traps and may prevent most of the sediment from moving downstream.

Channel modification is useful in reducing floodwater damages in areas where the topography is relatively level. Where flood peaks are high, very large channels are required in order to carry peak flows within banks. Channels constructed through erosive soils must be designed for non-erosive velocities which may necessitate grade stabilization structures. Increased peaks and higher velocities downstream must be considered in properly designed channels.

Levees can be used to prevent flood waters from damaging towns, industrial areas, or other areas of high value. In order to function properly during a flood, a constant maintenance program is required to see that flood gates, pumps and other facilities are operable and ready for use.

Recreation

Recent energy shortages and recessionary pressures make projections of recreation demand very speculative. This is especially true of the non-resident component. Upward shifts in demand associated with changed life styles, higher family incomes, and more leisure time have always been expected. The uncertainty about future economic growth and even discussion of no-growth policies may bring about a revision of the assumptions used in the past.

The impact of recent increases in transportation costs are unknown, but historical trends of non-resident demand may no longer be a reasonable basis for making projections. Even if past trends continue, shifts to other modes of transportation may dictate substantial changes in the logistics of public outdoor recreation facilities. A shift towards group transportation facilities by tourists would suggest a need for more group facilities, availability of more equipment and accessories and provision of some types of transportation systems within large outdoor recreation complexes.

The economic effects of outdoor recreation were discussed in Chapter IV. The uncertainty concerning future demand plus the need to consider the economic effects of meeting non-resident recreation demands, indicate the need for a dominant local role in planning outdoor recreation facilities.

Projections of demand for outdoor recreational activities were projected by subarea based upon per capita participation rates reflected in state recreation reports and OBERS Series "C" population projections (Tables V-17 and V-18). In the Florida subarea, resident and tourist demands were computed separately. Tourist demand ranged from 2 to 19 percent of the total being over fifteen percent for only two activities. Participation rates have been held constant although more leisure time, greater mobility, and higher incomes are expected to alter the recreation patterns. All of the increase is related to expected growth in resident population and number of tourists.

In the Alabama subarea, net demands were developed which have been adjusted for resident participation outside the area and included out-of-state participation within the area. Projections in this subarea reflect anticipated increases in per capita participation in addition to population growth. Population is projected to increase 48 percent by 2020 compared to a 114 percent increase in recreational activity occasions. The two state subarea projections are not comparable but do reflect the procedures used by the respective states.

Table V-17. Annual demand for selected recreational activities Florida subarea, Northeast Gulf River Basins, 1975 and projected 1990 and 2020

Activity	Activity Occasions[1/]		
	1975	1990	2020
	(1 0 0 0)		
Fishing, freshwater	17,925	21,746	35,237
Swimming, freshwater	13,028	15,648	25,331
Picnicking	10,503	12,629	20,593
Camping	7,538	9,423	14,835
Boating, freshwater	7,192	9,030	14,656
Hunting	6,954	8,292	13,293
Horseback riding	5,879	7,030	11,543
Skiing, freshwater	5,325	6,675	10,643
Hiking	5,143	6,470	10,212

1/ Based upon OBERS Series "C" population projections and use rates developed from Outdoor Recreation in Florida, Florida Department of Natural Resources, 1976.

Table V-18. Annual recreation demand, Alabama subarea, Northeast Gulf River Basins, 1973-74 and projected 1990 and 2020

Activity	Activity Occasions 1/		
	1973-74	1990	2020
	(1 0 0 0)		
Fishing, freshwater	3494	5230	8391
Picnicking	2551	2829	3903
Hunting	1695	2547	3305
Swimming, freshwater	1388	1978	3012
Boating, freshwater	956	1503	2516
Camping	657	919	1482
Skiing, freshwater	243	418	721
Horseback riding	55	104	204
Hiking	45	104	190

1/ Based upon OBERS "C" population projections and use rates developed from Statewide Comprehensive Outdoor Recreation Plan, Alabama Agricultural Experiment Station, Auburn University, 1975.

The total facilities needed for 1990 and 2020 (Table V-19) were obtained from projected activity occasions (Tables V-17, 18) and user rates as determined by the state planning agencies. The projected deficit of selected recreational facilities (Table V-20) is the difference of what was present at the time of the inventory and what will be needed in the future. This does not take into accout facilities which will be removed because of obsolescence or disuse nor those which will be added to the recreational system. The deficit table can be used for determining construction or purchase of facilities in an orderly fashion so as to provide adequate opportunities for the expanding recreational public.

Water based recreational facilities were inventoried differently in each state. Criteria used by Alabama was the number of water acres for each activity. In Florida, the number of boat ramps was the standard and surface water area was not considered to be a limiting factor through the time period of this study. Local shortages of boat ramps may develop but overall there are enough to satisfy the increasing demand. Overcrowding can be alleviated by a shift to the abundant salt water resources.

Corps of engineers and power company projects along the Chattahoochee River have created about 80 thousand acres of impounded waters. Of this total only 30 thousand acres are in Alabama; however, all of the impoundments are available to Alabama residents for water recreation.

Because those responsible for the inventories in each state were unable to locate all the hunting areas, particularly those leased by hunting clubs and individuals, the actual land available for hunting is probably much more than shown; therefore, the deficit may not be as severe as indicated herein.

Table V-19. Selected recreational facilities needed based on projected design demand, by state subarea and total basins - 1990 and 2020

Facilities	Alabama Subarea		Florida Subarea		River Basins Total	
	1990	2020	1990	2020	1990	2020
Picnic Tables (numbers)	2619	3614	7000	11445	9619	15059
Horseback Riding Trails (miles)	7	8	340	560	347	568
Campsites (numbers)	2042	3293	9400	14800	11442	18093
Hiking Trails (miles)	28	50	160	255	188	305
Hunting Habitat (acres)	2144000	2782000	4180000	6710000	6324000	9492000

Table V-20. Projected deficit recreational facilities by state subarea and total basins - 1990 and 2020

Facility	Alabama Subarea		Florida Subarea		Basins Total Deficit	
	1990	2020	1990	2020	1990	2020
Picnic Tables (numbers)	699	1694	3990	8435	4705	9940
Horseback Riding Trails (miles)	+21	+20	180	400	159	381
Campsites (numbers)	332	1583	+165	5235	+250	5640
Hiking Trails (miles)	+127	+105	+10	85	+150	+50
Hunting Habitat (acres)	1164000	1802000	1254000	3784000	1429000	4309000

+ Denotes surplus facilities

Some of the deficit recreational facilities could be provided by development of private facilities. From a physical standpoint natural resources are available to private entrepreneurs for development. Some private developments have evolved based upon development of a differentiated product (unique characteristics compared to public facilities) but expansion by this means is limited. Economic incentives do not exist for the bulk of these facilities because public facilities are provided at below true cost. Private facilities charging cost plus normal return generally capture the overflow from public facilities during peak periods. Expansion of private facilities cannot be expected to make up much of the deficit unless substantial changes are made in the rate structure for public facilities. This is not expected and minimal expansion of private facilities is anticipated except in the area of camping.

During preliminary investigations to locate reservoir sites to supply additional water for streams during periods of low flow, many potential sites near urban areas were found. These reservoirs, if constructed, could also provide water for other purposes such as water supplies and recreational areas. Four sites in Alabama which were determined to be satisfactory for supplementing stream flow would have approximately 2000 acres of surface water. Other sites were examined which were inadequate for stream flow augmentation but could provide water for other uses.

Ten sites in Florida, in areas where water shortages are expected to occur, were investigated for potential reservoirs (Figure V-4). The total surface area of the proposed reservoirs is approximately 32,000 acres with 250,000 acre-feet of water. This amount of surface water could accommodate 1600 fishing boats at any one time or 3.5 million fishermen per year. Other water activities such as skiing and swimming could also be accommodated. Picnicking and camping are often enjoyed adjacent to water areas and are fully compatible with other reservoir uses.

Environmental Quality

Areas of Natural Beauty

A great awareness of the importance of nature's handiwork has arisen in the past decade. In this short time, "ecology" and "environment" have become household words. Concern for our surroundings is evident from the proliferation of various groups opposing destruction or change of natural features. With this new awareness has come the realization that man needs a haven from the congestion of the city. Residents in the Northeast Gulf River Basins are fortunate in that they do not have far to travel, even from the largest cities, to reach the farms, forests, beaches, rivers, and lakes. With the expansion of the cities and the growth of population, it is uncertain how long this accessibility will last. Several cities in the nation have obtained land at the perimeter of their limits where no development is permitted. These places stop the urban sprawl and provide green open space for the city dweller. Where there is demand for housing development, the new concept is to fit the development into the natural surroundings rather than alter the land to suit the development. Bulldozing the land and destroying the vegetation and the natural features of hills and creeks is no longer acceptable. The land use determined by the environment takes into account natural drainage patterns, topography, vegetation, and other aspects for the well-being of the residents by preserving the natural areas with their plant and animal life. Reduction of noise levels is an added benefit.

The streams, lakes, and ponds of the study area are among the most scenic in the South and presently are relatively pristine. Several of the Florida streams may soon be included as part of the state's wild and scenic river system. The most scenic portions of some of the same rivers have been added to the Florida canoe trail system. Alabama has not yet designated any rivers as canoe trails although many have scenic attractions similar to those in Florida and are used by numerous canoeists. The large lakes and reservoirs usually have picnic areas located at scenic overlooks. The Chattahoochee-Apalachicola River systems are used by pleasure boaters who embark in Alabama and Georgia for a scenic ride to Apalachicola on the Gulf of Mexico. Fishing is excellent and is the most popular recreational activity on the inland waters.

The estuaries have many attractions for the naturalist because these most productive of all natural areas abound in fish and wildlife. Shorebirds, waders, and waterfowl are conspicuous, but hundreds of other birds make their homes in the estuarine areas. Millions of acres of coastal marshes and shores throughout the county have been lost to industrial, municipal, and agricultural development. Little regard was given to the eventual public cost for the loss of prime fish and wildlife habitat or storm protection provided by marshes. The conflicting demands on this resource are being resolved as local, state, and federal agencies have been delegated to preserve such critical areas.

The beaches are a big attraction to residents and visitors alike. They have been subject to exploitation for many years, particularly those stretches near Pensacola, Panama City, and Fernandina. Construction below the high water line and on the primary dunes have caused erosion while preventing replenishment. Buildings on the dunes have been destroyed during storms of moderate intensity. In spite of development, the saltwater beaches are still among the most scenic in Florida and draw millions of tourists and residents to the Gulf and Atlantic shores.

Bradwell Bay, covering 22,000 acres in the Apalachicola National Forest, has recently been declared a National Wilderness Area. The topography is flat with no well-defined drainage patterns; therefore, water is at or above ground level most of the year. The bay is an almost impenetrable titi (Cyrilla) thicket with a mixture of hardwood swamps and scattered pines. Many common and rare wildlife species such as deer, bear, alligator, and red-cockaded woodpecker are found here. The inaccessibility has prevented a timber harvest in the past and will provide a genuine challenge to the most experienced and intrepid hiker. There are many areas in the Basins which will offer sufficient variety and difficulty to appease any backpacker although these areas are not as large as Bradwelll Bay.

Quality Aspects of Water, Land and Air

The water quality of most of our streams and lakes is generally excellent; however, heavy rains cause much sediment to be deposited in the stream beds. Farming without proper land protection permits storm runoff to carry soil, fertilizers, and pesticides into the streams. Construction sites for buildings, parking lots and roads contribute sediment to stream beds. Islands caused by the sediment make boat navigation difficult. Flooding in the Apalachicola Valley causes closure of the oyster beds at the mouth of the Apalachicola because of the high coliform count. This type of pollution is normally associated with inadequate sewage treatment from residential areas. Sewage plants cannot process excessive flows, and sometimes part of the flow is bypassed.

Sections 208 and 303e of PL 92-500, the Federal Water Pollution Control Act, established a process for planning and implementing programs for reducing pollutants from all sources which enter our waters. The initial thrust was directed toward areas of heavily concentrated municipal and industrial complexes where the sources were rather easily determined. The summaries of wastewater discharge into the Alabama and Florida river systems in the Northeast Gulf Basins (Tables V-21-24) give the totals of point sources but do not account for the cleansing or dilution of pollutants due to the physical, chemical or biological characteristics of the streams, nor do they describe the quality or composition of the wastes. Thermal wastes are not included. Because of the limited number of gaging stations and infrequent monitoring, large amounts of pollutants could enter the streams and never be detected except perhaps by the sight of dead or dying fish. Many municipal and industrial sites have inadequate waste treatment facilities and several municipalities have no treatment facilities at all. Most of these municipal areas, however, have submitted treatment plans so that federal funds may be released for sewage plant construction.

Table V-21. Wastewater discharge into streams, Alabama subarea, by Basins

Sub-basin	Municipal	Industrial	Total
		(mgd)	
Chattahoochee (29a)	3.67	12.072	15.742
Chipola (29b)	-	-	-
Conecuh (33a)	3.22	33.860	37.080
Choctawhatchee (30)	6.83	1.910	8.740
Perdido (34)	1.42	.500	1.920
Yellow (31)	1.00	-	1.000
Total - Alabama Subarea	16.14	48.342	64.482

Nonpoint pollution sources are much more difficult to locate than are the municipal and industrial sources. Section 208 requires that states or regional entities develop a process to identify the sources of pollution from agriculture, forestry, construction, and mining activities. The agencies also must determine the methods, including land use requirements, to control such sources. Planning under Section 208 is on-going in "designated areas" of both states.

River Basin Water Quality Management Plans are required under the provisions of Section 303e of PL 92-500. These plans are being developed in each state. Alabama has published 12 of the 14 required water quality plans. Public hearings have been conducted on 11 plans and 5 have been submitted to EPA for final approval.

The Soil Conservation Service will have a leading role with coordination among all agencies for USDA activities in connection with PL 92-500 and will maintain liaison with the Environmental Protection Agency which is in charge of pollution control throughout the country.

Water quality data usually collected at or near the gaging stations include chemical concentrations and other properties such as turbidity, sediment, hardness, specific conductance, temperature, hydrogen ion concentration (pH), and stream flow (Table V-25).

More complete studies are required when alterations of streams, lakes, or their shores are contemplated. Fish populations, macroinvertebrates, macrophytes, plankton, periphyton, and bacteria are biological indicators of water conditions. Lack of species diversity is indicative of waters in poor condition.

More water quality gaging stations are needed on our major rivers so that pollutant sources can be pin-pointed and proper measures initiated to reduce or eliminate the pollutants. More frequent monitoring and more complete sampling procedures are desired. Improvement of existing waste treatment systems and the installation of systems where there are none are essential in maintaining or improving stream water quality.

Residential and commercial developments are adding excessive sediments and nutrients to some lakes, thereby hastening their eutrophication. Federal and state agencies have established guidelines to prevent or reduce the aging process of the lakes so that they will still be viable for many years ahead. Lake drawdown, where possible, is a recently developed method used to consolidate or oxidize organic material and nutrients and to retard or reverse advanced vegetational stages. More funds are needed for these programs and for assistance in other research programs.

Estuarine areas can absorb and utilize nutrients to a certain point and thereby act as cleansing agents; however, when this point is exceeded, the estuary will become unproductive. More research is required to determine the load capacity of such systems if we are to continue enjoying the recreational aspects and the food which is produced in these areas.

Table V-22. Wastewater discharge into streams of the Suwannee River Water Management District, Florida subarea, by sub-basins

Sub-basin	Municipal	Industrial	Total
	(mgd)		
Suwannee R. (25)			
Georgia	.506		.506
Florida	1.132	177.028	178.160
Alapaha R. (25a)			
Georgia	2.839	11.757	14.596
Florida	.465		.465
Withlacoochee R. (25b)			
Georgia	10.697	2.816	13.513
Florida		.006	.006
Little River (25b1)			
Georgia	3.108	.730	3.838
Santa Fe R. (25c)			
Florida	3.179	4.906	8.085
Aucilla R. (26)			
Georgia	.034		.034
Florida	.463		.463
GCA-d			
Florida	1.000	70.900	71.900
Total	23.423	268.143	291.566

Table V-23. Wastewater discharge into streams of the Northwest Florida Water Management District, Florida subarea, by sub-basins

Sub-basin	Municipal	Industrial	Total
	(mgd)		
St. Marks R. (27)			
Georgia	.130		.130
Florida	8.385	202.332	210.717
Ochlockonee R. (28)			
Georgia	5.267	4.460	9.727
Florida	2.190	.732	2.922
Apalachicola (29)			
Florida	1.568	1.117	2.685
Chattahoochee (29a)			
Alabama	3.670	12.072	15.742
Chipola (29b)			
Alabama	.200		.200
Florida	.473		.473
Choctawhatchee (30)			
Alabama	4.830		4.830
Florida	1.437	.482	1.919
Pea River (30a)			
Alabama	2.000	1.910	3.910
Yellow R. (31)			
Alabama	1.000		1.000
Florida	.549	.015	.564
Blackwater R. (32)			
Florida	2.006		2.006
Escambia R. (33)			
Florida	13.365	45.120	58.485
Conecuh R. (33a)			
Alabama	3.220	33.860	37.080
Perdido R. (34)			
Alabama	1.420	.500	1.920
Florida	2.523	25.100	27.623
GCAa (Florida)	8.520	.008	8.528
GCAb (Florida)	8.544	25.707	34.251
GCAc (Florida)	.570		.570
Total	71.867	353.415	425.282

Table V-24. Wastewater discharge into streams of the St. Johns Water Management District, Florida subarea, by sub-basins

Sub-basin	Municipal	Industrial	Total
	(mgd)		
St. Marys R. (16)			
Georgia	1.494	49.200	50.694
Florida	.500	44.900	45.400
ACa			
Florida	.178	.001	.179
Total	2.172	94.101	96.273

Table V-25. Chemical Composition of Selected Streams in Florida Subarea[1/]

Date of Collection	Instantaneous Discharge (cfs)	Dissolved Silica (SIO2) (MG/L)	Dissolved Iron (Fe) (MG/L)	Dissolved Calcium (Ca) (MG/L)	Dissolved Magnesium (Mg) (MG/L)	Dissolved Sodium (Na) (MG/L)	Dissolved Potassium (K) (MG/L)	Bicarbonate (HCO3) (MG/L)	Dissolved Sulfate (So4) (MG/L)	Dissolved Chloride (Cl) (MG/L)	Dissolved Flouride (F) (MG/L)	Dissolved Nitrate (N) (MG/L)	Dissolved Solids (Residue at 180C) (MG/L)	Dissolved Solids (Tons per Ac/Ft.)	Hardness (Ca, Mg) (MG/L)	Specific Conductance (Micromhos)	PH (Units)	Temperature (Deg F)	Dissolved Oxygen (MG/L)
Apalachicola River at Chattahoochee, Florida (29) 02358000																			
6-22-72	21300	3.7	-	16	1.2	5.2	1.0	54	4.0	3.5	0.2	.20	63	0.10	45	116	7.4	75	-
6-22-73	31440	7.0	580	8.2	1.0	4.0	1.3	29	5.2	2.3	0.2	.20	44	0.07	25	73	7.2	85	6.8
Chipola River near Altha, Florida (29b) 02359000																			
6-21-72	1550	5.4	-	24	3.0	2.2	.5	86	3.1	3.2	.1	.40	85	.14	73	160	7.6	75	5.7
6-28-73	1428	5.0	20	31	3.5	2.8	.5	105	0.4	3.5	.2	.57	99	.15	92	190	7.2	74	6.0
Aucilla River at Lamont, Florida (26) 02326500																			
4-28-72	360	2.1	780	5.1	1.2	3.7	0.2	6	6.0	6.0	0.3	0.01	27	0.14	18	45	4.7	63.5	-
6-28-73	716	4.0	680	4.5	1.1	2.5	0.5	6	4.8	5.2	0.3	.00	26	0.10	16	37	6.1	75	5.5
Choctawhatchee River at Caryville, Florida (30) 02365500																			
9-13-72	1056	6.9	300	15	1.9	3.5	0.9	51	2.4	6.0	0.1	.30	62	0.10	46	110	7.6	77	6.8
9-25-73	1900	7.3	0	13	1.4	3.3	1.1	42	0.0	5.5	0.4	.25	53	0.09	38	92	7.1	80	5.2
Escambia River near Molino, Florida 02376033 (33)																			
9-17-72	-	7.9	-	-	-	-	-	-	-	-	-	.10	-	-	-	115	7.1	81.5	6.2
9-26-73	1030	8.6	-	-	-	-	-	29	-	-	-	.13	-	-	-	87	6.6	76	6.1
Fenholloway River at Foley (GCAd) 02324500																			
4-28-72	159	9.5	680	38	12	210	1.9	128	120	250	1.2	0.0	700	1.36	145	1230	6.6	72	0.6
6-28-73	112	10.0	590	40	15	460	5.0	-	-	-	2.1	0.0	-	-	160	2310	8.4	87	-
Ochlockonee River near Havana, Florida (28) 02339000																			
3-13-72	1200	4.6	-	3.4	1.5	9.8	1.5	11	2.8	16	.1	-	45	.10	15	85	6.2	57	7.7
3-22-73	2270	5.0	-	-	-	-	-	10	-	-	-	1.4	-	-	-	52	-	61	-
Perdido River at Barrineau Park, Florida (34) 02376500																			
7-19-72	390	7.8	180	.9	.6	1.8	.3	2	2.0	3.8	.1	.02	18	.02	5	23	8.2	77	8.1
7-26-73	-	9.1	220	.5	.6	1.9	.4	2	2.2	3.2	.1	-	20	.03	4	23	5.3	74	7.8
St. Marys River near Macclenny, Florida (16) 02231000																			
10-12-71	112	8.4	440	3.2	1.7	3.6	.8	10	1.2	6.7	.3	.02	32	.09	15	48	6.5	71	6.2
10-12-72	48	8.2	240	5.8	2.0	5.3	.8	28	1.6	8.5	.2	.05	59	.10	25	72	7.2	76	6.7
Suwannee River at Branford, Florida (25) 02320500																			
10-06-71	6220	6.6	180	38	6.0	3.7	0.4	134	13	4.2	.2	.34	140	.23	120	255	6.9	74	6.7
10-11-72	3240	7.2	80	46	9.0	4.7	.5	164	21	4.0	.2	.56	202	.27	150	310	8.1	72	7.8
Santa Fe at Worthington Springs, Florida (25c) 02321500																			
10-06-71	438	5.4	360	8.6	3.2	9.0	.9	22	23	9.4	.3	.10	72	.14	40	130	6.4	68	7.3
10-03-72	107	3.7	270	6.0	2.5	6.0	.9	16	8.4	9.0	.2	0.0	77	.10	25	79	6.4	64	7.0
Withlacoochee River near Pinetta, Florida (25b) 02319000																			
10-05-71	150	13	260	24	4.5	36	1.5	168	16	8.6	.2	.10	188	.29	79	290	7.2	75	2.7
10-10-72	300	13	100	34	5.6	33	1.6	184	22	300	.2	.12	228	.31	110	330	8.3	70	4.9
Yellow River at Milligan, Florida (31) 02368000																			
6-12-72	261	5.6	-	11	1.9	2.8	.5	40	0	3.5	.1	.0	45	.06	36	83	7.4	77	8.2
6-19-73	1700	6.0	190	4.9	1.1	2.3	.6	17	.9	3.0	.2	.01	27	.05	17	43	6.8	76	5.8

1/ Water Resources Data for Florida, 1973
USDI Geological Survey

Ground water of good quality is available in large amounts in most of the Basins, the exceptions being the Piedmont and localized areas along the coasts where salt water instrusions have occurred. Use of ground water usually has less impact on the environment than use of surface water. Good quality ground water in large supplies is essential, and care should be taken in disposing of waste so as to avoid contamination of the ground water.

Erosion and sediment - Soil erosion rates within the Basins range from less than 1 ton per acre annually on the Coastal Lowlands Physiographic Division to over 40 tons per acre annually on small areas in southeast Alabama and west Florida (Figure V-2).

The rates of erosion are determined by the topography, amount and intensity of rainfall, inherent erodability of the soil, and cover conditions. Obviously, man cannot control the rainfall and inherent erodability and it is difficult and expensive to alter the topography extensively; therefore, the cover condition is the factor most affected by man.

Normally, the lowest erosion rates are on forested land, with the highest on cropland or in urban areas where the soil has been disturbed for development. Ideally, the row crops should be grown on the flatter slopes, with pasture on the intermediate slopes and woodland on the steeper slopes. Due to several factors, one being ownership patterns, much of the land in the Basins is not being used according to its capability.

During the late thirties, forties, and fifties, great progress was made in installing erosion control measures such as contour plowing, terraces, strip cropping, rotation, etc., but the tendency the last several years has been to disregard conservation measures and practice straight row farming. This trend is due partly to the development of larger farm machinery and the high cost and scarcity of farm labor. Erosion rates on croplands in the Basins are probably higher than they were ten years ago.

Most of the streams in the Basins carry large quantities of sediment (Figure V-3). Some of this sediment is deposited in the stream channels and is causing extensive swamping of the flood plains. Sediment in streams causes flood peaks to be higher than they would be if the sediment load was reduced and the channels were allowed to clean out. The sediment deposited in the bays and estuaries must cause some damage to fish and shellfish, but no data were found on the monetary damages. Sediment also fills streambeds and necessitates periodic dredging operations to keep the rivers navigable.

Gullies are a big contributor of sediment in southeast Alabama and west Florida. The gullies in these areas are very large and difficult to treat. Most of them cannot be stopped by vegetative measures alone but must have structural treatment as well.

All land use practices influence the hydrologic condition of watersheds. Intensive forest management practices have the potential for accelerating erosion. To assess the hydrologic impacts of forest-related activities in the Northeast Gulf Basins, the U. S. Forest Service conducted a field study in the summer of 1974.

The special study investigated all forestry activities from tree planting to forest fires. Undisturbed forest conditions were also measured to establish base-line information on natural or geologic erosion. Sheet erosion rates were estimated using the Modified Musgrave formula.

Spur roads (logging) and double drum chopping and burning (site preparation) were identified as major causes of erosion, especially in the coastal plain soils. These two practices account for 88 percent of the erosion on forest land (Table V-26). All figures given in the table are estimated values. Total erosion from all forestry practices amounts to 7.5 million tons annually.

The importance of water quality, especially reflected in provisions of the Federal Water Pollution Control Act Amendments of 1972, points to sediment production as our first concern in measuring the impact of forest-related activities on the environment. Site preparation (double drum chopping) accounts for 62.9 percent (an estimated 4.7 million tons of total soil material reaching a stream channel. Spur roads produce an estimated 1.9 million tons, or 25.4 percent of this loss.

Erosion rates can be reduced from the present level of 0.53 tons per acre per year to 0.16 tons per acre per year if changes are made in procedures commonly used for site preparation in the Basins. The customary practice of burning organic debris following chopping, should be eliminated, especially on slopes greater than 5 percent. Retention of maximum amount of organic debris on any planting site will provide essential protection. There are about 133,000 acres planted each year in the Basins, with chopping and burning occurring on 70,000 acres (52% of total planted areas). Elimination of burning and retention of organic debris will not increase cost of reforestation significantly.

Surface mined areas - There are approximately 24,000 acres mined in the Alabama subarea (Table V-27) and 23,500 acres in the Florida subarea (Table V-28). Some of these acres are located in the portions of counties outside the Basins. Mined areas are usually highly erosive and will not recover naturally for many years. They are listed as total acres needing treatment, acres on which there is a legal obligation to reclaim, and "orphan" acres, or land on which no one is under any legal obligation to reclaim. These figures are as of January 1974. Mining and reclamation operations are continuing; therefore, the affected acres constantly change.

Table V-26. Total estimated erosion and sediment yield by forestry related activities - Northeast Gulf River Basins

Disturbance	Acres Involved	Erosion Rate (tons/ac/yr)	Percent of Total Erosion
NATURAL	14,096,000	0	0
HARVESTING	552,000		
Logging		0.13	3.7
Skid Trails		1.54	1.3
Spur Roads		29.25	25.4
WILDFIRES	50,000	0.14	0.3
SITE PREPARATION	133,000		
Discing		2.52	1.3
KG/Bulldoze		7.48	5.2
Bedding		0.02	0.1
Double Chop and Burn		17.65	62.9
		0.53 1/	100.0

1/ Weighted average

Table V-27. Land treatment needs on strip mined areas within the Northeast Gulf River Basins - Alabama subarea1/

County	Mined Acres	Reclaimed Acres	To be Reclaimed According to Law	"Orphan" Acres	Total Needing Treatment
*Baldwin	220	100	0	120	120
Barbour	5850	1850	1000	3000	4000
*Bullock	100	30	0	70	70
*Butler	6880	3080	0	3800	3800
*Chambers	1385	1000	0	385	385
Coffee	10	0	0	10	10
Conecuh	80	55	5	20	25
Covington	25	3	0	22	22
Crenshaw	1635	900	10	725	735
Dale	43	0	0	43	43
Escambia	2140	390	250	1500	1750
Geneva	60	0	0	60	60
Henry	109	0	109	0	109
Houston	103	83	0	20	20
*Lee	70	0	70	0	70
*Lowndes	35	35	0	0	0
*Macon	100	0	0	100	100
*Monroe	10	5	0	5	5
Pike	3413	846	0	2567	2567
Russell	2170	217	0	1953	1953
Total	23650	13589	1444	14410	15854

1/ Source: Status of Land Disturbed by Surface Mining in Alabama - USDA-SCS, January 1974.

* Partial County

Table V-28. Land treatment needs on strip mined areas within the Northeast Gulf River Basins - Florida subarea[1/]

County[2/]	Mined Acres	Reclaimed Acres	To be Reclaimed According to Law	"Orphan" Acres	Total Needing Treatment
Alachua	9200	0	0	9200	9200
Baker	420	224	0	196	196
Bay	1580	120	1220	240	1460
Bradford	340	340	0	0	0
Calhoun	105	20	0	85	85
Columbia	525	201	0	324	324
Dixie	75	0	0	75	75
Duval	2200	0	0	2200	2200
Escambia	958	876	62	20	82
Franklin	25	0	0	25	25
Gadsden	2597	1650	0	947	947
Gilchrist	30	0	0	30	30
Gulf	36	6	0	30	30
Hamilton	340	0	340	0	340
Holmes	7	0	0	7	7
Jackson	250	0	0	250	250
Jefferson	100	0	0	100	100
Lafayette	11	0	0	11	11
Leon	485	75	0	410	410
Levy	145	0	0	145	145
Liberty	50	20	0	30	30
Madison	400	80	0	320	320
Nassau	67	0	0	67	67
Okaloosa	392	0	0	392	392
Santa Rosa	158	0	0	158	158
Suwannee	1850	0	0	1850	1850
Taylor	14	0	0	14	14
Union	0	0	0	0	0
Wakulla	280	40	0	240	240
Walton	605	54	0	551	551
Washington	300	56	0	244	244
Total	23545	3762	1622	18161	19783

1/ Source: Status of Land Disturbed by Surface Mining in Florida - USDA-SCS, January 1974.

2/ Counties partially in basins not separated; figures are for whole counties.

Waste disposal - Solid waste disposal rules and regulations in Alabama are the responsibility of the Alabama State Department of Public Health, Division of Solid Waste and Vector Control. The most recent legislation, Act. No. 771 (Solid Waste Disposal, 1969) as amended by Act 2247, sets up current rules and regulations for solid waste management. To be classed as acceptable in meeting minimum state standards, a waste management facility must not burn refuse, must compact and cover refuse daily if it contains garbage, must not create water pollution problems, and must manage hazardous waste properly.

Solid waste management systems in the Alabama subarea are organized by counties in the four major basins (Table V-29). Nineteen counties have 27 sanitary landfill sites, 16 of which meet state standards, 8 are borderline, and 3 are substandard.

Man's assessment of the value of livestock wastes as a resource has changed greatly over the years. For example, the 1938 Yearbook of Agriculture carries this statement:

> "One billion tons of manure, the annual product of livestock on American farms, is capable of producing $3 billion worth of increase in crops. The potential value of this agricultural resource is three times that of the nation's wheat crop and equivalent to $440 for each of the country's 6,800,000 farm operators. The crop nutrients would cost more than six times as much as was expended for commercial fertilizers in 1936. Its organic matter content is double the amount of soil humus annually destroyed in growing the nation's grain and cotton crops."

This optimistic outlook changed drastically. With the abundance and availability of synthetic nitrogen fertilizers at low cost following World War II, it became more economical for the farmer to supply plant nutrients to his fields from the fertilizer bag rather than meet the expense of hauling manure from barnyard or feedlot. Further, the general trend in mechanizing and streamlining production was given impetus by labor shortages during and after the war. Manure accumulated in large quantities and disposal became a problem. Economic studies indicated that the costs of handling manures made them no longer competitive in price with chemical fertilizers. As rising energy costs add to the cost of producing synthetic fertilizer elements, animal wastes may again become a more competitive plant nutrient source.

An inventory of the extent of livestock waste problems in the Alabama subarea was made in each county by the Soil Conservation Service District Conservationists. This information will be used by the Alabama Development Office (ADO) and the Alabama Water Improvement Commission (AWIC) in preparing current water quality management plans for each sub-basin. The information gathered includes pertinent data on: (1) all beef cattle feedlots where 100 animals or more are kept in continuous confinement,

(2) all hog parlors, (3) all dairy operations where cows are kept in continuous confinement, (4) and all dairy operations milking more than 100 cows.

Table V-30 summarizes the results of the confined livestock inventory for each sub-basin in Alabama. According to the survey, 124 operators had approximately 52,561 hogs, dairy cattle, and beef cattle confined as set forth in the above paragraph. This varies from about 1,975 animals in the Chipola sub-basin to 21,560 animals in the Perdido-Escambia sub-basin.

Approximately 105 hog parlor operators are housing 38,112 hogs in the Alabama subarea. The survey indicated 20 operators with 4,384 confined hogs in Conecuh County, the largest county total for the Basins. The Perdido-Escambia sub-basin had 58 hog parlor operators handling 20,400 hogs, contrasted to 8 operators and 1,850 animals in the Chipola sub-basin. The number of operations with some type of waste treatment facility is approaching 100 percent for all sub-basins. The adequacy of the facilities or the efficiency of the treatment is not a part of this inventory.

Operators of 17 dairies are milking more than 100 cows each, or keeping smaller herds in continuous confinement. All of these have some type of waste treatment facility. The Choctawhatchee sub-basin has the largest number of operators and the largest number of cows in any sub-basin.

The annual solid waste production of the confined animals in the Alabama subarea is about 187,200 tons, and liquid waste amount to 77,200 tons annually (Table V-31). More than half of the solid waste is generated by beef cattle. Using an average population equivalent factor from several sources, the 52,561 confined animals inventoried in this report produce a volume of waste equivalent to a human population of approximately 325,000 or equivalent to about 72 percent of the human population in the Alabama subarea.

Additional information on livestock waste disposal problems for a specific area is available from the State Public Health Department, Extenstion Service, Agricultural Experiment Station, and Soil Conservation Service Field Offices.

Data for confined livestock in the Florida subarea were available for dairy cattle only. The inventory showed 6,800 heifers and 17,700 milk cows. These dairy cows alone would generate 226,000 tons per year of solid waste and 73,000 tons of liquid waste. The waste disposal problems would be equivalent to a human population of about 400,000 people which is about 47 percent of the population in the Florida subarea. It is reasonable to assume that all confined livestock in the Florida subarea would produce about the same equivalent waste disposal problems as 70 percent of the human population.

Table V-29. Solid waste management systems in Alabama subarea, 1974

Basin County	Number Units	State Standards Meets Fully	 Borderline	 Substandard
Chattahoochee				
Barbour	1		X	
Chambers	1	X		
Henry	1	X		
Lee	1	X		
Randolph	1			X
Russell	1		X	
Chipola				
Houston	1		X	
Choctawhatchee				
Coffee	1		X	
Covington	1		X	
Dale	2	X		X
Geneva	2	XX		
Houston	1		X	
Pike	2		XX	
Perdido-Escambia				
Baldwin	2	XX		
Bullock	1	X		
Butler	2	XX		
Conecuh	1			X
Covington	2	XX		
Crenshaw	1	X		
Escambia	2	XX		
Totals	27	16	8	3

Table V-30. Confined livestock operations by type, county and sub-basin in the Alabama subarea, Northeast Gulf River Basins, 1974

Sub-basin County	Type of Operation: Hog Parlors: Number Operators	Hog Parlors: Number Animals	Dairy Operations: Number Operators	Dairy Operations: Number Animals	Cattle Feedlots: Number Operators	Cattle Feedlots: Number Animals
Choctawhatchee						
Barbour	1	200				
Coffee	5	3850	7	2550		
Dale	6	1175				
Geneva	7	1877			1	10000
Henry	4	1259	1	200		
Total	23	8361	8	2750	1	10000
Chattahoochee						
Barbour	1	565				
Chambers	1	60				
Henry	5	3914	2	300		
Houston	1	100	1	120		
Lee	2	70				
Russell	6	2786				
Total	16	7495	3	420		
Chipola						
Houston	8	1850	1	125		
Perdido-Escambia						
Baldwin	5	1500				
Butler	7	3652				
Conecuh	20	4384	3	274		
Covington	12	7115				
Crenshaw	6	1850				
Escambia	7	1815	1	100	1	180
Pike	1	90	1	600		
Total	58	20406	5	974	1	180
Alabama Subarea	105	38112	17	4269	2	10180

1/ Inventory includes all hog parlors, dairy herds kept in continuous confinement, dairy herds exceeding 100 head and beef cattle feedlots exceeding 100 head.

Table V-31. Production of wastes by confined livestock in the Alabama subarea, Northeast Gulf River Basins, 1974

Livestock	Number (1000)	Solid Waste 1/ (1000 tons/yr)	Liquid Waste 1/ (1000 tons/yr)
Beef Cattle	10	95.0	36.4
Hogs	38	41.1	24.4
Dairy Cattle	4	51.1	16.4
Total	52	187.2	77.2

1/ Source: "Wastes in Relation to Agriculture and Forestry", U.S.D.A. Miscellaneous Publication No. 1065

Air quality, Florida - Protecting and enhancing air quality and preventing air pollution in the State of Florida are responsibilities of the Florida Department of Environmental Regulation.

Chapter 17-2, Air Pollution Rules for the State of Florida, establishes ambient air quality standards and emission standards. These rules were adopted to achieve and maintain such levels of air quality as will protect human health and safety, prevent injury to plant and animal life and property, foster the comfort and convenience of people, promote the economic and social development of the State, and facilitate the enjoyment of the natural attractions of the State.

The policy inherent in the standards shall be to protect the air quality existing at the time the air quality standards were adopted (1 January 1972) or to upgrade or enhance the quality of the air of the State. In any event, where a new or increased source of air pollution poses a possibility of degrading existing high air quality or ambient air quality standards, such source or proposed source shall not be issued a Department permit until the Department has reasonable assurance that the rules of Chapter 17-2 will not be violated.

Whether or not the rules are violated is based on an "air pollution episode." An episode describes a condition which exists when meteorological conditions and rates of discharge of air pollutants combine to produce pollutant levels in the atmosphere which, if sustained, can lead to a substantial threat to the health of the people. In order to prevent episode conditions from continuing or from developing into more severe conditions, positive action and a rapid abatement response is necessary. The severity of an episode is classified as an alert, a warning, or an emergency based on criteria established in Chapter 17-2.06. Required action-control rules are also established for these conditions.

There are several ambient air monitoring stations in the Florida subarea of the Northeast Gulf River Basins (Table V-32). Many of the stations are monitoring only partial analysis pollutants that affect the ambient air quality. Much of the data available are on source-oriented surveillance which is unrepresentative of general ambient air quality in a given area.

Consideration was given to estimating future ambient air quality for population centers in the Florida subarea based on population projections and expected future industrial expansion. After studying the problems, it was concluded that it was not practical to make projections because existing sources which have had uncontrolled emissions must be in compliance with established emission standards by either 1975 or 1977. Also, new sources must be designed to be in compliance with emission standards.

The conclusions drawn from the study were that enforcement of these standards should result in much improved air quality. Therefore, a qualitative prediction based on compliance scheduling and new source performance standards is that future air quality will improve. Under conditions of high growth, however, air quality will decrease.

<u>Air quality, Alabama</u> - Protecting and enhancing air quality and preventing air pollution in Alabama are responsibilities of the Alabama Air Pollution Control Commission.

The Commission operates a statewide air monitoring network. This network is designed to meet standards adopted by the Environmental Protection Agency for conducting air quality surveillance and is comprised of 93 sites. Approximately 80 percent of these stations monitor suspended particulate matter only. The remaining 20 percent also monitor gaseous pollutants such as sulfur dioxide, nitrogen dioxide, carbon monoxide, and ozone.

The Northeast Gulf River Basins has nine particulate monitoring stations. These stations are in Abbeville, Andalusia, Brewton, Dothan, Eufaula, Evergreen, Opelika, Phenix City, and Troy (Table V-33). A review of the 1974 air quality data from these nine stations shows violations of the National Ambient Air Quality Standards (NAAQS). The primary NAAQS for particulate matter is 275 micrograms per cubic meter as a 24-hour maximum, not to be exceeded more than once per year, and 75 micrograms per cubic meter as an annual geometric mean. The secondary NAAQS is 150 micrograms per cubic meter as a 24-hour maximum, not to be exceeded more than once per year.

The ambient air quality in the Alabama portion of the Basins is within acceptable limits presently and should improve in the future.

Table V-32. Ambient air monitoring stations, Florida Subarea, Northeast Gulf River Basins

Units	Total Suspended Particulate: Micrograms/ cubic meter	Sulfur Dioxide: Parts Per Million	Nitrogen Dioxide: Parts Per Million	Carbon Monoxide: Parts Per Million
Chapter 17-2.05-Ambient Air Quality Standards	60.00	0.02	0.05	9.00
<u>Alachua County</u>				
Newberry	35.35			
Micanopy	38.21			
Gainesville	36.64			
<u>Bay County</u>				
Panama City Health Dept.	46.30			
Panama City Airport	49.93	0.012	0.0073	
<u>Escambia County</u>				
Cantonment	54.68			
Pensacola-Univ.W.Fla.	41.36	0.01	0.004	
Pensacola-Leonard & Halifax St.	73.91	0.0037	0.005	0.70
Pensacola-Ellyson Naval Air Station	42.04	0.007	0.003	
<u>Leon County</u>				
Tallahassee				
Appleyard Drive	42.64			
100 E. Madison St.				1.280
<u>Nassau County</u>				
Fernandina Beach				
A1A So. of 8th Ave.	66.14			
Jr. High School	44.73			
5th St. at Lime Ave.	50.65	0.006		
<u>Santa Rosa County</u>				
Jay	54.45	0.0025		
Gulf Breeze	35.11	0.0009	0.00395	
<u>Taylor County</u>				
Perry	36.94		0.012	

NOTE: All numbers are annual mean values - geometric mean for total suspended particulate and arithmetic mean for other pollutants. Source: State of Florida, Department of Pollution Control.

Table V-33. Ambient air monitoring stations, Alabama subarea, Northeast Gulf River Basins

Location	Total Suspended Particulate
Abbeville	35.22
Andalusia	45.27
Brewton	46.31
Dothan	52.48
Eufaula	44.23
Evergreen	27.71
Opelika	41.58
Phenix City	53.23
Troy	40.49

NOTE: All values are geometric mean for period 1/74 to 12/74.
Source: Alabama Air Pollution Control Commission.

Conservation - Properly installed conservation management systems in rural or urban areas have important positive effects on environmental combinations of conservation treatment measures on highly erodable cropland or changing the land use by converting row crops to permanent cover such as grass, trees, or wildlife areas, and cropping the less erodable soils. In some cases, existing gullied areas can be shaped and planted to grass or trees to improve the visual quality of the landscape as well as provide economic returns and reduce further erosion.

Installation of conservation measures to solve specified problems should be carried out after careful planning and with adequate consideration of the total conservation program. Failure to study possible side effects of a conservation measure has sometimes led to the creation of problems more difficult to correct than the original problem. Systems which provide for adequate disposal of surface water runoff from erodable soils are needed. Some of the old terrace systems have created damaging and unsightly conditions where unstable outlets were installed at road ditches. Water concentrated at these outlets has led to the formation of major gullies so extensive that highways have had to be relocated.

The design and location of animal feed lots and dairies can be planned so that minimum detrimental effects on air and water will result. Much progress has already been made in the installation of facilities for disposing of animal wastes and wash water from dairies.

In urban areas, especially those that are rapidly expanding, good conservation systems are needed. The proper use of vegetation on erodable soils soon after construction of new homes, shopping centers, and industrial areas can do much toward reducing sediment delivered to streams and bottomlands. Where possible, potentially critical areas should be retained in good vegetative cover to reduce the risk of soil erosion and to enhance the scenic values in urban areas.

In some locations, wet areas in and around cities should be retained in their natural state or in semi-developed conditions for parks or other recreational purposes.

Conservation laws - Legislation which provides opportunities for improving the quality of the water and land resources has been passed by the legislatures of both Florida and Alabama. Among the more significant Florida Legislative actions are the Environmental Land and Water Management Act of 1972, the Water Resources Act of 1972, and the Land Conservation Act of 1972.

The Florida Environmental Land and Water Management Act established a procedure for identification and regulation of geographic areas and land development activities of state or regional concern. The great majority of land use decisions, which are of local concern only, are not affected. The role of the state is focused on these land-use decisions which have a substantial impact outside the boundaries of the local government in which the land is located.

The Florida Water Resources Act provides, among other things, for the identification and survey of the state's water resources, the creation of water management districts, permitting of consumptive use of water, regulation of wells, management and storage of surface waters, and the development of a state water use plan. The intent of the legislature in this Act is for the management of water and related land resources to promote the conservation, development, proper utilization and management of surface and ground water for the health, safety and general welfare of the people of Florida.

Under the Florida Land Conservation Act of 1972, the State is directed to conserve and protect environmentally unique and irreplaceable lands as valued ecological resources. The Act emphasizes the ecological significance of land areas and their related water resources, define the direct and indirect sources of danger to these lands as those which result primarily from development activities, and charges the Governor and cabinet with the responsibility for preparation and continued maintenance of a plan to conserve and protect these lands.

Under relevant Florida statutes, the Florida Department of Environmental Regulation has the legal authority to establish a continuing planning process in accordance with the Federal Water Pollution Control Act.

Florida has a preferential assessment tax for agricultural lands. Localities were given full zoning and planning authority in 1968.

The 1970 Florida Legislature created the Coastal Coordinating Council[1/] (Chapter 370.0211 of Florida Statutes) and charged it with the responsibility of developing a comprehensive plan for the development, protection and zoning of the coastal zone and of providing coordination of planning and management activities involved in the coastal zone.

Alabama Legislative Act No. 1260, 1971, as amended, was enacted to provide for water pollution control, establish a new Water Improvement Commission and prescribe its jurisdiction, powers and duties, providing for enforcement of the act and rules, regulations, and orders of the Commission, and prescribing penalties.

Alabama legislation related to the quality of water and land resources includes Section 341-364, Chapter 26, Title 12 of the Code of Alabama which contains enabling legislation for a comprehensive land management and use program in unincorporated floodprone areas of the state. It allows county commissions in Alabama to meet requirements of the National Flood Insurance Act of 1968, and authorizes the county commission to prescribe criteria for land management and use in floodprone areas Similar authority for municipalities is provided by Section 772, Chapter 16, Article 1, Title 37 of the Code of Alabama.

Alabama has a strip mining law that provides for smoothing of spoil following the mining operation. The state also has a property tax law that permits some preferential assessment of agricultural lands. Local governmental agencies have been delegated planning and zoning authority for this.

Of interest to both states is a joint agreement (February 1975) between the National Oceanic and Atmospheric Administration and the Office of Community Planning and Development in the Department of Housing and Urban Development (HUD). The purpose of the agreement is to help coastal states coordinate their planning and management activities. A key element of the agreement is that HUD will accept approved coastal zone management programs as meeting the minimum land use planning requirements necessary for states to remain eligible in HUD's 701 (Urban Planning Assistance) Program.

1/ The Coastal Coordinating Council was abolished by the Environmental Reorganization Act of 1975, and its staff and functions were reassigned to the Division of Resource Management, Department of Natural Resources.

Conservation districts are actively engaged in helping to solve resource problems which affect all aspects of environmental quality and human endeavor. All counties in the Basins are in conservation districts, established as units of government under state law. Each district is legally responsible for developing a district-wide conservation program directed at solving local soil, water, and related resource problems. The district is responsible for carrying forward that program by helping, on request, landowners and operators, individually and in groups, to plan, apply and maintain appropriate land use and conservation treatment measures. Districts are authorized to provide assistance to plan and implement resource management programs, which usually involve units of government. The Soil Conservation Service is authorized, under the terms of the Soil Conservation Act of 1935 and other acts, to carry out a broad program of assistance to individual or groups of land users and to units of government for conserving and developing soil, water, and related resources. Federal laws give SCS certain duties and responsibilities, and state laws give conservation districts certain duties and responsibilities. These laws are complementary.

Nonstructural measures enhance the quality of water, land, and air by controlling pollution, reducing erosion, and restoring eroded areas or other areas of deterioration. These measures include ordinances, flood hazard studies, flood insurance, floodwarning systems, and watershed protection. The use of nonstructural measures may reduce severe floodwater damages of the future through zoning laws which prohibit development within the flood plain. Flood insurance offers financial protection for those structures already built in the flood plain and discourages further development in the flood zone through preventive ordinances. Additional areas in the flood plain are made available for open space, recreation, wildlife habitat, pasture and forest.

Proper land use and treatment measures in upland areas contribute to watershed protection by helping to hold soil in place and by increasing the infiltration of rainfall into the soil. Downstream areas are thereby benefited by reductions in sediment and flood hazards.

Biological Resources

Water - Fishing, next to beach activities, is enjoyed by more people in the Basins than any other active recreational pursuit, judging from the number of fishing licenses sold annually. Fishing is becoming limited in some areas, however, because of natural events or man's activities. Some of the largest fish kills in the country have occurred in West Florida bays. Some of the bay bottoms are covered with industrial and municipal sludge, rich in carbon, nitrogen, and phosphorous. This causes depressed oxygen levels, destruction of marine grasses, and heavy plankton blooms. Military bases and communities release poorly treated or untreated human wastes into the tributaries and the bays.

Industrial plants contribute their waste products. Water circulation in the bays is not sufficient for good flushing action. Industries and municipalities have been ordered to clean up their effluent, but septic tanks and storm sewers continue to contribute wastes to the bays. Pollution in the coastal waters has caused over a million acres of oyster grounds in Florida to be closed. Heavy rains in the Chattahoochee-Flint River Basin raise the coliform count beyond acceptable levels in the Apalachicola Bay area so that oysters cannot be harvested. This causes extreme local hardship and is reflected in Florida's economy.

Probably the most immediate threat to pond and lake fish is the proliferation of exotic aquatic weeds. Boats and trailers spread the weeds from one body of water to the other. Occasionally, they may be introduced by birds or other animals. Excess weeds prevent the predatory fish such as bass and channel catfish from feeding on forage fish (bluegills, shellcrackers, shad, etc.) which leads to an overabundance of stunted forage fish and an unbalanced fish population. Boat passage becomes difficult, and when fishing becomes poor, the water body is lost as a recreational asset. Control of weeds by herbicides has been expensive, generally unsatisfactory, and usually temporary. The environmental cost is undetermined. Mechanical harvesting has been attempted with poor results because of large expanses of open water and rapid plant growth. Biological control is now considered to be the most feasible method of plant regulation. Insects, bacteria, and viruses which are weed specific are being investigated by state and Federal agencies.

Possibly the most controversial control being considered is the grass carp (Ctenopharyngodon idella). That the fish can control weeds has already been established, but the possible cost to the aquatic ecosystem is considered by some agencies to be too high to accept without further investigation. Past experience with other introduced species has caused the agencies to move very cautiously. One objection is the fear that the fish will destroy valuable weeds which provide food and cover for waterfowl and fish. Another objection is that it may reproduce and compete with the native fish. Production of sterile fish is now being attempted which, if successful, will remove the last objection. Financial aid must be provided for research on all methods of weed control before surface water supplies, canals, lakes, and ponds are rendered useless.

For many years, Federal and state hatcheries have been supplying fish to farmers and other landowners for stocking their ponds. They have provided the correct number and species at the best times of the year to assure balanced fish populations, provided simple fish management practices are adhered to. This stocking program has been a most satisfactory arrangement and has created much good will. Although this program does not directly affect the public, it has an indirect affect by relieving fishing pressure on public waters. It was recently announced that Federal hatcheries will no longer supply fingerlings for private stocking. With the reduced supply of fingerlings, some pond owners will have to get them from public waters. This method of stocking has been proven unsatisfactory in the past as the wrong size and species have often been put into the ponds. When this occurs, the fish either become overcrowded and stunted or they disappear altogether. With this loss of hatchery fish, it is essential that the states expand their hatchery operations in order to compensate for the fish that are no longer available from other sources.

Wildlife - Wildlife in the Basins continues to be under greater pressure every year because of the increased human population, more intensive land use, and increased hunter-days due to shorter work weeks. The states have done a commendable job in obtaining wildlife areas for the hunting public. Usually this land is under lease from the wood producing industries, but state and national forests, Corps of Engineers' project areas, and military bases are included in the state's wildlife management programs. The demand on these areas has caused the Florida Game and Fresh Water Fish Commission to limit the numbers of hunters in the managed areas for the first part of the hunting season. This trend of limiting the pressure on land and animals will probably accelerate unless some event such as an extreme energy crisis or a deep recession occurs. Land acquisition for wildlife management purposes may relieve the overcrowded situation for a while but at best is only a temporary solution. Research is needed to determine the carrying capacity of the management areas so that the harvest of game animals can be regulated accordingly. Education of the hunters, non-hunters, and political entities is essential for a viable program based on biological considerations. The endangered species program needs to be funded and expanded so that a species will not be lost because of habitat destruction or environmental deterioration.

Wetlands - It is difficult for the layman to comprehend the importance of wetlands for their biological and aesthetic value. That this so-called wasteland can produce so many pounds of fish or can feed and shelter untold numbers of waterfowl and other wildlife species or provide other environmental benefits is not easily understood. Until people become better informed, pressures will continue to mount for draining, filling, diking, impounding or otherwise altering the wetlands.

In the past, and somewhat in the present, different state and Federal agencies have worked in opposite directions; that is, one might advocate wetlands drainage while the other was attempting to acquire and preserve the wetlands. With these conflicts, it becomes necessary that agencies work together to produce projects which are compatible to both and are beneficial to the Nation. Conditions are improving in that land-use agencies have become more environment conscious. Most have added biologists to their staffs who can make recommendations to lessen the impacts of their projects upon the ecosystems. The fish and wildlife agencies, primarily supported by fees levied on the sportsmen, do not have the funds nor personnel required to adequately protect the wetlands and therefore need assistance from other agencies, with the support of the public.

The task of preserving and improving the wetlands becomes more difficult and expensive as the population increases. The present need is to plan for the preservation of important land and water areas to protect fish and wildlife, and to serve the needs of the people who depend on these resources for food, recreation, or their livelihood. A large portion of the commercial catch of fish and shellfish is partially or wholly dependent on the estuarine areas for development.

Land management - Land treatment and management greatly influence our biological resources. The way the farmers cultivate their lands, the techniques foresters utilize for timber harvest and site preparation, and the planner's recommendations for city expansion help determine the fate of irreplaceable ecosystems and the creatures that inhabit them.

Farm wildlife - rabbits, doves, and quail - favor diversified farms where there are mixtures of vegetation types. Where natural systems are missing, fence rows, farm ponds, turn rows, and windbreaks can provide food and cover. Songbirds thrive in such areas. Birds feed on crop pests, thereby reducing the need for pesticides. Other common farm practices which are beneficial to wildlife and reduce stream sedimentation are grassed terraces and waterways, strip farming on the contour, field borders, and gully control with legumes and shrubs. The trend toward larger farms with their intensive cropping operations has reduced wildlife habitat by the elimination of turn rows and fence rows, the destruction of terraces, and cultivation of some marginal soils. Incentives are needed to make it worthwhile for farmers to reduce the intensive use of steep or erodable lands.

Virgin forests support few animals or numbers of species. The Indians realized this and used fire in the woodlands to create open space and to stimulate growth of the new and succulent plants to attract animals. The modern forester uses fire to control undergrowth with the side benefit of creating choice wildlife habitat. Clearcutting of vast tracts of land, as practiced years ago, resulted in great increases of wildlife populations which lasted until the overstory shaded out the herbs and shrubs, or the browse grew out of reach. The rather sudden loss of browse led to a rapid decrease of animals through starvation and disease. Modern timber management has reduced the size of clearcuts. Multiple purpose operations dictate clearing of small tracts in random fashion so that there will always be openings with various stages of vegetative growth to provide wildlife food. Some of the most vociferous complaints about clearcutting have been instigated by clearing to the highways or to the edge of streams. Where one is merely unsightly, the other permits sediment to enter streams from the erosion caused by soil disturbance. Logging roads provide access for wildlife harvest and management but when improperly constructed or located, may cause enough damage to streams by sedimentation to render them unfit for fish and recreation. Sediment from poor road drainage may block stream flow and destroy fish spawning areas. Road systems should be planned so that damages to streams will not occur. Disturbed areas should be planted with permanent cover as soon as possible. Undisturbed areas should be left along the stream banks.

Urban sprawl has damaged or eliminated unique ecological systems and has infringed on valuable farmlands. Until very recently, local governments were responsible for controlling the growth of their communities. Planning was based on the needs and desires of the citizens with little thought for the environment. Wildlife also suffered from indiscriminant construction. Wetlands and floodprone areas were particularly vulnerable to development. Disturbances to the land resulted in increased sediment load in the streams. Septic tanks were frequently inoperative because of wet soils. Wells became contaminated by high water levels. Dredging to create more land and construction of canals for drainage were detrimental to the flora and fauna. Because local governments have been reluctant in setting environmental standards, the state governments have enacted protective legislation so that development will proceed in an orderly manner with less damage to our surroundings; however, because of the continued loss of critical areas, legislation has been proposed for a National policy of land use planning. This National policy, while appearing to be an infringement on states' rights, is considered by some to be necessary to maintain our natural systems and to improve our quality of life.

Effluent - In the Alabama subarea, 25 towns or communities were discharging effluent from sewage treatment facilities into streams that do not have sufficient flow to properly assimilate the effluent or maintain fish habitat downstream.[1/] It is necessary to maintain approximately 5 parts per million (PPM) dissolved oxygen in the streams for fish survival during these low flow periods. Only 3 of the 25 towns had suitable reservoir sites available with sufficient storage to meet the minimum low flow requirements 19 out of 20 years. One other site could meet more than one-half of the required low flow. These sites and their low flow requirements and maximum yield are as follows:

Location	Low Flow Required cfs	Max. Yield Available cfs
Persimmon Creek near Greenville	1.5	16.8
Blanket Creek near Enterprise	6.5	3.5
Pea Creek near Clayton	0.7	5.4
Walnut Creek near Troy	7.5	7.5

These four sites are shown on the Opportunity Location Map (Figure V-4) and are designated by the letters "SFN", or stream flow nourishment. The statistics of these four reservoirs are given in Table V-34. No potential streamflow nourishment reservoir sites are evaluated in Florida for the interim report, but there possibly will be some sites evaluated during the remainder of the Northeast Gulf Study in both state subareas.

1/ From a list of problem areas identified by Alabama Water Improvement Commission

Table V-34. Statistics of potential storage sites for stream flow nourishment, Alabama subarea

Site Location	Drainage Area (sq.mi.)	Dam Height (feet)	Pool Surface Area (acres)	Water Depth (feet)	Pool Elevation (msl)	Total Storage Volume Avail. (ac.ft.)	Usable Storage Volume (ac.ft.) 1/	Maximum Yield 2/ (cfs)	Type of: Map Used 3/	Map Contour Interval (feet)
CHOCTAWHATCHEE RIVER										
Blanket Creek, Sec. 19 T4 R21, Goodman Quadrangle, Coffee County	3.28	50	263	44	300	4468	3950	3.5	7½'	10
Pea Creek Site No. 2, Sec. 29 T11 R26, Clayton North Quadrangle, Barbour County	5.28	68	608	62	490	11975	10590	5.4	7½'	10
Walnut Creek Sec. 2 T9 R21, Troy Quadrangle Pike County	8.44	42	447	36	400	6805	5800	7.5	7½'	10
PERDIDO-ESCAMBIA RIVERS										
Persimmon Creek Sec. 13 T10 R14 & Sec. 18 T10 R15 Greenville East Quadrangle, Butler Co.	20.6	42	718	36	380	10260	8900	16.8	7½'	10

1/ The difference between total storage and usable storage is the amount set aside for the 100 yr. sediment pool.

2/ Maximum available flow just below the reservoir which can be maintained during 19 out of 20 years or 95% of time. A reservoir operation study was made for each site using available storage and recorded hydrologic data.

3/ 7½' denotes U. S. Geological Survey quadrangle series.

Human Use and Interest

Historic sites - Historic and archeological sites provide evidence of the lives and activities of men who existed in the past. These sites are associated with people or events that have had an impact on our own lives. Types of architecture or other construction which are unusual, denote an important period, or were connected with past civilizations or distinguished personages should be included in state or local lists of important places which should be preserved, developed, restored, or reconstructed. If these areas meet certain criteria, they are eligible to be placed in the National Register of Historic Places, and grants may be available for work on the sites.

It is doubtful if there is a county in the Basins' area that does not have a site of historical significance. Indian mounds of all types are found throughout the area and vary in importance because of age, degree of civilization, and use. Ante bellum homes in fair to excellent condition are plentiful, many of which are of Greek Revival architecture. Sites of Indian skirmishes and Revolutionary and Civil War encounters are known to be in the area.

Several cities have tours of outstanding houses and historic districts, but many cities overlook their heritage. Historic or cultural groups could be organized to preserve, protect, or restore such places for the benefit of local people and tourists alike.

By properly identifying mounds, missions, battlefields, forts, and other sites, and executing acts of preservation, restoration, or whatever measures are dictated, the cultural aspects of our heritage can be more fully appreciated. This preservation and identification should not be viewed as an obstacle to progress since many cities, such as Savannah, Pensacola, and Williamsburg have capitalized on such development. Many sites have been destroyed in the past few years by expansion of the urban areas, inundation caused by dam construction, and road development. But, ironically, many sites have been discovered during such works. When unique sites are found, it is the duty of the discoverer to notify the proper authorities prior to further progress on the project. Discovery should not lead to disturbance or vandalism; therefore, many sites are known by the responsible state agencies but remain unknown to the general public until they can be properly investigated by qualified persons. Impact statements by Federal and state agencies and by large scale developers require notices as to the location of archeological or historical sites on the project area.

Geologic sites - A variety of geologic points of interest may be found in the Northeast Gulf Basins. The Coastal Plain Physiographic Province covers most of the Basins, with less than two percent in the Piedmont Province.

As the name implies, the Coastal Plain is an area of very subdued topography. There are no spectacular valleys, fault scarps, or other dramatic evidences of crustal movement.

The rocks of the Piedmont were intensely folded and distorted. Evidence of this can be seen in many road cuts.

All the Florida subarea is underlain by soluble limestone, with the exception of the western panhandle counties of Walton, Okaloosa, Santa Rosa, and Escambia. This limestone extends into the extreme southeast Alabama subarea.

Because of the solution of the limestone, this area is pocked with sinkholes, and the sub-surface is riddled with caverns. Much of the drainage is underground, and streams running into sinkholes and disappearing underground are common.

Many of the caverns are water filled, and scuba diving in these caverns is a very popular but hazardous sport. Cave diving is discouraged by the authorities because of its dangers.

There are many large springs in the limestone area, the largest and best known being Wakulla Spring in Wakulla County, Florida. These springs are actually underground streams coming to the surface.

Recreation - The quality of the recreational experience within the Basins is now being considered as important as the quantity. Some state parks are receiving so much use that the numbers of visitors are restricted to prevent deterioration of resources and to enhance the quality of the outdoor activity. Visitors to Florida parks have increased 100 percent in the past ten years. State and federal governments presently provide most of the outdoor recreational opportunities and may be expected to enlarge their facilities somewhat in the future; however, purchase of additional land will be limited because of high costs and the paucity of desirable natural areas suitable for recreational development. The U. S. Forest Service has recently been forced to close some of its facilities on the National Forests because of limited funds for repair and maintenance. These funds may once again be made available with the expected improvement of the economy. Corps of Engineers' recreation projects may be expanded when their present facilities approach saturation. The military bases could accommodate more people when the multiple-use concept is more fully implemented without impairing military effectiveness.

The private sector can be expected to provide a higher proportion of recreational opportunities than it has in the past. Intensive use of campgrounds, swimming pools, and picnic grounds can be established using less land area with a more rapid turnover of customers. More amenities can be supplied on these areas than on governmental lands.

Many people are quite gregarious and enjoy close association with their fellow men and are pleased with such accommodations, while others seek more primitive, less crowded areas.

New reservoirs, near populated areas, constructed primarily for water supplies or to recharge the aquifers can also provide quality recreational opportunities (Figure V-4). Swimming, fishing, picnicking, and camping are among the activities suitable for reservoir sites. Miles of beaches, not in the Pensacola, Panama City, or Fernandina areas, which are little used, could be made accessible for the enjoyment of many visitors if adequate protection were provided for the dunes and shoreline. Transportation routes should be constructed or improved considering all the facets of the fragile coastal ecosystems. Development, with all its ramifications, should proceed only after the most careful planning. Construction should fit into the landscape rather than altering the landscape to suit the construction. The beautiful beaches, clean air, lakes and rivers are the principal attractions of the area. Destruction of these assets would vitally affect the economy and the lives of the residents of the Basins.

CHAPTER VI. EXISTING WATER AND RELATED RESOURCE PROGRAMS

Soil and Water Conservation

All of the private lands within the Basins are organized in local soil and water conservation districts. These districts, organized under state laws, are legal entities of the states. The district conservation programs are administered by a board of supervisors. Local contributions, initiative, and leadership through these local soil and water conservation districts are largely responsible for the total conservation program now on the land. Technical assistance by the Soil Conservation Service to landowners and operators for planning and applying conservation measures is provided through soil and water conservation districts.

Soil surveys are being conducted for the interpretation of capabilities and limitations of the soils for agricultural and for non-agricultural purposes. Modern soil surveys have been published for 17 counties.

The Agricultural Stabilization & Conservation Service Cropland Adjustment Program provides for long-term diversion of land from the production of surplus crops to protective conservation uses for the immediate and longtime benefits of all citizens. This program will be discontinued when existing contracts expire. Crop acreage allotment programs have an impact on water and land resource programs. The Agricultural Conservation Program (ACP) is for the purpose of assuring a continued supply of food and fiber resources for the maintenance of a strong and healthy people and economy, and to provide for environmental conservation or enhancement.

Public Law 83-566, the Watershed Protection and Flood Prevention Act, provides for technical and financial assistance to state or local organizations in planning and installing works of improvement on watersheds of 250,000 acres or less. Interest in the small watershed program developed soon after the passage of the Law in 1954.

The Farmers Home Administration has various loan programs which directly assist in the efficient development and management of rural and urban water resources. These include watershed loans to local sponsors to carry out their responsibilities under the small watershed program; soil and water conservation loans directly to landowners to permit them to apply conservation plans on private land; and soil and water association loans to public bodies and associations for development of land and water, rural domestic water supply, and waste disposal systems.

There are five Resource Conservation and Development projects within, or partially within, the study area. These are the West Florida, Suwannee River and Three Rivers Projects in Florida, and the Wiregrass and Coosa Valley Projects in Alabama. There are 29 counties in the project areas. These projects promote the systematic conservation and development of human and natural resources of the counties involved. Plans are developed by governing bodies and soil and water conservation districts with assistance by U.S.D.A. and other Federal, state and local agencies.

Forestry

Three national forests, Apalachicola and Osceola in Florida and Conecuh in Alabama, having a combined acreage of nearly 800,000 acres, are located in the study area. The management of these forests by the Forest Service, U.S. Department of Agriculture, is based on the Multiple Use-Sustained Yield Act of 1960 which confirmed long-standing Forest Service policy to administer the National Forests for outdoor recreation, range, timber, watershed, wildlife, and fish purposes, and the National Environmental Policy Act of 1969 which declared a national policy to encourage productive and enjoyable harmony between man and his environment. Other public forests include three state forests - Blackwater River and Pine Log in Florida, and Geneva in Alabama. These forests are managed for timber production, recreation, and wildlife. The principal military installations, Eglin and Tyndall Air Force Bases in Florida and Fort Rucker in Alabama, are mostly forested.

State forestry organizations cooperate with the U. S. Forest Service to administer programs of environmental protection and improvement, organization management, and resource use and management. These programs give direction for the protection, management, and wise use of all renewable resources; the production of timber and water in ways which will protect the environment, improve wildlife habitat, enhance esthetic values, and furnish outdoor recreation; and the development of rural communities. State universities, forest industries, state forestry organizations, and the U.S. Forest Service cooperate in research and the dissemination of forestry information.

Recreation, Fish and Wildlife

Federal agencies are responsible for the administration of significant areas of land and water within the Basins. These include three national forests, five wildlife refuges, six military reservations, and three reservoirs. Most of these areas are operated on the multiple-use concept and provide opportunities for picnicking, camping, fishing, hunting, and other forms of outdoor recreation.

The states control many smaller areas which include state parks, forests, wildlife management areas, canoe trails, public lakes, and aquatic preserves. These places are more limited to particular types of outdoor recreation dependent upon their purpose.

Corporate woodlands owners frequently permit recreational use of their property at no cost or for a small user fee. Hunting clubs, shooting preserves, fish ponds, campgrounds, and other private and semi-private organizations can provide more recreational opportunities than state and Federal agencies. Federal and state programs supply financial and technical assistance to landowners for development of fish ponds, wildlife areas, and recreational facilities.

Water Resources

The U.S. and State Geological Surveys and the Water Resources Research Institute are currently cooperating in several water resource studies of major importance in the Basins. These agencies continuously collect and publish data on streamflow, groundwater, and quality of water.

Legislation passed by the 1972 Florida Legislature (Chapter 72-299 L.F.) authorized five water management districts in the state. Two of these districts and a portion of the third are in the Northeast Gulf River Basins.

Navigation and Flood Control

The Mobile District office of the U.S. Army Corps of Engineers has responsibility for this agency's work in the Alabama subarea, and for the Florida subarea, west of and including the St. Marks River. The Savannah District includes all of the Georgia subarea and the St. Marys River in Florida. All of the Florida subarea east of the St. Marks River, excluding the St. Marys River, is in the Jacksonville District.

The portion of the Gulf Intracoastal Waterway between the Alabama-Florida line, east to Carrabelle, Florida, is complete. In 1968, the section between St. Marks and Tampa, Florida was authorized. No construction had been initiated through June 1972.

The Apalachicola, Chattahoochee, and Flint River Florida and Georgia Project, consists of channel improvement in the Apalachicola River (104 miles) with a navigation-power dam (Jim Woodruff). The project also has navigation channels up the Flint River to Bainbridge, Georgia, and up the Chattahoochee River to Columbus, Georgia.

Electric Power

The Rural Electric Administration has made financial loans and given other assistance in organization and operation of rural electric cooperatives that operate within the Basins. These cooperatives and private power companies furnish electricity and provide services to their customers, which have done much to improve the standard of living of rural and urban residents.

Education

The Cooperative Extension Service provides educational and organizational assistance to groups and individuals for planning and implementing resource development programs. It provides scientific information, advice, training, and evaluation services to individuals and groups. Its expanding efforts in resource development are expected to have great impact throughout the Basins.

Planning

Regional planning councils or commissions are set up under state legislation. Their purpose is to promote the orderly economic growth and development of the areas they encompass. Their organizational structure gives counties and municipal governing bodies the opportunity to work together on problems that are faced by two or more units of government. There are 18 regional planning councils or commissions in the Basins; 7 in Alabama, 4 in Florida, and 7 in Georgia. These include:

East Alabama Regional Planning and Development Commission
*South Central Alabama Development Commission
*Alabama-Tombigbee River Regional Planning & Development Commission
South Alabama Regional Planning Commission
*Southeast Alabama Regional Planning and Development Commission
Central Alabama Regional Planning and Development Commission
East-Central Alabama Planning and Development Commission
Lower Chattahoochee Area Planning and Development Commission
Southwest Georgia Area Planning and Development Commission
Middle Flint Planning and Development Commission
Heart of Georgia Area Planning and Development Commission
Coastal Plain Area Planning and Development Commission
Slash Pine Area Planning and Development Commission
Coastal Area Planning and Development Commission
Escambia-Santa Rosa (Fla.) Regional Planning Council
North Central Florida Regional Planning Council
*Northwest Florida Development Council
Jacksonville Area Planning Board

Water Management

The Environmental Protection Agency under Section 303e of PL 92-500, has developed final regulations dealing with the State Continuing Planning Process, policies, and procedures and the preparation of State and designated areawide water quality management plans have been published in the Federal Register. These regulations require that the States assume responsibliity for preparation of water quality management plans for the entire State--directly in non-designated areas and indirectly in designated areas through coordination with areawide agencies.

An EPA document, Guidelines for State and Areawide Water Quality Management Program Development, has been prepared to assist State and designated areawide agencies in developing implemental water quality management programs consistent with the requirements set forth in the regulations. These guidelines describe the overall factors which should be taken into account and provide a framework for agencies to use in developing their water quality management programs.

Alabama has published twelve of the fourteen water quality river basin plans and public hearings have been conducted on eleven. Five of these have been submitted to EPA for final approval.

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*Also an Economic Development District

Flood Plain Management

There are several programs that are available for local governments to use in managing or regulating flood plains. The Flood Hazard Analysis program is a cooperative program between the Soil Conservation Service and local governments through which communities are provided flood hazard data and technical assistance in implementing local flood plain management measures. This program is authorized by Section 6 of Public Law 83-566 and other related legislation and executive orders.

Another program that is available to local governments to assist in regulating flood plain development and zoning is the Flood Insurance program as administered by the Federal Insurance Administration (FIA) in the Department of Housing and Urban Development (HUD). This program provides low cost insurance to existing development and at the same time helps prevent future flooding by preventing further development in the flood plain by zoning.

The U. S. Geological Survey has a study underway which delineates all areas subject to flooding by the 100 year frequency storm. This study is nearing completion for most areas of Florida that have 7½ minute quadrangle sheets available. In the Alabama subarea, the study is complete for approximately 75 per cent of the area covered by 7½ minute quadrangle sheets.

The Corps of Engineers makes Flood Plain Information studies for towns and communities along navigable streams, lakes, and coastal areas. These studies are prepared in accordance with the authority granted by Section 206 of the Flood Control Act of 1960 (Public Law 86-645), as amended.

Aquatic Weed Control

State agencies in cooperation with Federal agencies have responsibilities for research and control of noxious aquatic plants in public waters. In Florida, this program is coordinated by the Bureau of Aquatic Plant Research and Control, under the Department of Natural Resources. The Alabama Department of Conservation and Natural Resources has been designated to represent that state.

GLOSSARY OF TERMS

Activity Occasion - Participation by an individual in a specific outdoor recreation activity during any part of a day.

Aggregated Watersheds - Grouping of small watersheds (hydrologic units, as delineated in CNI) into larger units of approximately 250,000 acres to facilitate summarizing data on floodprone areas.

Aquifer - A formation, group of formations or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Artesian Well - A well deriving its water from an artesian or confined water body. The water level in an artesian well stands above the top of the artesian water body it taps.

Astronomical Tide - The normal fluctuation of the tide caused by the position of various astronomical bodies principally the sun and the moon. Tide is the highest when the sun and moon are located on the same side of the earth and are so lined up that their gravitational pull is working together.

Basin - A geographic area drained by a single major stream. The Northeast Gulf contains several basins including the St. Marys, Suwannee, Aucilla, St. Marks, Ochlockonee, Apalachicola, Chattahoochee, Choctawhatchee, Yellow, Blackwater, Escambia and Perdido.

Basins - Northeast Gulf River Basins.

Commercial Farm - Farm with sales of $2,500 or more.

Commercial Forestland - Forest land producing or capable of producing industrial wood and not withdrawn from timber utilization.

Constant Dollars - Dollars of constant purchasing power measured at a specific point in time. In this study, 1972 dollars are used as the base.

CNI - Conservation Needs Inventory.

Consumptive Use - The amount of water transpired by the leaves of the crop and also includes the amount of water evaporated from the adjoining soil surface.

Cropland - Land currently tilled, including cropland harvested, crop failure, idle cropland, cropland in cover crops or soil improvement crops not harvested or pastured, rotation pasture, and cropland being prepared for crops, or newly seeded crops. Cropland also includes land in vegetables and fruits including those grown on farms for home use. Hay is included as cropland.

Cuesta - A hill or ridge with a steep front face and a gentle back slope. The back slope is developed on the dip of gently dipping beds.

Demand - The amount of a commodity that will be bought at each specified price in a given market at a given time.

Design Demand - The level of demand or the portion of peak-day demand, selected as the basis for designing an outdoor recreation system.

Desalinization - The partial or complete removal of salts from a source of water that has excess salts for the use intended.

Employment Ratio - Ratio of number of people employed to total population.

Evapotranspiration - Water withdrawn from an area by evaporation from water, soil, vegetative, and other surfaces, and by transpiration from plants.

Fetch - The length in miles of open water lined up with the prevailing wind. Generally, the longer the fetch the larger the waves for a particular wind velocity.

Forest Land - Land at least 16.7 percent stocked by forest trees of any size and not currently developed for non-forest use.

Stocking - The degree of occupancy of land by trees, measured by basal area or the number of trees in a stand compared to a minimum standard, depending on tree size, to fully utilize the growth potential of the land.

Forest Land Ownership -

1. Farmer-owned lands are either areas operated as a unit of 10 or more acres from which the sale of agricultural products totaled $50 or more annually, or areas operated as a unit of less than 10 acres from which the sale of agricultural products for the year amounted to at least $250.

2. Miscellaneous private lands - corporate, are lands owned by private corporations other than forestry industry.

3. Miscellaneous private lands - individual, are privately owned lands other than forest-industry, farmer-owned, or corporate lands.

4. Forest industry lands - lands owned by companies or individuals operating wood-using plants.

5. National forest lands - Federal lands which have been legally designated as national forests or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Forest Range - Land used for the production of both timber and forage.

Forest Types - Forest type is a classification of forest land based upon the species forming a plurality of live-tree stocking.

Pine types: Forests in which longleaf, slash, loblolly, pond or sand pines, singly or in combination, comprise a plurality of the stocking.

Oak-pine type: Forests in which hardwoods comprise a plurality of the stocking but in which pines make up 25 to 50 percent of the stocking.

Hardwood types: Forests in which hardwoods such as oaks, hickory, gum, or cypress, singly or in combination, comprise a plurality of the stocking, and pine makes up less than 25 percent.

Gross erosion - Total loss of soil by all erosive processes.

Gross irrigation requirement - Includes the net irrigation requirement plus the amount lost due to the efficiency of application.

Growing-stock trees - Live trees of commercial species qualifying as desirable or acceptable trees.

Growing-stock volume - Net volume in cubic feet of growing-stock trees 5.0 inches d.b.h. and over from a 1-foot stump to a minimum 4.0-inch top diameter outside bark of the central stem, or to the point where the central stem breaks into limbs. (net volume in primary forks is included)

Hardwoods - Dicotyledonous trees, usually broad-leaved and deciduous.

Industrial water use - Water used by industry for cooling, processing, and sanitary purposes. May be self-supplied or municipally supplied.

Industrial wood - All round wood products except fuelwood.

Labor Force - Persons 14 years of age and over who are employed or are seeking employment.

Land Capability Classes - A grouping of soils into special units, subclasses, and classes according to their capability for intensive use and the treatments required for sustained use.

<u>Land Resource Areas</u> - Broad, geographic areas having similar soil, climatic, geologic, vegetative and topographic features.

<u>Land Treatment</u> - A pattern of tillage, land use, or land management to alter runoff, reduce sediment production, improve use of drainage and irrigation facilities, or improve plant or animal production.

<u>Land Use</u> - (See table at end of Glossary).

<u>Levee</u> - Man-made dike to prevent flooding of low-lying areas.

<u>Location Quotient</u> - A number, generally in index form, which shows the relative importance of an industry in a local region compared to the importance of that industry in a larger area.

<u>Macroinvertebrates</u> - Animals without a backbone which can be seen with the unaided eye.

<u>Macrophytes</u> - Large aquatic plants.

<u>Mortality</u> - Number or sound-wood volume of live trees dying from natural causes during a specified period.

<u>Natural State</u> - Land within floodprone areas not developed for either urban, commercial, or agricultural purposes. Includes forest land or land reverting to forest cover. Pine plantations, or lands in preparation for reforestation, are not included in this condition.

<u>Net annual growth</u> - The increase in wood volume for a specific year.

<u>Net irrigation requirement</u> - The amount of water needed by the crop for optimum production above the amount supplied by rainfall.

<u>Non-structural measures</u> - Actions that can be taken in lieu of structures or channels to solve floodng problems such as: flood warning, zoning floodprone land out of future residential development and flood insurance.

<u>Miscellaneous</u> - Includes marsh land (not grazed), rural homesites, private farm roads, cattle pen areas, or any other rural area which is not being used for producing agricultural or forest products.

<u>Pasture</u> - Land in grass or other long term forage growth that is used primarily for grazing. Pasture includes grassland, nonforested pasture, and other grazing land. It may contain shade trees or scattered timber trees with less than 10 percent canopy, but the principal plant cover is such as to identify its use primarily as permanent grazing land.

<u>Per Capita Personal Income</u> - Total personal income divided by total population.

Periphyton - Plants growing upon or attached to other plants or often on some non-living support such as rocks, deriving no sustenance from the supporting structure.

Permeability - The capacity of a soil to transmit fluid. The field coefficient of transmissibility divided by the saturated thickness of the aquifer, in feet.

Personal Income - Income from salary disbursements and other labor income, proprietor's income, property income (interest, dividends, and rental income) and government and business transfer payments. Both cash and in-kind income are included from private and government sources. Personal income is measured before tax deductions are made but it does not include personal contributions for social security.

Physiographic Province - Broad areas of similar rocks and similar geologic structure.

Plankton - Organisms of relatively small size, mostly microscopic, that either have relatively small powers of locomotion or drift in the water subject to the action of waves and current.

Poletimber Trees - Growing stock trees of commercial species at least 5.0 inches in diameter at breast height but smaller than sawtimber size.

Principles and Standards - Principles and Standards for Planning Water and Related Land Resources were developed by the Water Resources Council and published September 10, 1973 in the Federal Register Volume 38, Number 174, Part III and became effective October 25, 1973.

Rural Population - All residents not classified as urban.

Saplings - Live trees 1.0 inch to 4.9 inches in diameter at breast height.

Sawtimber trees - Live trees of commercial species containing at least a 12-foot saw log, or two non-contiguous saw logs, each 8 feet or longer, and with at least one-third of the gross boardfoot volume between the one-foot stump and minimum saw-log top being sound. Softwoods must be at least 9.0 inches and hardwoods at least 11.0 inches in diameter at breast height.

Seedlings - Live trees less than 1.0 inch in diameter at breast height that are expected to survive and develop.

Shift-Share Analysis - An analytical technique to measure and classify Basins economic growth over time. Growth may be defined in terms of employment, earnings or income. The technique defines growth in terms of its component parts; namely, growth in the Basins due to overall growth of the national economy, growth due to the industry-mix of the Basins, and growth due to geographic advantages or differences. The latter component is referred to as the regional share component.

Site Class - A classification of forest land in terms of inherent capacity to grow crops or industrial wood based on fully stocked natural stands.

Class 1: Sites capable of producing 165 or more cubic feet per acre annually.

Class 2: Sites capable of producing 120 to 165 cubic feet per acre annually.

Class 3: Sites capable of producing 85 to 120 cubic feet per acre annually.

Class 4: Sites capable of producing 50 to 85 cubic feet per acre annually.

Class 5: Sites incapable of producing 50 cubic feet per acre annually, but excluding unproductive sites.

Softwoods - Coniferous trees, usually evergreen, having needles or scale-like leaves.

Pines: Yellow pine species which include slash, longleaf, loblolly, sand, pond and spruce pine.

Other Softwoods: Cypress, eastern redcedar and white cedar.

Soil Resource Group - A grouping of soils that have similar cropping patterns, yield characteristics, and responses to fertilizers, management and land treatment measures.

Standard Industrial Classification (SIC) - The classification of establishments, published by the Office of Management and Budget, by major type of industrial activity in which they are engaged.

Stand Size - Stand size is a classification of forest land based on the size class of growing-stock trees on the area.

Sawtimber stands are at least 16.7 percent stocked with growing stock trees, with half or more of the total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands are at least 16.7 percent stocked with growing-stock of trees of which half or more of this stocking is in pole-timber and sawtimber trees, and with poletimber exceeding that of sawtimber.

Sapling-seedling stands are at least 16.7 percent stocked with growing-stock trees of which more than half of the stocking is saplings and seedlings.

State Subarea - That portion of the state located within the Northeast Gulf River Basins.

Structural Measures - Measures that will delay, reduce, or control erosion or flood flows. These measures include water management structures, channel improvements, levees, diversion channels, and gully structures.

Sub-basins - Tributaries that make up the major river basins. These areas form confluences with major rivers before they reach the Ocean.

Supply - The amount of a commodity that sellers offer at each specified price in a given market at a given time.

Supply of Outdoor Recreation - The capacity of outdoor recreation facilities with given conditions of price, accessibility and quality.

Tourist - An out-of-state resident who stays at least one night in the state for reasons other than strictly business transactions. Visitors on shopping trips, those in transit to points outside the U. S., military personnel and students were not classified as tourists.

Type 4 River Basin Study - A state sponsored survey of water and related land resources for all or part of a state, in which one or more Federal agencies participate.

Urban and built-up areas - Cities, villages, residential, commercial, and industrial developments of more than 10 acres, industrial sites, railroad yards, cemeteries, airports, golf courses, institutional and public administrative sites, and road rights-of-way.

Urban Population - All persons living in urbanized areas or in places of 2,500 inhabitants or more outside urbanized areas. Places may be either incorporated or unincorporated.

User-Occasion - Participation by an individual in a specific outdoor recreation activity during any part of a day.

Watershed - All lands enclosed by a continuous hydrologic drainage divide and lying upslope from a specified point on a stream. Watersheds were delineated as a part of the 1967 Conservation Needs Inventory.

Wetlands - Areas which are subject to permanent or prolonged periods of inundation or saturation and exhibit vegetative communities or soil types characteristic of this hydroperiod.

LAND USE - Correlation of Northeast Gulf Land Use System with Florida Classification System

FLORIDA LAND USE AND COVER CLASSIFICATION SYSTEM	LAND USE AS PRESENTED IN NORTHEAST GULF INTERIM REPORT
100 - Urban or Built-up	Presented by sub-basins and States. No breakdown below Level I of Florida classification system.
200 - Agriculture	
210 - Cropland and Pastureland	Presented separately by sub-basins and States for 1972. Presented by States for 1990 and 2020.
211 & 212 - Row Crops and Field Crops	Presented by crops for 1972, 1990, and 2020 for Alabama and Florida subarea.
213 - Improved pasture	Presented for 1972, 1990, and 2020 for Alabama and Florida subareas.
300 - Rangeland	Very small percentage of area identified as rangeland - included with miscellaneous if not grazed, pasture if grazed, or forest if reverted to trees.
400 - Forested Uplands	Forested Uplands and bottomlands are included in forest types by acres. These are delineated comparable to Level III. The bottomland forests are also included in the Wetlands category. Total forestland is included in land use section 1972 and is broken down to sub-basin level.
500 - Water	Water area presented by sub-basins and States. Water area by counties available from census. For floodprone areas, open water, fresh and salt is presented by aggregated watersheds, sub-basins, basins, and States. Not broken down below Level I.
600 - Wetlands - This includes pond pine which Northeast Gulf Study included in forestland	Wetlands present in manner similar to Florida State report except for Wetlands - Coniferous Forest which is included in Freshwater Swamps (Level III). The breakdown is by counties and sub-basins and includes land which has been altered.
700 - Barren Land	Included with miscellaneous land.

LEGEND

SOILS OF THE LOW COASTAL RIDGES

1 KUREB-LAKELAND association: Nearly level to sloping, excessively drained sandy soils that are sandy throughout.

2 ST. LUCIE-KUREB-RIMINI association: Nearly level to sloping, excessively drained sandy soils that are sandy throughout or that have thick sandy layers over weakly cemented sand subsoil.

SOILS OF THE COASTAL PLAIN UPLAND SAND HILLS

3 ARREDONDO-GAINESVILLE-KENNEY association: Nearly level to sloping, well drained sandy soils that are sandy throughout and sandy soils that have very thick sandy layers over loamy subsoil.

4 BLANTON-SUSQUEHANNA-WAGRAM association: Nearly level and gently sloping, well drained sandy soils that are sandy throughout; somewhat poorly drained soils that have thin sandy layers over clayey subsoils; and well drained sandy soils that have very thick sandy layers over loamy subsoils.

5 BLANTON-WAGRAM association: Nearly level and gently sloping, well drained soils that are sandy throughout and well drained sandy soils that have thick sandy layers over loamy subsoils.

6 CHIEFLAND-LAKELAND-HERNANDO association: Nearly level and gently sloping, excessively drained soils that are sandy throughout and well drained soils that have thick sandy layers over clayey subsoils.

7 LAKELAND-TROUP-ALAPAHA association: Nearly level to sloping, excessively drained soils that are sandy throughout; well drained soils that have very thick sandy layers over loamy subsoils; and nearly level poorly drained soils that have thick sandy layers over loamy subsoil.

8 TROUP-EUSTIS-PLUMMER association: Nearly level and gently sloping, well drained soils that have very thick sandy layers over loamy subsoil; somewhat excessively drained soils that are sandy throughout; and poorly drained soils that have very thick sandy layers over loamy subsoils.

9 TROUP-LAKELAND-DOTHAN association: Nearly level to sloping, well drained soils that have very thick sandy layers over loamy subsoils; excessively drained soils that are sandy throughout and well drained soils that have a thin sandy layer over loamy subsoils.

10 TROUP-FUQUAY-LUCY association: Nearly level and gently sloping, well drained soils that have very thick sandy layers over loamy subsoils and well drained soils that have thick sandy layers over loamy subsoils.

11 TROUP-SMITHDALE-MALBIS-ESCAMBIA association: Nearly level and gently sloping, well drained soils that have very thick sandy layers over loamy subsoils and well drained soils that have thin sandy layers over loamy subsoils.

SOILS OF THE UNDULATING COASTAL PLAIN UPLANDS

12 DOTHAN-FACEVILLE-RED BAY association: Nearly level and gently sloping, well drained soils that have thin sandy layers over loamy or clayey subsoils.

13 DOTHAN-FUQUAY-WAGRAM association: Nearly level and gently sloping, well drained soils which have thin to very thick sandy layers over loamy subsoils.

14 DOTHAN-ORANGEBURG-ESTO association: Nearly level and gently sloping, well drained soils that have thin sandy layers over loamy subsoils and sloping to steep well drained soils that have thin sandy layers over clayey subsoils.

15 DOTHAN-ORANGEBURG-FUQUAY association: Nearly level and gently sloping, well drained soils that have thin to thick sandy layers over loamy subsoils.

16 FACEVILLE-TIFTON-PELHAM association: Nearly level and gently sloping, well drained soils that have thin sandy or loamy layers over loamy or clayey subsoils and nearly level, poorly drained soils that have thick sandy layers over loamy subsoil.

17 FUQUAY-LEEFIELD-PELHAM association: Nearly level and gently sloping, well drained soils that have thick sandy layers over loamy subsoils; somewhat poorly drained soils that have thick sandy layers over loamy subsoils and poorly drained soils that have thick sandy layers over loamy subsoils.

18 MALBIS-RED BAY-GRADY association: Nearly level to sloping, well drained soils that have thin sandy or loamy layers over loamy subsoils and very poorly drained soils that have thin loamy layers over clayey subsoils.

19 ORANGEBURG-DOTHAN-LUVERNE-RED BAY association: Nearly level and gently sloping, well drained soils that have thin sandy or loamy layers over loamy subsoils and gently sloping to steep, well drained soils that have thin loamy layers over clayey subsoils.

20 ORANGEBURG-RED BAY-DOTHAN-TROUP association: Nearly level and gently sloping, well drained soils that have thin to thick sandy or loamy layers over loamy subsoils.

21 POARCH-BENNDALE-ESCAMBIA association: Nearly level to sloping, well drained soils that have thin loamy layers over loamy subsoils.

22 RED BAY-ORANGEBURG-DOTHAN association: Nearly level and gently sloping soils that have thin sandy or loamy layers over loamy subsoils.

23 SUMTER-OKTIBBEHA-TRINITY association: Nearly level to sloping, moderately well drained fine textured soils that are calcareous near the surface.

24 TIFTON-ALAPAHA association: Nearly level and gently sloping, well drained soils that have thin sandy or loamy layers over loamy subsoils and nearly level, poorly drained soils that have thick sandy layers over loamy subsoils.

25 TIFTON-CARNEGIE-OSIER association: Nearly level and gently sloping, well drained soils that have thin loamy layers over loamy or clayey subsoils and nearly level, very poorly drained soils that are sandy throughout.

26 TIFTON-DOTHAN-ALAPAHA association: Nearly level and gently sloping, well drained soils that have thin sandy or loamy layers over loamy subsoils and nearly level, poorly drained soils that have thick sandy layers over loamy subsoils.

27 TIFTON-FUQUAY-PELHAM association: Nearly level and gently sloping, well drained soils that have thin to thick sandy or loamy layers over loamy subsoils and poorly drained soils that have thick sandy layers over loamy subsoils.

SOILS OF THE ROLLING AND HILLY COASTAL PLAIN UPLANDS

28 BOSWELL-LUVERNE-QUITMAN-SMITHDALE association: Sloping to steep, moderately well drained and well drained soils that have thin loamy layers over clayey or loamy subsoils and nearly level to gently sloping somewhat poorly drained soils that have thin loamy layers over loamy subsoils.

29 BOSWELL-SUSQUEHANNA association: Sloping to steep, moderately well drained and somewhat poorly drained soils that have thin loamy layers over clayey subsoils.

30 LAKELAND-CUTHBERT-SHUBUTA association: Strongly sloping to steep, excessively drained soils that are sandy throughout and strongly sloping to steep, well drained and moderately well drained soils that have thin loamy layers over clayey subsoils.

31 LUVERNE-SMITHDALE-BOSWELL association: Sloping to steep, well drained and moderately well drained soils that have thin loamy layers over clayey or loamy subsoils.

32 TROUP-LUVERNE-DOTHAN-ORANGEBURG association: Sloping to strongly sloping, well drained soils that have very thick sandy layers over loamy subsoils and sloping to strongly sloping, well drained soils that have thin loamy layers over loamy or clayey subsoils.

33 TROUP-SMITHDALE-ESTO association: Sloping to strongly sloping, well drained soils that have very thick sandy layers over loamy subsoils, sloping, well drained soils that have thin loamy layers over loamy subsoil and sloping to steep, well drained soils that have thin sandy layers over clayey subsoil.

33a TIFTON-LAKELAND-CUTHBERT association: Sloping, well drained soils that have thin sandy or loamy layers over loamy subsoils, sloping and strongly sloping excessively drained soils that are sandy throughout and moderately well drained soils that have thin loamy layers over clayey subsoils.

33b SUSQUEHANNA-CUTHBERT-SHUBUTA association: Sloping to strongly sloping, somewhat poorly drained, moderately well drained and well drained soils that have thin loamy layers over clayey subsoils.

SOILS OF THE PIEDMONT PLATEAU

34 APPLING-CECIL-LLOYD association: Sloping and strongly sloping, well drained soils that have thin loamy layers over clayey subsoils.

35 LLOYD-CECIL-APPLING association: Sloping and strongly sloping, well drained soils that have thin loamy layers over clayey subsoils.

36 MUSELLA-GWINNETT-HIWASSEE association: Strongly sloping to steep, well drained soils that have thin loamy layers over clayey or loamy subsoils.

SOILS OF THE COASTAL PLAIN LOWLANDS

37 ARDILLA-STILSON-CHIPLEY association: Nearly level and gently sloping, somewhat poorly drained soils that have thin loamy layers over loamy subsoil, moderately well drained soils that have thick sandy layers over loamy subsoils and moderately well drained soils that are sandy throughout.

37a GOLDSBORO-LYNCHBURG-RAINS association: Nearly level and gently sloping, moderately well drained, somewhat poorly drained and poorly drained soils that have thin loamy layers over loamy subsoils.

38 COXVILLE association: Nearly level, poorly drained soil that has thin loamy layers over clayey subsoils.

38a PANTEGO-STILSON association: Nearly level and gently sloping, very poorly drained and moderately well drained soils that have thin sandy layers over loamy subsoils.

39 BLANTON-CHIPLEY-SURRENCY association: Nearly level and gently sloping, well drained soils that have very thick sandy layers over loamy subsoils, moderately well drained soils that are sandy throughout and very poorly drained soils that have thick sandy layers over loamy subsoils.

40 BLANTON-LEON-OSIER association: Nearly level, well drained soils that have very thick sandy layers over loamy subsoils, poorly drained soils that have thick sandy layers over weakly cemented sandy subsoils and poorly drained soils that have loose sandy layers throughout.

41 CHIPLEY-ALBANY-LEON-BLANTON association: Nearly level and gently sloping, moderately well drained soils that are sandy throughout, somewhat poorly drained and well drained soils that have very thick sandy layers over loamy subsoils and poorly drained soils that have thick sandy layers over weakly cemented sandy subsoils.

42 CHIPLEY-SCRANTON association: Nearly level, moderately well drained and somewhat poorly drained soils that are sandy throughout.

43 LEEFIELD-PELHAM association: Nearly level and gently sloping, somewhat poorly drained and poorly drained soils that have thick sandy layers over loamy subsoils.

44 LEON-PLUMMER-RUTLEGE association: Nearly level, poorly drained soils that have thick, loose sandy layers over weakly cemented sandy subsoils, very thick sandy layers over loamy subsoils or are sandy throughout.

45 LEON-PLUMMER-SURRENCY association: Nearly level, poorly drained soils that have thick sandy layers over weakly cemented sandy subsoils and very thick sandy layers over loamy subsoils and very poorly drained soils that have thick sandy layers over loamy subsoils.

46 MANATEE-FELDA association: Nearly level, very poorly drained soil with thin sandy layers over loamy subsoil and poorly drained soil with thick sandy layers over loamy subsoil.

47 MASCOTTE-ALAPAHA-PELHAM association: Nearly level, poorly drained soils that have thick loose sandy layers over a weakly cemented sandy layer and loamy subsoil and poorly drained soils that have thick sandy layers over loamy subsoils.

48 MASCOTTE-LEON-PLUMMER association: Nearly level, poorly drained soils that have thick loose sandy layers over a weakly cemented sandy layer or loamy subsoil or both.

49 MASCOTTE-PELHAM-OLUSTEE association: Nearly level, poorly drained soils that have thin or thick loose sandy layers over a weakly cemented sandy layer and loamy subsoil and poorly drained soils that have thick sandy layers over loamy subsoils.

50 MASCOTTE-PLUMMER-RUTLEGE association: Nearly level, poorly drained soils that have thick loose sandy layers over a weakly cemented sandy layer and loamy subsoil and poorly drained soils that have very thick sandy layers over loamy subsoil or are sandy throughout.

51 PELHAM-RUTLEGE-ALAPAHA association: Nearly level, poorly drained soils that have thick sandy layers over loamy subsoils or are sandy throughout.

52 REX-BLANTON-LEON association: Nearly level and gently sloping soils that have thick to very thick sandy layers over loamy subsoils and poorly drained soils that have thick loose sandy layers over weakly cemented sandy subsoils.

53 SCRANTON-PLUMMER association: Nearly level somewhat poorly drained and poorly drained soils that are sandy throughout or that have very thick sandy layers over loamy subsoils.

SOILS OF STREAM BOTTOMLANDS

54 BIBB-MYATT-LEAF association: Nearly level, poorly drained soils that are silty or loamy throughout and poorly drained soils that have a thin silty layer over clayey subsoil.

55 BIBB-MANTACHEE association: Nearly level, poorly drained and somewhat poorly drained soils that are loamy throughout.

56 JOHNSTON-RAINS association: Nearly level, very poorly drained and poorly drained soils that are loamy throughout.

57 MYATT-CAHABA-CHEWACLA association: Nearly level, poorly drained soils that are loamy throughout and nearly level to gently sloping well drained soils that have a thin loamy layer over loamy subsoil.

58 MYATT-CHEWACLA-WICKHAM association: Nearly level, poorly drained soils that are loamy throughout and nearly level to gently sloping, well drained soils that have thin loamy layers over loamy subsoils.

59 OSIER-BIBB association: Nearly level, poorly drained soils that are sandy or loamy throughout.

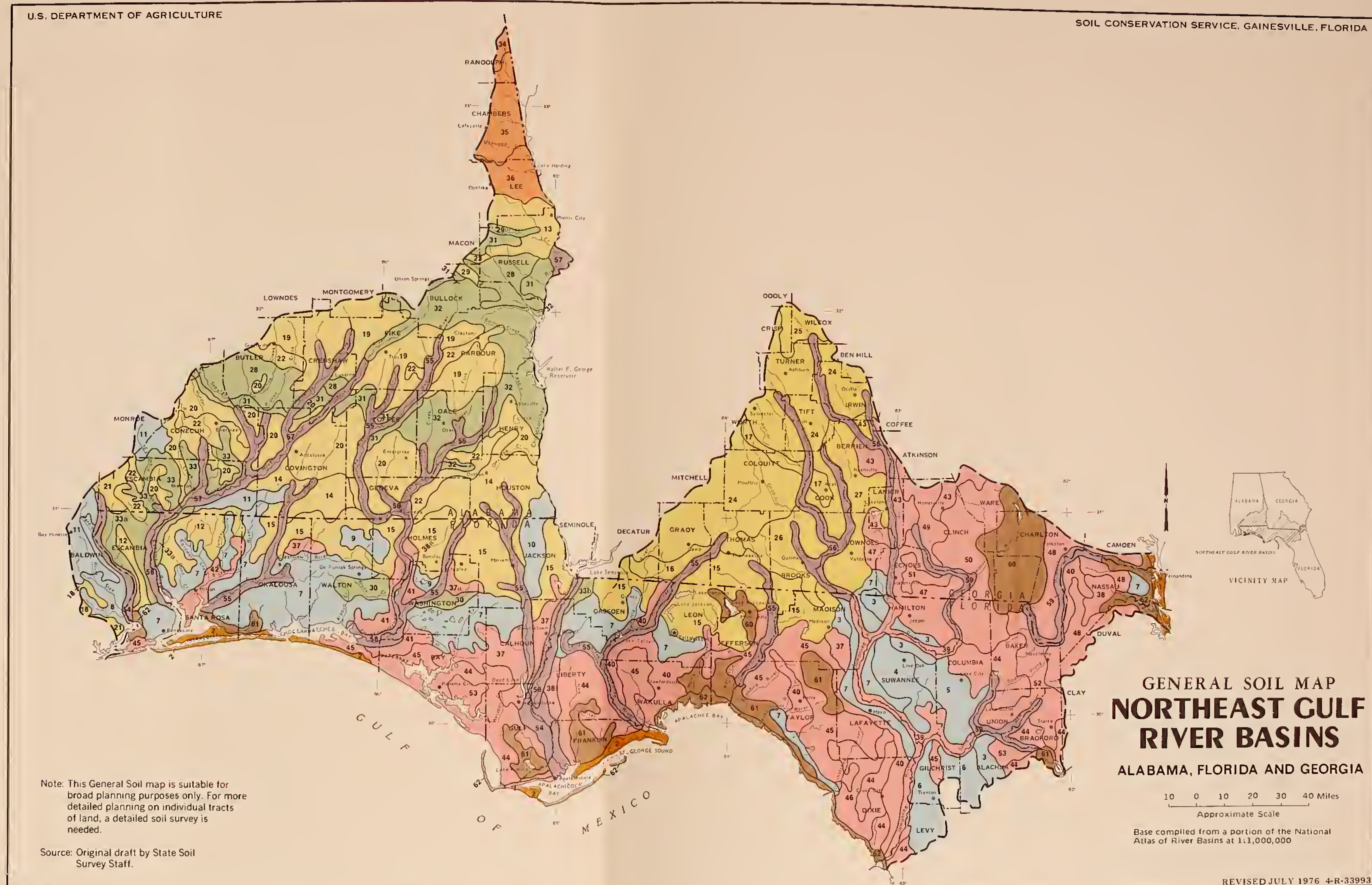
SOILS OF SWAMPS AND MARSHES

60 SWAMP-ISTOKPOGA association: Nearly level, very poorly drained sandy, loamy and organic soils.

61 FRESHWATER SWAMPS AND MARSHES association: Nearly level, very poorly drained sandy, loamy and organic soils.

62 SALTWATER SWAMPS AND MARSHES association: Nearly level, very poorly drained sandy, loamy and organic soils that are near saltwater and are flooded by tidal waters.

REVISED JULY 1976 4-R-33993-A



USDA-SCS-FORT WORTH TEXAS 1976
REVISED JUNE 1974
4-R-31988

INTERPRETATIONS BY SOIL ASSOCIATION

Soil association & map symbol	Percent of soil association	Soil Features			Limitation or hazard		
		Slope (percent)	Natural drainage	Flood prone	Erosion	Community Development	Cropland
1.							
Kureb	50	0-8	Excessive	None	Slight	Slight	Severe(1,2,3,4)[1/]
Lakeland	40	0-8	Excessive	None	Slight	Slight	Severe(1,2,3,4)
Other	10				(wind)		
2.							
St. Lucie	55	0-8	Excessive	None	Slight	Slight	Severe(1,2,3,4)
Kureb	25	0-8	Excessive	None	Slight	Slight	Severe(1,2,3,4)
Rimini	10	0-8	Excessive	None	Slight	Slight	Severe(1,2,3,4)
Other	10				(wind)		
3.							
Arredondo	45	0-8	Well	None	Slight	Slight	Moderate(1,3,4)
Gainesville	25	0-8	Well	None	Slight	Slight	Moderate(1,3,4)
Kenny	15	0-8	Well	None	Slight	Slight	Moderate(1,3,4)
Other	15						
4.							
Blanton	55	0-5	Well	None	Slight	Slight	Moderate(2,4)
Susquehana	30	0-5	Somewhat poor	None	Severe	Severe (5,6)	Severe (2,7)
Wagram	10	0-5	Well	None	Slight	Slight	Slight
Other	5						
5.							
Blanton	65	0-5	Well	None	Slight	Slight	Moderate(2,4)
Wagram	25	0-5	Well	None	Slight	Slight	Slight
Other	10						
6.							
Chiefland	45	0-5	Somewhat excessive	None	Slight	Moderate	Moderate(2,4)
Lakeland	30	0-5	Excessive	None	Slight	Slight	Severe(1,2,3,4)
Hernando	20	0-5	Well	None	Slight	Slight	Slight
Other	5						
7.							
Lakeland	70	0-8	Excessive	None	Slight	Slight	Moderate(1,2,3,4)
Troup	15	0-5	Well	None	Slight	Slight	Moderate(1,2,3,4)
Alapaha	10	0-2	Poor	Yes	Slight	Severe (8,10)	Severe(8,9,10)
Other	5						

1/ See page 10 for explanation of numbers.

Soil association & map symbol	Percent of soil association	Soil Features			Limitation or hazard		
		Slope (percent)	Natural drainage	Flood prone	Erosion	Community Development	Cropland
8.							
Troup	55	0-5	Well	None	Slight	Slight	Moderate(1,2,3,4)
Eustis	25	0-5	Somewhat excessive	None	Slight	Slight	Moderate(1,2,3,4)
Plummer	15	0-2	Poor	Yes	Slight	Severe (8,10)	Moderate (8)
Other	5						
9.							
Troup	40	0-8	Well	None	Slight	Slight	Moderate(1,2,3,4)
Lakeland	35	0-8	Excessive	None	Slight	Slight	Severe(1,2,3,4)
Dothan	15	0-8	Well	None	Slight	Slight	Slight
Other	10						
10.							
Troup	40	0-5	Well	None	Slight	Slight	Moderate(1,2,3,4)
Fuquay	20	0-5	Well	None	Slight	Slight	Slight
Lucy	20	0-5	Well	None	Slight	Slight	Slight
Other	20						
11.							
Troup	25	0-5	Well	None	Slight	Slight	Moderate(1,2,3,4)
Smithdale	15	0-5	Well	None	Slight	Slight	Slight
Malbis	10	0-5	Moderately well	None	Slight	Slight	Slight
Escambia	5	0-5	Somewhat poorly	None	Slight	Moderate (6,8)	Slight
Other	45						
12.							
Dothan	45	0-5	Well	None	Slight	Slight	Slight
Faceville	30	0-5	Well	None	Slight	Slight	Slight
Red Bay	15	0-5	Well	None	Slight	Slight	Slight
Other	10						
13.							
Dothan	30	0-5	Well	None	Slight	Slight	Slight
Fuquay	15	0-5	Well	None	Slight	Slight	Slight
Wagram	5	0-5	Well	None	Slight	Slight	Slight
Other	50						

Soil association & map symbol	Percent of soil association	Soil Features			Limitation or hazard		
		Slope (percent)	Natural drainage	Flood prone	Erosion	Community Development	Cropland
14.							
Dothan	40	0-5	Well	None	Slight	Slight	Slight
Orangeburg	20	0-5	Well	None	Slight	Slight	Slight
Esto	10	5-12	Well	None	Severe	Severe (6)	Severe(7,11)
Other	30						
15.							
Dothan	50	0-5	Well	None	Slight	Slight	Slight
Orangeburg	25	0-5	Well	None	Slight	Slight	Slight
Fuquay	10	0-5	Well	None	Slight	Slight	Slight
Other	15						
16.							
Faceville	40	0-5	Well	None	Slight	Slight	Slight
Tifton	30	0-5	Well	None	Slight	Slight	Slight
Pelham	10	0-2	Poor	Yes	Slight	Severe (8,10)	Moderate(8,10)
Other	20						
17.							
Fuquay	40	0-5	Well	None	Slight	Slight	Slight
Leefield	25	0-2	Somewhat poor	None	Slight	Moderate(8)	Slight
Pelham	20	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,10)
Other	15						
18.							
Malbis	35	0-8	Moderately well	None	Slight	Slight	Slight
Red Bay	30	0-5	Well	None	Slight	Slight	Slight
Grady	20	0-2	Very poor	Yes	Slight	Severe(8,10)	Severe(8,10)
Other	15						
19.							
Orangeburg	40	0-5	Well	None	Slight	Slight	Slight
Dothan	30	0-5	Well	None	Slight	Slight	Slight
Luverne	15	2-12	Well	None	Moderate to severe	Moderate (5,6)	Moderate to severe (7,11)
Red Bay	10	0-5	Well	None	Slight	Slight	Slight
Other	5						
20.							
Orangeburg	35	0-5	Well	None	Slight	Slight	Slight
Red Bay	20	0-5	Well	None	Slight	Slight	Slight
Dothan	15	0-5	Well	None	Slight	Slight	Slight
Troup	10	0-5	Well	None	Slight	Slight	Moderate(1,2,3,4)
Other	10						

Soil association & map symbol	Percent of soil association	Soil Features			Limitation or hazard		
		Slope (percent)	Natural drainage	Flood prone	Erosion	Community Development	Cropland
21.							
Poarch	35	0-8	Well	None	Slight	Slight	Slight
Benndale	30	0-8	Well	None	Slight	Slight	Slight
Escambia	20	0-5	Somewhat poorly	None	Slight	Moderate (6,8)	Slight
Other	15						
22.							
Red Bay	35	0-5	Well	None	Slight	Slight	Slight
Orangeburg	30	0-5	Well	None	Slight	Slight	Slight
Dothan	25	0-5	Well	None	Slight	Slight	Slight
Other	10						
23.							
Sumter	35	2-8	Well	None	Severe	Moderate(6)	Moderate(7)
Oktibbeha	15	2-6	Moderately well	None	Moderate	Severe(5,6)	Moderate(7)
Trinity	10	0-2	Somewhat poor	Yes	Slight	Severe(5,6, 10)	Severe(10)
Other	40						
24.							
Tifton	45	0-5	Well	None	Slight	Slight	Slight
Alapaha	35	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,9,10)
Other	20						
25.							
Tifton	45	0-5	Well	None	Slight	Slight	Slight
Carnegie	20	0-5	Well	None	Slight	Slight	Slight
Osier	15	0-5	Poor	Yes	Slight	Severe(8,10)	Severe(8,10)
Other	20						
26.							
Tifton	45	0-5	Well	None	Slight	Slight	Slight
Dothan	20	0-5	Well	None	Slight	Slight	Slight
Alapaha	15	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,9,10)
Other	20						
27.							
Tifton	40	0-5	Well	None	Slight	Slight	Slight
Fuquay	20	0-5	Well	None	Slight	Slight	Slight
Pelham	20	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,10)
Other	20						
28.							
Boswell	30	8-17	Moderately well	None	Severe	Severe(5,6)	Severe(7,11)
Luverne	20	5-8	Well	None	Moderate	Moderate(5,6)	Moderate(7,11)
Quitman	15	0-5	Somewhat poor	Yes	Slight	Severe (8,9)	Moderate (8,9)
Smithdale	10	0-5	Well	None	Slight	Slight	Slight
Other	25						

Soil association & map symbol	Percent of soil association	Soil Features			Limitation or hazard		
		Slope (percent)	Natural drainage	Flood prone	Erosion	Community Development	Cropland
29.							
Boswell	35	8-17	Moderately well	None	Severe	Severe(5,6)	Severe(7,11)
Susquehanna	20	5-15	Somewhat poor	None	Severe	Severe(5,6)	Severe(7,11)
Other	45						
30.							
Lakeland	40	8-25	Excessive	None	Moderate	Severe(11)	Severe(11)
Cuthbert	15	8-25	Moderately well	None	Severe	Severe(6,11)	Severe(7,11)
Shubuta	15	8-25	Well	None	Severe	Severe(6,11)	Severe(7,11)
Other	30						
31.							
Luverne	25	5-8	Well	None	Moderate	Moderate(5,6)	Moderate(7,11)
Smithdale	15	5-8	Well	None	Moderate	Slight	Slight
Boswell	10	8-17	Moderately well	None	Severe	Severe(5,6)	Severe(7,11)
Other	50						
32.							
Troup	25	5-12	Well	None	Severe	Moderate(11)	Severe(1,2,3,4, 11)
Luverne	20	5-8	Well	None	Severe	Moderate(5,6)	Moderate(7,11)
Dothan	15	5-10	Well	None	Moderate	Slight	Moderate(7,11)
Orangeburg	15	5-12	Well	None	Moderate	Moderate(11)	Moderate(7,11)
Other	25						
33.							
Troup	20	5-12	Well	None	Severe	Moderate(11)	Severe(1,2,3,4, 11)
Smithdale	15	5-8	Well	None	Moderate	Slight	Slight
Esto	10	5-12	Well	None	Severe	Severe(6)	Severe(7,11)
Other	55						
33a.							
Tifton	40	5-12	Well	None	Severe	Slight	Moderate(7,11)
Lakeland	30	5-12	Excessive	None	Slight	Slight	Severe(1,2,3,4)
Cuthbert	20	8-17	Moderately well	None	Severe	Moderate(6)	Severe(2,7,11)
Other	10						
33b.							
Susquehanna	50	5-12	Somewhat poorly	None	Severe	Severe(5,6)	Severe(2,7)
Cuthbert	25	8-17	Moderately well	None	Severe	Moderate(6)	Severe(2,7,11)
Shubuta	15	8-12	Well	None	Severe	Severe(5,6)	Severe(2,7,11)
Other	10						

Soil association & map symbol	Percent of soil association	Soil Features			Limitation or hazard		
		Slope (percent)	Natural drainage	Flood prone	Erosion	Community Development	Cropland
34.							
Appling	30	5-10	Well	None	Moderate	Moderate(6)	Moderate(7,11)
Cecil	25	5-10	Well	None	Moderate	Moderate(6)	Moderate(7,11)
Lloyd	20	5-10	Well	None	Moderate	Moderate(6)	Moderate(7,11)
Other	25						
35.							
Lloyd	65	5-10	Well	None	Moderate	Moderate(6)	Moderate(7,11)
Cecil	15	5-10	Well	None	Moderate	Moderate(6)	Moderate(7,11)
Appling	10	5-10	Well	None	Moderate	Moderate(6)	Moderate(7,11)
Other	10						
36.							
Musella	20	10-15	Well	None	Severe	Severe	Severe(2,7,11)
Gwinnett	15	5-10	Well	None	Moderate	Slight	Moderate(7,11)
Hiwassee	15	5-10	Well	None	Moderate	Moderate(5, 6)	Moderate(7,11)
Other	50						
37.							
Ardilla	40	0-5	Somewhat poorly	Slight	Slight	Severe(8)	Slight
Stilson	35	0-5	Moderately well	None	Slight	Slight	Slight
Chipley	15	0-5	Moderately well	None	Moderate	Moderate(8)	Moderate(2)
Other	10						
37a.							
Goldsboro	40	0-5	Moderately well	None	Slight	Moderate(8)	Slight
Lynchburg	20	0-5	Somewhat poorly	Yes	Slight	Severe(8,10)	Slight
Rains	15	0-2	Poorly	Yes	Slight	Severe(8,10)	Moderate(8,10)
Other	25						
38.							
Coxville	75	0-2	Poorly	Yes	Slight	Severe(8,10)	Severe(8,10)
Other	25						
38a.							
Pantego	55	0-2	Very poor	Yes	Slight	Severe(8,10)	Severe(8,10)
Stilson	25	0-2	Moderately well	None	Slight	Slight	Slight
Other	20						

Soil association & map symbol	Percent of soil association	Soil Features			Limitation or hazard		
		Slope (percent)	Natural drainage	Flood prone	Erosion	Community Development	Cropland
39.							
Blanton	30	0-5	Well	None	Slight	Slight	Moderate(2,4)
Chipley	25	0-5	Moderately well	None	Moderate	Moderate(8)	Moderate(2)
Surrency	25	0-2	Very poor	Severe	Slight	Severe	Severe
Other	30						
40.							
Blanton	60	0-5	Well	None	Slight	Slight	Moderate(2,4)
Leon	25	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Osier	10	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,9,10)
Other	5						
41.							
Chipley	40	0-5	Moderately well	None	Moderate	Moderate(8)	Moderate(2)
Albany	30	0-5	Somewhat poor	No	Moderate	Moderate(8)	Moderate(8)
Leon	15	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Blanton	5	0-5	Well	None	Slight	Slight	Moderate(2,4)
Other	10						
42.							
Chipley	45	0-2	Moderately well	None	Moderate	Moderate(8)	Moderate(2)
Scranton	30	0-2	Somewhat poor	No	Slight	Severe(8)	Moderate(8)
Other	25						
43.							
Leefield	40	0-5	Somewhat poor	None	Slight	Moderate(8)	Slight
Pelham	35	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,10)
Other	25						
44.							
Leon	35	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Plummer	30	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,9,10)
Rutlege	25	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,9,10)
Other	10						
45.							
Leon	55	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Plummer	25	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,9,10)
Surrency	10	0-2	Very Poor	Yes	Slight	Severe(8,10)	Severe(8,9,10)
Other	10						
46.							
Manatee	45	0-2	Very poor	Yes	Slight	Severe(8,10)	Moderate(8,9,10)
Felda	35	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Other	20						

Soil association & map symbol	Percent of soil association	Soil Features			Limitation or hazard		
		Slope (percent)	Natural drainage	Flood prone	Erosion	Community Development	Cropland
47.							
Mascotte	50	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Alapaha	15	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,9,10)
Pelham	15	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,10)
Other	20						
48.							
Mascotte	40	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Leon	35	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Plummer	10	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,9,10)
Other	15						
49.							
Mascotte	40	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Pelham	20	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,10)
Olustee	20	0-2	Poor	None	Slight	Severe(8)	Moderate(8)
Other	20						
50.							
Mascotte	35	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Plummer	25	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,9,10)
Rutlege	20	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,9,10)
Other	20						
51.							
Pelham	45	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,10)
Rutlege	25	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,9,10)
Alapaha	15	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,9,10)
Other	15						
52.							
Rex	55	0-5	Moderately well	None	Moderate	Moderate(6)	Moderate(2,4,7)
Blanton	30	0-5	Well	None	Slight	Slight	Moderate(2,4)
Leon	20	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Other	5						
53.							
Scranton	75	0-2	Somewhat poor	No	Slight	Severe(8)	Moderate(8)
Plummer	15	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,9,10)
Other	10						
54.							
Bibb	25	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,10)
Myatt	20	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,10)
Leaf	20	0-2	Poor	Yes	Slight	Severe(5,6,8,10)	Moderate(8,10)
Other	35						

Soil association & map symbol	Percent of soil association	Soil Features			Limitation or hazard		
		Slope (percent)	Natural drainage	Flood prone	Erosion	Community Development	Cropland
55.							
Bibb	60	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,10)
Mantachee	20	0-2	Somewhat poor	Yes	Slight	Severe(8,10)	Severe(8,10)
Other	20						
56.							
Johnston	40	0-2	Very poor	Yes	Slight	Severe(8,10)	Severe(8,10)
Rains	25	0-2	Poor	No	Slight	Severe(8)	Moderate(8)
Other	35						
57.							
Myatt	25	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,10)
Cahaba	20	0-5	Well	None	Slight	Slight	Slight
Chewacla	10	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,10)
Other	45						
58.							
Myatt	30	0-2	Poor	Yes	Slight	Severe(8,10)	Moderate(8,10)
Chewacla	20	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,10)
Wickham	15	0-5	Well	None	Slight	Slight	Slight
Other	35						
59.							
Osier	40	0-2	Poor	Yes	Slight	Severe(8,9,10)	Severe(8,9,10)
Bibb	30	0-2	Poor	Yes	Slight	Severe(8,10)	Severe(8,10)
Other	30						
60.							
Swamp	60	0-2	Very poor	Yes	Slight	Severe(6,8,10)	Severe(8,9,10)
Istokpoga	25	0-2	Very poor	Yes	Slight	Severe(6,8,10,12)	Severe(8,9,10)
Other	15						
61.							
Fresh water swamps and marshes	75	0-2	Very poor	Yes	Slight	Severe(6,8,10,12)	Severe(8,9,10)
Other	25						
62.							
Salt water swamps and marshes	95	0-2	Very poor	Yes	Slight	Severe(6,8,10,12)	Severe(8,9,10)
Other	5						

KEY PHRASE		EXPLANATION
1	DROUGHTY	Soils holds too little water for plants during dry periods.
2	PRODUCTIVITY	Soils lack the ability to produce high yields with high level management inputs.
3	SEEPAGE	Water moves through the soil so quickly that it affects the specified use.
4	SOIL BLOWING	Soil easily moved and deposited by wind.
5	SHRINK-SWELL	The soil expands on wetting and shrinks on drying, which may cause damage to roads, dams, building foundations, or other structures.
6	LOW STRENGTH	The soil has inadequate strength to support loads.
7	ERODES EASILY	Water erodes soil easily.
8	WETNESS	Soil wet during period of use.
9	FLOODS	Soil temporarily flooded by stream overflow, runoff, or high tides.
10	POOR OUTLETS	Surface or subsurface drainage outlets are difficult or expensive to install.
11	SLOPE	Slope too great.
12	EXCESS HUMUS	Soil contains too much organic matter.

EXECUTIVE SUMMARY OF VOLUME I

NORTHEAST GULF RIVER BASINS

FLORIDA, ALABAMA, AND GEORGIA

COOPERATIVE SURVEY

prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ECONOMIC RESEARCH SERVICE
FOREST SERVICE

in

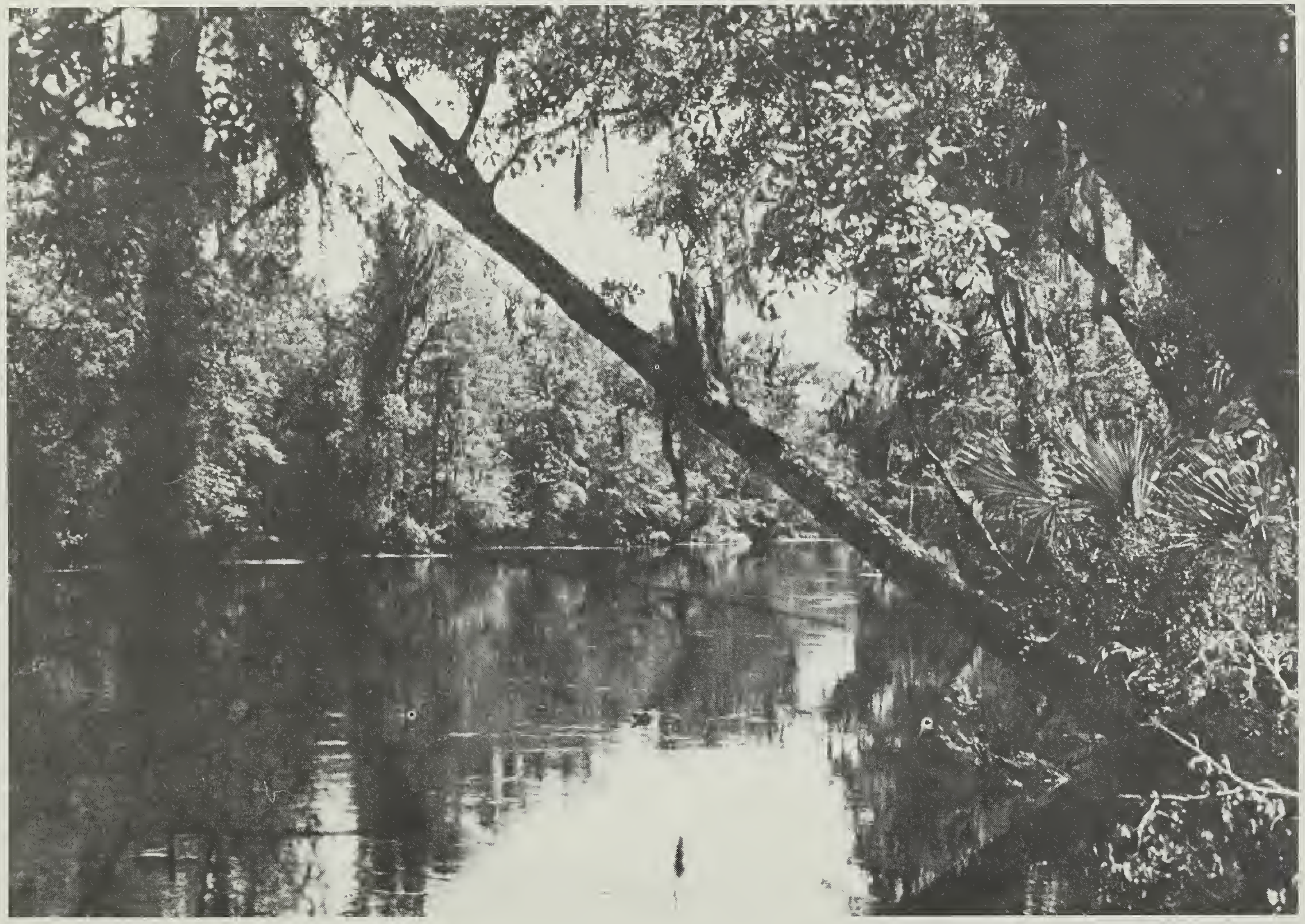
cooperation with

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

and

STATE OF ALABAMA
ALABAMA DEVELOPMENT OFFICE

JUNE 1977



Scenic View
of
St. Marks River, Florida

E X E C U T I V E   S U M M A R Y

O F

V O L U M E   I

Northeast Gulf River Basins
Florida, Alabama and Georgia
Cooperative Survey

Prepared
By

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service
Economic Research Service
Forest Service

In
Cooperation With

STATE OF FLORIDA
Department of Environmental Regulation

And

STATE OF ALABAMA
Alabama Development Office

June 1977

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INTRODUCTION

The U.S.D.A. Cooperative Study for the Northeast Gulf River Basins is being conducted in two phases. Phase I, which is completed and documented in Volume I and its Appendix, includes primarily inventory data and projected use of natural, human, and economic resources and related problems and opportunities. This Executive Summary is a condensation of data collected and developed during Phase I.

The Northeast Gulf River Basins are located in north Florida, southeast Alabama and south Georgia, an area of about 24.8 million acres. Approximately 34 percent of Florida's land and water area is located within the Basins, 22 percent of Alabama's, and 13 percent of Georgia's. The State of Georgia is not a sponsor of the study, hence, only limited amount of data is included in the report for the Georgia subarea.

Participation in this cooperative study by the USDA is under the authority of Section 6, Public Law 83-566 as amended. The principal participating agencies within USDA are the Soil Conservation Service, Economic Research Service, and the Forest Service. The sponsoring state agencies are the Florida Department of Environmental Regulation and the Alabama Development Office.

In order to appraise and evaluate opportunities, problems, and needs, and to reflect society's preference for preservation, conservation, and productive use of the water and land resources of the Basins, the major objectives of the study are:

1. National Economic Development - (NED)

    a. Increase national income
    b. More fully utilize unemployed or underemployed resources

2. Environmental Quality - (EQ)

    a. Preserve and improve the visual quality of the landscape
    b. Preserve and improve the quality of land, air, and water resources for all uses
    c. Preserve and improve the aspects of the environment that relate to human use and interest
    d. Preserve and utilize important ecosystems to maintain and improve environmental quality

ENVIRONMENTAL SETTING AND NATURAL RESOURCES

Major land resource areas - The Northeast Gulf River Basins are comprised of portions of six major land resource areas--geographically located areas characterized by particular patterns of soil, climate, water resources, land use, and type of farming. These six areas in order of decreasing size are: Southern Coastal Plain, Gulf Coast Flatwoods, Atlantic Coast Flatwoods, North Central Florida Ridge, Southern Piedmont, and Alabama and Mississippi Blackland Prairies.

Climate - The climate in the Basins is generally mild and humid and is greatly influenced by the adjacent bodies of water. The average temperature varies from $65^{\circ}F$ in the north to $70^{\circ}F$ in the south. The mean minimum January temperature in the northern portion of the Basins is $34^{\circ}F$ and is $48^{\circ}F$ along the Gulf Coast. The mean maximum temperature in July is fairly uniform throughout the Basins, ranging from $88^{\circ}F$ to $92^{\circ}F$. The average rainfall is 54 inches and varies from 48 inches in the northern portion of the Basins to more than 64 inches in the Florida panhandle; however, the Pensacola area in the past 70 years has experienced extremes of 35 inches and 90 inches. Wind velocity is normally less than 10 miles per hour but has exceeded 100 miles per hour during hurricanes.

Minerals - Some of the minerals which are known to exist in the Basins are bauxite, dolomite, iron ore, kaolin, lignite, limestone, petroleum and natural gas, phosphate, structural clay, sand and gravel, and aluminum silicates. There are probably some undiscovered deposits which may not be feasible for mining now but may be profitable in the future.

Soils - The soils range from strongly sloping well drained in the Piedmont Plateau to very poorly drained in the freshwater and saltwater swamps and marshes along the Gulf and Atlantic coasts. Most of the Alabama subarea is comprised of well drained sloping soils with the exception of stream bottoms which are made up of narrow strips of poorly drained soils. In the Florida subarea, the soils are about evenly divided between well drained and poorly drained. Generally, the well drained soils are adjacent to Alabama and Georgia, and the poorly drained soils are nearer to the coasts and in the east Florida portion. Some of the soils are well suited to a wide variety of uses without special treatment. Others have severe limitations and require intensive treatment and management when used for any purpose. All land use and management programs must ultimately deal with this diversity of soil conditions.

Land Use and Management - Forests occupy most of the Alabama and Florida subareas--approximately 71 percent. The remainder of the area is comprised of cropland (15%), pasture (6%), urban and built-up (3%), miscellaneous (2%), and water (3%).

Most of the cropland in the Basins is located on the higher elevations of the Southern Coastal Plain. Field crops such as corn, peanuts, soybeans, cotton, and small grains are the principal crops, with relatively small vegetable and tobacco acreages. Much of the cropland is on soils having slopes which require one or more management practices to prevent erosion, including such practices as contour stripcropping, minimum tillage, crop rotations, grassed waterways, contour farming, terracing, and diversions.

Wetlands - The wetlands were delineated so that these valuable resources could be identified and preserved. In the past, swamps and marshes have been drained and filled for housing developments, shopping centers, highways, airports, and farms. Such areas naturally aid in filtering pollutants such as pesticides and silt. During wet periods of the year the wetlands help control excess water by providing temporary storage. Slow release of this water helps maintain stream flow. Wildlife such as squirrels, deer, turkey, ducks, and innumerable non-game species spend all or part of their lives in the swamps, sloughs, or marshes.

Of particular importance to Florida are the estuarine areas where fresh water from land drainage is mixed with seawater. Nutrients from land and sea combine to produce more protein than some of the most intensively managed farms. Many commercial fish such as spotted sea trout, mullet, and redfish spend most of their lives in these productive areas as do crabs, oysters, and some species of clams. Several species of commercially important shrimp live and spawn as adults offshore and come to the estuaries as larvae for protection and the abundant food, then return to sea where they mature. Any destruction of the salt marsh means a reduction of commercial and sports fisheries which attract both tourists and residents. The economic considerations alone may be sufficient reasons for preservation of these self-sustaining ecosystems.

Measuring areas of vegetation that are dependent upon a water regime was the method used to ascertain the extent of wetlands in the Florida subarea. The different types of wetlands were distinguished by certain vegetative communities although some overlapping of types is acknowledged. The criteria for the wetland survey in the Alabama subarea are stated in Circular 39, Wetlands of the United States, U. S. Department of Interior.

In the Northeast Gulf River Basins there are approximately 2,621,000 acres of wetlands, of which 2,257,000 are in the Florida subarea and 364,000 in the Alabama subarea. Approximately 53,800 acres of wetlands in the Florida subarea have been converted to other uses.

Surface Water - The runoff from most of the areas in the Basins is high with annual runoff averaging 15-20 inches per year. Abundant surface water is one of the assets of the Basins that should make the area self-sufficient in good quality water for many years into the future. Local water shortages are expected in some areas but in most cases there are potential reservoir sites on nearby streams that can be developed to meet these needs.

There are twelve principal rivers and numerous smaller streams in the Basins. The streams are generally perennial although some of the smaller streams cease to flow during the dry seasons of the year. The Aucilla River in Florida with a drainage area of almost 750 square miles is the largest stream in the Basins that has a record of no-flow sometime during its period of record. Econfina Creek is unique in that the minimum flow of over 2.5 cubic feet per second per square mile is larger than the average flow per square mile for any of the large streams in the Basins. Most streams in Alabama have well defined flood plains while in Florida many streams have poorly defined flood plains, especially those along the Gulf of Mexico east of the Apalachicola River. Due to shorter times of concentration, peak flows for most of the Alabama streams tend to be higher per square mile of drainage area than the streams of Florida.

Ground water - The entire Florida portion of the Basins and extreme southeast Alabama are underlain by a series of hydraulically connected limestone formations. These formations are collectively known in Florida as the Floridan Aquifer. This aquifer is the principal source of high quality ground water.

Highly permeable layers in the different geological formations yield water to wells and springs. As the water passes through the permeable material it picks up dissolved minerals, thereby becoming less potable. As the aquifers approach the coasts, high withdrawal rates permit salt-water to replace the ground water normally in the aquifer.

Water Use - Most of the municipal water comes from ground water supplies. Five counties in the Florida and Alabama sub-areas obtain some or all of their municipal water from surface water sources. Bay County uses 37.4 million gallons per day (mgd) from surface water supplies of which 33 mgd is supplied to industry and commerce. Self supplied industrial water requirements in the Basins exceeded municipal requirements in 1970 by almost 4 to 1. In Florida, most of the industrial water comes from the ground; in Alabama it is mostly from surface sources. One of the largest industrial uses of water in the Basins is for pulp mills. The phosphate mining industry which is expanding in the Basins also uses large quantities.

There are many benefits from small impoundments

Fish and Wildlife - State and national forests, military reservations, and corporate timberlands provide hunting and fishing opportunities as their primary interests allow. State agencies provide leadership in habitat improvement and law enforcement.

Some practices which enhance wildlife habitat are selective timber harvests, controlled burning, and planting of food plots. Game and non-game species benefit from such management practices. Picnicking, bird watching, camping, photography, and hiking are enjoyed in these areas.

Fishing, both salt and freshwater, is one of the most popular pastimes in the study area. Lakes, rivers, estuaries, the Gulf of Mexico, and the Atlantic Ocean are highly productive areas which contribute to the health and well-being of the inhabitants and visitors and are important to the economy.

Aquatic preserves are state-protected coastal areas below mean high tide which have unusually outstanding biological, aesthetic, educational, or scientific value. Public use, such as hunting, fishing, boating, and swimming, is permitted as long as no environmental degradation occurs.

Endangered species of plants and animals are constantly under pressure from highway construction, impoundments, drainage, timber harvesting, pesticides, urbanization, industrial development, pollution, and strip mining. Knowledge of the endangered species and their habitat is necessary for effective land use planning.

HUMAN AND ECONOMIC RESOURCES

The general aspects of the human and economic resources are presented by utilizing secondary data sources compatible between states. The agriculture, forestry, and fisheries sectors are discussed in more detail and both primary and secondary data are utilized. The base year for the study was 1972 and all data are presented for this base year if available.

General Perspective

Population - In 1970 there were 1.59 million people residing within the Basins. Population was 1.28 million in 1950 and 1.44 million in 1960 reflecting a gradual increase of approximately one percent per year. Only 21 of the Basins' 77 counties gained in population at a faster rate than the national average. Almost 96 percent of the Basins' increase occurred in the Florida subarea. This subarea increased in population by 54 percent between 1950 and 1970 while the Alabama and Georgia subareas registered gains of only 1 and 2 percent, respectively. Over two-thirds of the population growth in the Basins occurred in Escambia, Okaloosa, and Leon counties in Florida.

Throughout the U.S. rural population has been on the decline, and this group has made up less than half of the total population for several decades. Nationally, rural population was 40 percent in 1950 and declined to 27 percent by 1970. In the Basins, 48 percent of the population was classified as rural in 1970, down some from the 55 percent in 1960. Over half of the population in both the Alabama and Georgia subareas, however, was still classified as rural in 1970.

Employment - The small change in population, especially in rural areas has been largely a function of the lack of employment opportunities. The civilian labor force increased from 439,100 in 1950 to 556,900 in 1970. Total civilian employment of persons 14 years and older increased from 425,000 to 542,000. Over 90 percent of this gain was in the Florida subarea. Employment in the Alabama and Georgia subareas has changed very little. Large employment gains occurred during this period in manufacturing, educational services, and public administration. The services sector however, was the largest employer in the Basins.

Employment in agriculture, forestry, and fisheries declined from 139,200 in 1950 to 44,200 in 1970. Employment in manufacturing of furniture, lumber and wood products, food and kindred products, railway express, and private households also declined between 1960 and 1970.

Income - Total personal income in the Basins in 1969 was 4.8 billion. The Alabama, Florida, and Georgia subareas represented 27, 56, and 17 percent, respectively. Approximately two-thirds of personal income is from wages and salaries.

The Basins' real income more than doubled in the 1950-1970 period and increased from 56 to 74 percent of the 1970 national average of $4,235. However, 8 of the 66 counties predominantly in the Basins still had per capita incomes of less than half of the national average, and only one county exceeded the national average.

In 1970 there were 406,000 persons whose incomes were below the poverty level. The average family income of this group was only $2,177 which was $1,715 below the poverty level. There was very little variation in this figure in any state subarea. Each state subarea has a higher percentage of poverty families than the state.

Outdoor recreation and tourism - More than half of the outdoor recreational activities are water related. Swimming, diving, fishing, skiing, boating, and other activities indirectly water oriented such as camping and picnicking are by far the most popular forms of outdoor recreation. The Gulf beaches are among the most attractive in the country and are so extensive that the summer tourists can find crowds or solitude as they desire. Winter visitors from many of the northern states and Canada find the beaches to their liking and contribute substantially to the local economies. Salt-water fishing, both estuarine and deep sea, is important to Pensacola, Fort Walton, Destin, Panama City, and Fernandina.

The 1972 official Welcome Station data for Florida indicated that approximately 9 percent of the automobile tourists had destinations within the Florida subarea. All automobile tourists pass through the Alabama or Georgia subarea and continue their trip through the Florida subarea even if the final destination is further south. Bay, Escambia, and Okaloosa counties were the leading destination points within the Basins.

During 1971, tourism contributed more than $4 billion to Florida's economy and made sizable contributions to tax monies. Within the Basins, the impact was somewhat less, but important to the local economy, especially in the Florida subarea.

The Gulf Islands National Seashore which extends from Okaloosa County, Florida, to the Mississippi Delta, was recently established to preserve in their natural state, the undeveloped dunes, shorelines, and estuaries so that they may be enjoyed by all.

William Bartram, one of America's foremost naturalists, traveled extensively through the southern states and the Basins in the Eighteenth Century. These has been a movement in Georgia, Alabama, and Florida to re-establish his trails as a memorial.

Agriculture, Forestry, and Fisheries

Farm Characteristics - Land in farms declined from 12.4 million acres in 1949 to 9.0 million acres in 1969. Much of this land became commercial forest land. During this twenty-year period the number of farms decreased even faster, declining from 89,500 to 35,700. Average farm size increased from 139 acres to 252 acres which was still considerably below the U.S. average of 390 acres. Farms in the Florida subarea averaged 266 acres, while those in Alabama and Georgia subareas averaged 235 and 260 acres, respectively.

Corn is by far the most important crop in terms of acreage in each state subarea. Production has increased from 16.2 million bushels in 1949 to 46.5 million bushels in 1972. Soybeans are the second leading crop in terms of acreage, increasing from 19,000 acres in 1949 to 454,000 acres in 1972. Production in 1972 was 7.9 million bushels, about 20 times the 1949 production. Acreage is largest in the Florida subarea.

Peanuts are the most important crop in terms of sales, and each state subarea had more acreage in 1949 than in 1974. Approximately one-fourth of the U.S. acreage is grown in the Basins. Peanut acreage is allotted and in 1972 there were 361,000 acres harvested.

Cotton acreage declined more than any other crop. In 1949, there were 462,000 acres grown in the Basins while in 1972 there were only 105,000 acres. Tobacco, another allotted crop, was the second leading cash crop grown in 1972 although only 38,400 acres were grown. This represents almost 5 percent of the U.S. total.

Despite declining cropland acreage, the acreage irrigated, although very small, has increased each census year since 1949. In 1969 there were 2,600 farms that irrigated a total of 74,200 acres, the majority of which was in Georgia.

There were approximately one million head of cattle and calves on Basins' farms in 1964 and 1969. However, from 1959 to 1969, sales increased from 329,000 to 499,000 head, and feeder calf production has become very important. The Alabama subarea was the leading subarea representing about 41 percent of both cattle sales and inventories in 1969 and approximately 23 percent of Alabama's cattle sales and inventories.

The number of milk cows in the Basins has declined steadily in each state subarea since 1949. In 1969, there were only 54,000 head, or about 40 percent as many as two decades earlier.

The number of hogs sold increased from 911,000 in 1949 to 1.3 million in 1969. However, during this period, inventories declined. This indicates improved management and higher number of pigs saved per litter in 1969.

In 1969, there were 53.8 million broilers sold compared to 5.4 million in 1954. The number of broilers sold has almost doubled in each five-year period since 1954. The Florida subarea sold over one-half the broilers produced in the Basins in 1969.

Well-managed timberland contributes significantly to the Basins' economy

Forestry - Approximately 13.6 billion cubic feet of timber are growing in the Basins, including more than 40.8 billion board feet of sawtimber. Annual growth produces 733.6 million cubic feet of growing stock of which 2.6 million board feet is sawtimber.

Timber harvesting and land clearing remove approximately 550 million cubic feet of growing stock annually. Sawlogs produced from this harvest yield 1.4 billion board feet of lumber and the remaining volume is converted into pulpwood, piling, posts and other wood products.

Timber stands throughout the Basins can produce an average of 70 cubic feet of wood per acre annually. Current growth rates are between 60 and 80 percent of that capacity. Improved management of private forest tracts can bring about better utilization of the growing capacities of these forest stands over the next 20 to 30 years.

Forest industry activities in the Basins contribute materially to employment, earnings, and personal wages. Annual wages and salaries paid to workers in the forest products industry during 1972 amounted to more than 195 million dollars. The naval stores industry also makes a contribution to the Basins' economy. The current annual production of 118,000 barrels of oleoresin returns about $7.5 million to producers.

Commercial fishing - Commercial fishing is not a large industry in the study area, but it is of major importance in some seaboard counties and constitutes the backbone of the economy of some coastal communities. Essentially all of the commercial fishing industry in the Basins is located in the Florida subarea. This subarea's commercial landings of fish and shellfish for food, bait, and miscellaneous purposes amounted to 62.4 million pounds worth $12.1 million at dockside in 1972.

PROJECTIONS, PROBLEMS AND OPPORTUNITIES

Projections - Agricultural and Forestry

Land Use - Non-agricultural land needs were first projected to determine the amount of land available in future time periods for agriculture and forestry production. Projections indicate a 2 percent decline in the agricultural land base by 1990 and a 6 percent decline by 2020. The major part of the reduction is expected to take place in the Florida subarea.

The agricultural projections reflect what is expected to take place without accelerated development[1/] and are based upon specific assumptions. Yields are projected to increase approximately 50 percent by 1990 and double by 2020. Efficiency gains through land use shifts are expected, but institutional factors, tradition, and other non-economic affects are assumed to limit these changes.

Much of the pasture acreage is presently under-utilized, but a substantial increase in the beef industry will require development of additional pasture acreage in the Alabama and Florida subareas.

Forest land projections indicate a slight decline in commercial forest acreage with the majority of the decline being in the Florida subarea. Currently there are 14 million acres in forest cover; by 2020 this acreage will have dropped to less than 13.5 million acres. There are approximately 720,000 acres of land capability classes I and II presently in forest land use in the Florida subarea and another 700,000 acres in the Alabama subarea. No substantial shift of these acres to openland uses is expected with the projected economic setting. Under conditions of food and fiber needs much higher than those projected in this study, these lands could be shifted into crop production. Crop and livestock production in the Basins could be increased to nearly three times the projected 1990 production level under these conditions.

Crop and Livestock Production - Beef production is expected to increase, particularly in the Alabama subarea. Production levels of crops other than pasture and hay will probably stabilize or decline in the Alabama subarea. In the Florida subarea, the production of peanuts, soybeans, wheat, vegetables, and hay are expected to increase substantially. However, yield increases are generally expected to more than account for projected increases in production, thus resulting in acreage declines of most field crops.

1/ "Without development" was defined for this study to include existing developments and projects--authorized and funded but with no accelerated type of development resulting from proposals in this or other studies.

Forestry Production - Although forest acreage will decline gradually over the decades ahead, more intensive management by forest landowners and their adoption of improved technology in production, will tip the scales in favor of a gradual increase in timber volumes. The supply of raw wood in the Basins is expected to meet the demand for timber products well into the 1980's. Current production (1972) of 590 million cubic feet of annual timber growth is well ahead of current demand of 305 million cubic feet. Currently 52 percent of the demand for wood products moves into the pulpwood market. This rate is expected to increase to 59 percent by the year 2020. In 1972, 153 million cubic feet of wood went into pulpwood; by 2020, the expected demand for pulpwood will reach 900 million cubic feet.

Agricultural and Rural Water Supply - Water is expected to become increasingly valuable in the future as agricultural production expands. Saltwater intrusion problems will become more serious along the coastal areas as more water is withdrawn for agriculture and other purposes. Ground water supplies will have to be supplemented or even eliminated from use in those areas where the water quality becomes unsuitable for irrigation or other uses. Ground water supplies in the northern part of the Alabama subarea are limited due to geologic conditions but should provide adequate water for most individual rural homes.

Water requirements for irrigation, livestock, and rural domestic use are projected to increase in the future, but no severe rural water shortages are expected in either the Florida or Alabama parts of the Basins through the year 2020. Increased expenditures will be required for additional wells, dams, or other water management features.

Projections - Municipal and Industrial

Population - The area has historically been rural and has experienced limited growth. This rural influence is projected to gradually decline, but subarea population and employment are not projected to grow as fast as the respective states. The Gulf Coast area is one exception where intensified urban growth pressures are expected in the future.

The urban sector became dominant in the Florida subarea during the sixties and the Alabama subarea is projected to have more urban than rural residents before 1990. Basins' population is expected to almost double by 2020 increasing from 1,294,039 to approximately 2,279,000. The Alabama subarea has 35 percent of the population of the Basins and this is expected to decline to 32 percent by 1990 and to 29 percent by 2020.

Employment - The percent of the population employed in the Basins has historically been below the national average. Some, but not all, of the deviation is expected to be eliminated in the future. Total employment in the Basins is projected to increase from the 1970 level of 337,000 to 630,000 by 1990 and to 873,000 by 2020.

Income - Per capita income levels have historically been below state and national averages. The Basins are expected to more nearly reflect the states' per capita income levels in the future, but the gap is not expected to be closed entirely. Projections to 2020 indicate both subareas will be at least 5 percent below state levels and each state is projected to be 10 percent or more below the national figure. Substantial gains in per capita income however, are projected for the Basins.

Municipal and Industrial Water Supply - The municipal water demand in 1990 will be almost double the amount used in 1970 and is projected to double again by 2020. By 2020 municipal demand in the Basins is projected to be approximately 435 mgd as compared with the 1970 municipal demand for 126 mgd.

Projections indicate that thermoelectric power plants will continue to require more water than all other users. In the future, however, an increasing number of plants are expected to use seawater for cooling.

Problems and Opportunities

Soil Erosion and Sedimentation - This is the most serious resource problem encountered in much of the Alabama subarea and that portion of the Florida subarea just south of the Alabama line. Many of the fields of highly productive agricultural soils are bounded by very erodible soils. These highly erodible soils occur in the steeply sloping transition zone between the relatively level farm lands and the creek or river bottoms. When concentrated runoff from the fields is released to flow uncontrolled down the steep slopes, caving gullies are formed and progress into valuable agricultural land. These large, caving gullies disrupt farming operations by cutting fields into smaller units that are difficult or impossible to farm with modern machinery. These gullied areas are normally abandoned or put to other less productive uses. There are an estimated 2950 large gullies which affect or threaten one-half million acres of farmland and millions of dollars worth of roads, fences and other improvements in nine counties of southeastern Alabama alone.

Grass and trees alone will not control an active gully

Intensive forest management practices have the potential for accelerating erosion and for lowering water quality in lakes, streams and reservoirs. Logging and site preparation account for 88 percent of the erosion on forest lands.

In the Alabama subarea, about 40,000 acres of land classified as cropland have a severe erosion problem; over 730,000 acres are moderately erosive; and approximately 750,000 acres have slight or no erosion problem. The Florida subarea has 20,000 acres of cropland in the severe hazard group, 295,000 acres in the moderate to severe group; and 1,055,000 with only slight or no erosion hazard.

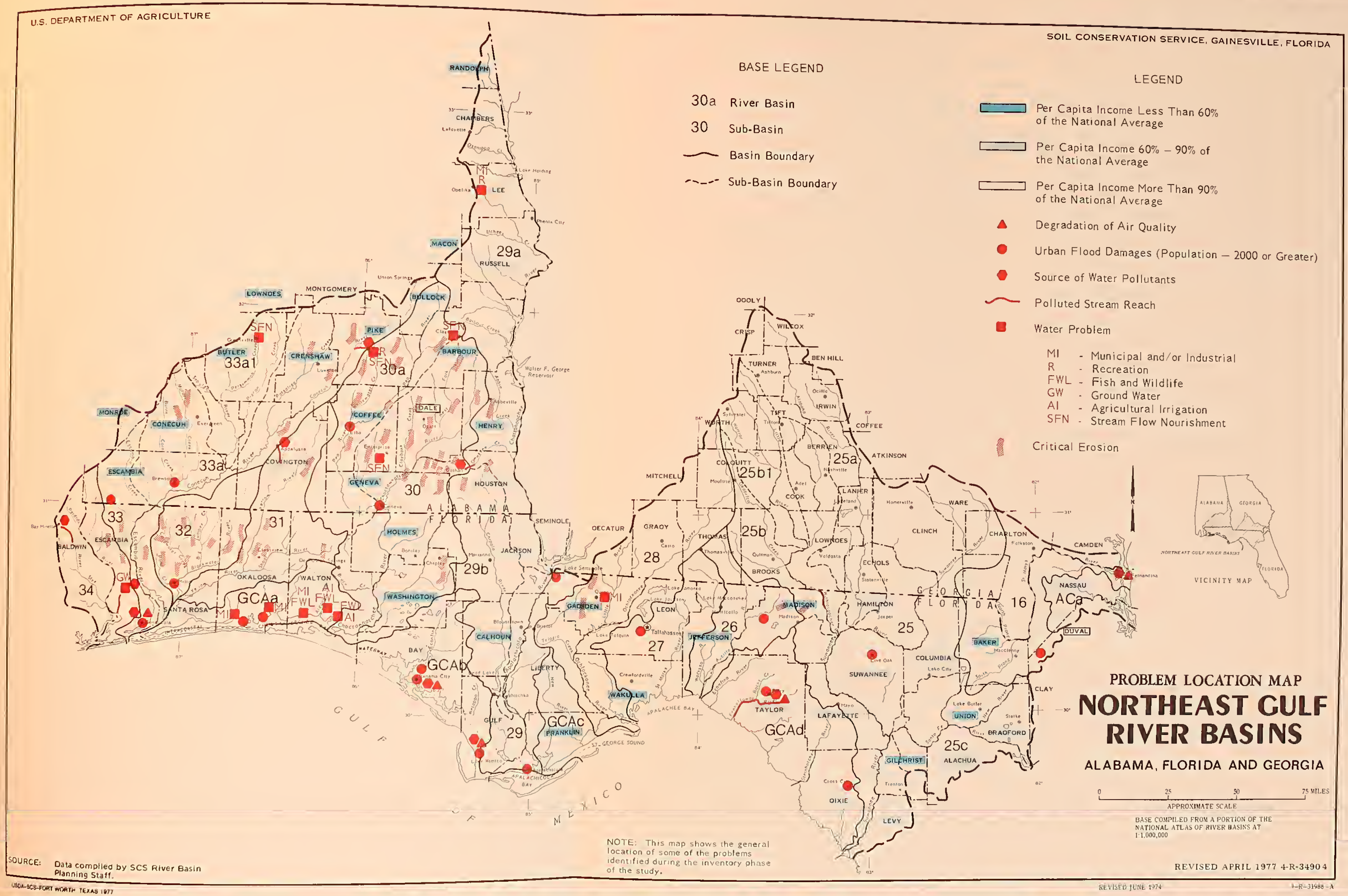
Soil erosion in urban areas, though not so widespread as erosion in farming areas, is of major concern in rapidly expanding population centers. The increasing problems are related to building construction, expansion of utilities, and street and highway construction.

Protection of highly erodible soils is necessary before and after construction

The problems of soil erosion, sediment, flooding, impaired drainage, improper land use, and other types of resource abuse cannot be solved in an area as large as the Northeast Gulf Basins without widespread knowledge and application of adequate resource management systems. Land use changes could be a means of accomplishing better resource management. Land ownership and economic considerations greatly influence the use of soil resources.

Water management is a vital part of the total resource management program. Improved terrace systems are needed in west Florida to receive the excess flow and direct it to points where it can be safely stored or spread to avoid additional erosion problems. An adequate resource management plan cannot be developed for one specific practice to the exclusion of all other alternatives. An inventory of all resources must be made along with the intended use of resources. This could help serve as a basis for development of a management system that would put each resource-soil, vegetation, water--to its fullest, most efficient use.

Forestry - The condition of timber stands in the Basins has been improving over the past decades, especially in stocking levels and volume growth. However, there is still room for improvement in that 40 to 50 percent of the Basins' forested tracts is still understocked or non-stocked. The Alabama subarea has 1.7 million acres that need restocking; 3.6 million acres in the Florida subarea require the same treatment. Stands with


U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
BASE LEGEND
30a River Basin
30 Sub-Basin
Basin Boundary
Sub-Basin Boundary
LEGEND
Per Capita Income Less Than 60% of the National Average
Per Capita Income 60% – 90% of the National Average
Per Capita Income More Than 90% of the National Average
Degradation of Air Quality
Urban Flood Damages (Population – 2000 or Greater)
Source of Water Pollutants
Polluted Stream Reach
Water Problem
MI - Municipal and/or Industrial
R - Recreation
FWL - Fish and Wildlife
GW - Ground Water
AI - Agricultural Irrigation
SFN - Stream Flow Nourishment
Critical Erosion
VICINITY MAP
ALABAMA
FLORIDA
GEORGIA
GULF OF MEXICO
PROBLEM LOCATION MAP
NORTHEAST GULF RIVER BASINS
ALABAMA, FLORIDA AND GEORGIA
0 25 50 75 MILES
APPROXIMATE SCALE
BASE COMPILED FROM A PORTION OF THE NATIONAL ATLAS OF RIVER BASINS AT 1:1,000,000
NOTE: This map shows the general location of some of the problems identified during the inventory phase of the study.
SOURCE: Data compiled by SCS River Basin Planning Staff.
REVISED APRIL 1977 4-R-34904
USDA-SCS-FORT WORTH TEXAS 1977
REVISED JUNE 1974
4-R-31988-A

adequate stocking can be improved through timber stand improvement (TSI). In the Florida subarea 3.6 million acres would benefit from TSI. The Alabama subarea has 1.7 million acres that can be improved through this treatment.

Mortality resulting from such factors as wildfires, insect and disease attacks, and climatic conditions account for a reduction of 10 percent in the gross volume produced in the Basins, representing a loss of 53.2 million cubic feet of wood annually. Improvement in current programs and new technology expected from current research should produce a reduction of at least 15 percent in mortality, principally through more effective wildfire control and insect and disease control.

Wildfires destroy thousands of acres of prime timber each year

Flooding - Most of the flood plains in the Alabama subarea are well defined and are predominantly in natural stands of timber. A summary of floodprone data developed for the entire Alabama subarea reveals that only 1.3 percent of the floodprone area is in cropland, 3 percent is in pasture, and over 95 percent is in forest land. Damages to crops occur one to three times each year, but the short period of inundation and the small area involved result in relatively minor damages, even though the individual farmer who owns the land may have suffered considerable monetary loss and inconvenience.

In the Florida subarea, land use in the flood plains is similar to that in Alabama. As the streams approach the Gulf and Atlantic coasts, however, the flood plains become less well-defined and comprise a larger portion of the total watershed areas. Use in the coastal areas is almost entirely for timber.

Of the 12.7 million acres in the Florida portion of the Northeast Gulf River Basins inventoried at this time, 5.0 million acres are floodprone or 39.0 percent of the subarea. Of the areas classified as floodprone, 0.4 percent is in cropland, 0.8 in pastureland, 0.7 percent in urban and built-up areas, 5.3 percent in planted forest land, 9.4 percent in open water and 83.4 percent in natural state.

Tidal flooding has a potential of doing extensive damage along the coast in a short time. Most of this type of flooding is the result of hurricanes passing near the coast in such a direction as to cause on-shore winds for several hours. The Corps of Engineers has projected tides as high as 10 to 12 feet above mean sea level for a 100-year frequency storm for many coastal areas of the Basins.

Dwellings located in flood plain are subject to frequent flooding

Opportunities are available for prevention or reduction of the impacts of floodwater damages by the use of structural and non-structural measures. Non-structural measures include flood plain regulation, flood insurance, flood forecasting, flood hazard analysis, and flood-proofing. Structural measures include channel modification, levees, and reservoirs.

Water Supply - The source of municipal water supplies is expected to remain at about the same ratio of ground water to surface water. An exception to this is in coastal areas where saltwater intrusion will be an increasing problem as more ground water is used in the future. Artificial recharge of the aquifers is not necessary where natural recharge equals or exceeds the withdrawals. This condition prevails over most of the area, the exceptions being the Pensacola-Cantonment area of Escambia County, Florida, Ft. Walton Beach, and Panama City. Large withdrawals in the Brunswick, Georgia and Jacksonville, Florida areas which are outside the Northeast Gulf Basins, affect ground water in the St. Marys Basin.

There are many potential reservoir sites where surface water runoff could be stored to meet water needs in the Basins. The Alabama subarea is especially endowed with good reservoir sites due to its topography. Several reservoir sites were identified for potential water storage in the Alabama and Florida subareas.

Drainage - Impaired drainage of agricultural land is not a major problem under current land use patterns. Throughout the Basins, however, there are areas where inadequate drainage outlets result in lower yields or inefficient farm operations. In some cases, these areas are depressions in larger fields or low land along flood plains of streams. Most of the soils which have internal drainage problems are now being used for pasture, timber, or wildlife habitat. If future crop production requirements substantially exceed current projections, then some of these soils could be used to help fill this need. Drainage would be necessary for crop production on these areas.

Low Per Capita Income - A major problem in the Basins is low per capita income. The Basins' real income more than doubled in the 1950-1970 period, but the absolute gap was reduced very little. Per capita income, however, increased from 56 to 74 percent of the national average. Nine of the 77 counties had per capita incomes less than half the 1970 national average of $4,235. Only one county had an average income that exceeded the national average and only nine counties had averages that exceeded the southeast average ($3,643). Low income and lack of acceptable employment opportunities have contributed to the slow population growth in the area.

Clear streams abound in the river basins

Areas of Natural Beauty - Increasing awareness of the importance of the relationship between man and natures' handiwork has occurred during the past decade. The streams, lakes and ponds of the study area are among the most scenic in the South and presently are relatively pristine.

Several of the Florida streams may be included as part of the state's wild and scenic river system. Scenic portions of some of these rivers are in the Florida canoe trail system. The large lakes and reservoirs usually have picnic areas located at scenic overlooks. The Chattahoochee-Apalachicola River system is used by pleasure boaters who embark in Alabama and Georgia for a scenic ride to Apalachicola on the Gulf of Mexico.

The estuaries have many attractions for the naturalist because these most productive of all natural areas abound in fish and wildlife. Shore birds, waders, and waterfowl are conspicuous but hundreds of other birds make their homes in the estuarine areas. The conflicting demands on this resource are being resolved as local, state, and federal agencies are working to preserve such critical areas.

The beaches are a big attraction to residents and visitors alike. They are among the most scenic in Florida and draw millions of tourists and residents to the Gulf and Atlantic shores.

<u>Quality Aspects of Water, Land, and Air</u> - The water quality of most streams and lakes is generally excellent; however, heavy rains cause much suspended sediment and deposition in the stream beds. Farming without proper land protection permits storm runoff to carry soil, fertilizers, and pesticides into the streams. Construction sites for buildings, parking lots and roads contribute sediment to stream beds. Flooding of the Apalachicola Valley causes closure of the oyster beds at the mouth of the Apalachicola because of the high coliform count. This type of pollution is normally associated with inadequate sewage treatment from residential areas.

Sections 208 and 303e of PL 92-500, the Federal Water Pollution Control Act, establish a process for planning and implementing programs for reducing pollutants from all sources which enter our waters. The initial thrust was directed toward areas of heavily concentrated municipal and industrial complexes where the sources were rather easily determined. River Basin Water Quality Management Plans are being developed in both states under Section 303e. Alabama has published 12 of the required 14 water quality plans. Because of the limited number of gaging stations and the infrequent monitoring occasions, large amounts of pollutants could enter the streams and never be detected except perhaps by the sight of dead or dying fish.

Estuarine areas can absorb and utilize nutrients to a certain point, and thereby act as cleansing agents; however, when this point is exceeded, the estuary will become unproductive. More research is needed to determine the load capacity of such systems.

Ground water of good quality is available in large amounts in most of the Basins, the exceptions being the Piedmont and localized areas along the coasts where saltwater intrusions have occurred. Good quality ground water in large supplies is essential, and care should be taken in disposing of waste so as to avoid contamination.

There are several ambient air monitoring stations in the Florida subarea of the Northeast Gulf River Basins. Many of the stations are monitoring only partial analysis pollutants that affect the ambient air quality. Much of the data available is on source oriented surveillance rather than population oriented surveillance which is not representative of general ambient air quality in a given area. The Air Pollution Control Commission in Alabama operates a statewide air monitoring network which includes nine stations in the Northeast Gulf Basins which monitor particulate matter.

Conservation management systems when properly installed in rural or urban areas have important positive effects on environmental quality. On farm lands, these systems may involve installing better combinations of conservation treatment measures on highly erodible cropland, or changing the land use by converting row crops to permanent cover such as grass, trees or wildlife areas, and cropping the less erodible soils. In some cases, existing gullied areas can be shaped and planted to grass or trees to improve the visual quality of the landscape as well as provide economic returns and reduce further erosion.

Modern cropping methods reduce energy needs and maintains soil tilth

In urban areas, especially those that are rapidly expanding, good conservation systems are needed. The proper use of vegetation on erodible soils soon after construction of new homes, shopping centers or industrial areas can do much toward reducing sediment delivered to streams and bottom lands.

Legislation which provides opportunities for improving the quality of the water and land resources has been passed by the legislatures of both Florida and Alabama. Among the more significant Florida Legislative actions are the Environmental Land and Water Management Act of 1972, the Water Resources Act of 1972, and the Land Conservation Act of 1972. Alabama legislation related to the quality of water and land resources includes Section 341364, Chapter 26, Title 12 of the Code of Alabama which contains enabling legislation for a comprehensive land management and use program in unincorporated floodprone areas of the state. It allows county commissions in Alabama to meet requirements of the National Flood Insurance Act of 1968, and authorizes the county commissions to prescribe criteria for land management and use in floodprone areas. Similar authority for municipalities is provided by Section 772, Chapter 16, Article I, Title 37 of the Code of Alabama.

Biological Resources - Fishing, next to beach activities, is enjoyed by more people in the Basins than any other active recreational pursuit, judging from the number of fishing licenses sold annually. Fishing is becoming limited in some areas, however, because of natural events or man's activities. Some of the largest fish kills in the county have occurred in West Florida bays. Some areas of the bay bottoms are covered with industrial and municipal sludge, rich in carbon, nitrogen and phosphorous, which causes depressed oxygen levels, destruction of marine grasses, and heavy plankton blooms. Water circulation in the bays is not sufficient for good flushing action. Pollution of Florida coastal waters has caused over a million acres of oyster grounds in the state to be closed. Heavy rains in the Chattahoochee-Flint River Basin have, at times, raised the coliform count beyond acceptable levels in the Apalachicola Bay area so that oysters cannot be harvested.

Probably the most immediate threat to pond and lake fish is the proliferation of exotic aquatic weeds. Boats and trailers spread the weeds from one body of water to another. Occasionally, they may be introduced by birds or other animals. Excess weeds prevent predatory fish such as bass and channel catfish from feeding on forage fish--bluegills, shellcrackers, shad, etc., which leads to an overabundance of stunted forage fish and an unbalanced fish population. Boat passage becomes difficult, fishing is poor, and recreational assets are lost. Control of weeds by herbicides has been expensive, generally unsatisfactory, and usually temporary.

Possibly the most controversial control being considered is the grass carp (*Ctenopharyngodon idella*). That the fish can control weeds has already been established but the possible cost to the aquatic ecosystem is considered by some agencies to be too high to accept without further investigation. Experience with other introduced species has caused the agencies to move very cautiously.

The States have done a commendable job in obtaining wildlife habitat and areas for the hunting public. Usually this land is under lease from the wood producing industries, but state and national forests, Corps of Engineers' project areas and military bases are included in the state's wildlife management programs. The demand on these areas has caused the Florida Game and Fresh Water Fish Commission to limit the number of hunters in the managed areas for the first part of the hunting season. This trend of limiting the pressure on land and animals will probably accelerate unless some event such as an extreme energy crisis or a severe recession occurs. Land acquisition for wildlife management purposes may relieve the overcrowded situation for a while, but at best is only a temporary solution.

Wetlands have important biological and aesthetic values which are difficult for the layman to fully comprehend. That this so-called wasteland can produce many pounds of fish or can feed and shelter untold numbers of waterfowl and other wildlife species or provide other environmental benefits, is not generally understood. Until the public becomes better informed, pressures will continue to mount for draining, filling, diking, impounding, or otherwise altering the wetlands.

The task of preserving and improving the wetlands becomes more difficult and expensive as the population increases. The present need is to plan for the preservation of important land and water areas to protect fish and wildlife, and to serve the needs of the people who depend on these resources for food, recreation, or their livelihood. A large portion of the commercial catch of fish and shellfish is partially or wholly dependent on the estuarine areas for its development.

Old grist mill serves as a reminder of our heritage

Human Use and Interest - Historic and archeological sites provide evidence of the lives and activities of men who existed in the past. These sites are associated with people or events that have had an impact on our own lives. If these areas meet certain criteria, they are eligible to be placed in the National Register of Historic Places and grants may be available for work on these sites.

By properly identifying sites, and executing acts of preservation, restoration, or whatever measures are dictated, the cultural aspects of our heritage can be more fully appreciated. Many cities, such as Savannah, Pensacola, and Williamsburg have capitalized on such development. When unique sites are found, it is the duty of the discoverer to notify the proper authorities prior to further progress on the project. Discovery should not lead to disturbance or vandalism, and therefore, many sites are known by the responsible state agencies but remain unknown to the general public until they can be properly investigated by qualified persons.

All the Florida subarea is underlain by soluble limestone, with the exception of the western panhandle counties of Walton, Okaloosa, Santa Rosa, and Escambia. Because of the solution of the limestone, this area is pocked with sinkholes, and the sub-surface is riddled with caverns. Many of the caverns are water-filled, and scuba diving in these caverns is a very popular but hazardous sport. There are many large springs in the limestone area, the largest and best known being Wakulla Springs in Wakulla County, Florida.

Some state parks are receiving so much use that the numbers of visitors are restricted to prevent deterioration of resources and to enhance the quality of the outdoor activity. Visitors to Florida parks have increased 100 percent in the past ten years. State and Federal governments presently provide most of the outdoor recreational opportunities and may be expected to enlarge their facilities somewhat in the future; however, purchase of additional land will be limited because of high costs and the paucity of desirable natural areas suitable for recreational development.

The private sector can be expected to provide a higher proportion of recreational opportunities than it has in the past. Campgrounds, swimming pools, and picnic grounds can be established using less land area to satisfy more people.

New reservoirs, near populated areas, constructed primarily for water supplies or to recharge the aquifers can also provide quality recreational opportunities. Swimming, fishing, picnicking, and camping are among the activities suitable for reservoir sites. There are miles of beaches which are little used, but which could be made accessible for the enjoyment of many visitors if adequate protection were provided for the dunes and shoreline. Transportation routes should be constructed or improved considering all the facets of fragile coastal ecosystems. Development, with all its ramifications, should proceed only after the most careful planning. Construction should fit into the landscape rather than altering the landscape to suit the construction. The beautiful beaches, clean air, lakes and rivers are the principal attractions to the area. Destruction of these assets would vitally affect the economy and the lives of the residents of the Basins.

APPENDIX
FOR
VOLUME I

NORTHEAST GULF RIVER BASINS
FLORIDA, ALABAMA AND GEORGIA
COOPERATIVE SURVEY

PREPARED
BY

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ECONOMIC RESEARCH SERVICE
FOREST SERVICE

IN
COOPERATION WITH

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

AND

STATE OF ALABAMA
ALABAMA DEVELOPMENT OFFICE

JUNE 1977

NORTHEAST GULF RIVER BASINS

APPENDIX
VOLUME I

TABLE OF CONTENTS

INTRODUCTION

This appendix was prepared by the U. S. Department of Agriculture and is presented as part of the Northeast Gulf River Basins Report, Volume I. Volume I presents the methods and data summaries of various inventories while more detailed information is available in the appendix. The Florida Department of Environmental Regulation, the Alabama Development Office, and other state agencies provided assistance and guidance for obtaining data for the inventories. The information contained herein should be useful to individuals, groups, and concerned agencies for planning and implementing land and water use programs.

Floodprone Areas - Florida

In the Northeast Gulf River Basins, 12.73 million acres in Florida and 7.12 million acres in Alabama were inventoried to determine the location and extent of floodprone land and its current land use. The U. S. Geological Survey 100-year frequency floodprone maps were the base maps for the survey. Floodprone areas were divided into three categories - riverine, tributary, and coastal.

The Florida floodprone survey classified areas directly flooded by major rivers as riverine. The delineations were followed upstream on the tributaries to the approximate mean sea level elevation of the flood stage at the mouth of each tributary.

Tributary flooding encompassed (1) those areas not directly influenced by the major rivers, including small streams, marshes, swamps and ponds, and (2) the upstream portions or source areas of major rivers less than 250,000 acres. As the accumulated drainage area exceeded this amount, it then was classified as riverine. The break, on the upstream portions of major rivers, between tributary and riverine flooding coincides with increments of watersheds delineated during the Conservation Needs Inventory of 1967 (Figure 1).

Coastal flooding was delineated as the lowlands below the 100-year hurricane line. The elevations adopted for the 100-year hurricane line were taken from the Coastal Coordinating Council's Florida Coastal Zone Management Atlas, published in December 1972.

The three major classifications of floodprone areas - riverine, tributary, and coastal - were inventoried as to land use in the flooded area. The land use emphasis was on the extent of present development in the floodprone areas. The categories for these developed flooded areas were cropland, pastureland, planted trees, and urban or built-up. Areas that did not fall into one of these categories were classified as natural state except the "open water" areas which were divided into fresh and salt. The fresh water areas were further classified into streams, lakes or impoundments. In Florida, the Mark Hurd photography was used to delineate the open water. Open water areas in Alabama were included in the natural state classification. The U.S.G.S. floodprone maps were utilized by Field Office Soil Conservation Service personnel in delineating current land use in the floodprone areas.

Floodprone areas were measured and recorded by land use within each section and summarized by Township and Range. In areas where sections are not surveyed such as bays, marshes and swamps, or in old Spanish Land Grants where boundaries are askew with Township and Range lines, standard 640-acre sections were marked off and numbered according to survey procedures for townships. The back-up data files will have to be consulted for the location and numbering of these unsurveyed sections. The Government lots along the Florida-Georgia boundary were incorporated into the sections to the south by extending the section lines up through the Government lots.

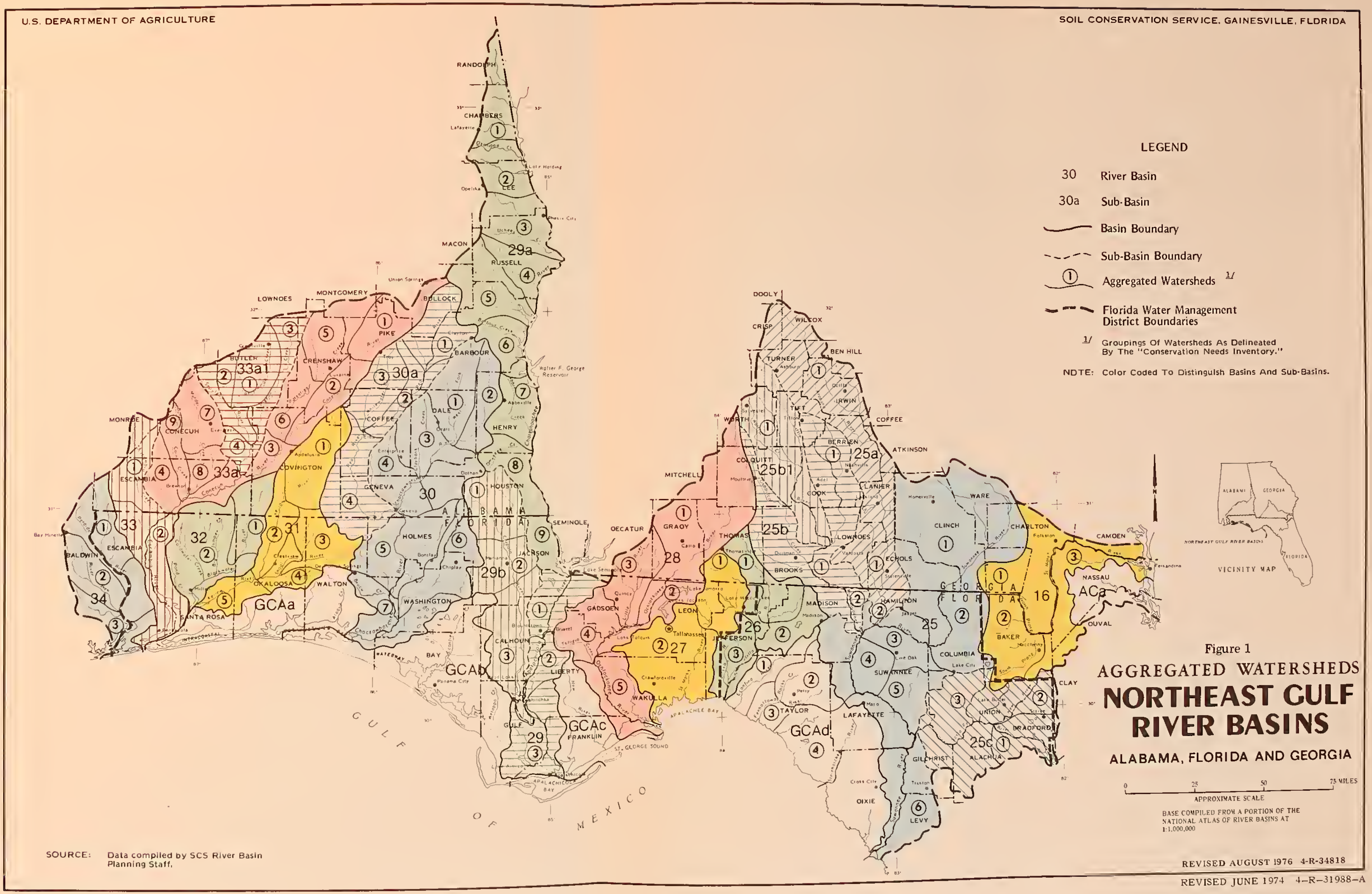


Figure 1
AGGREGATED WATERSHEDS
NORTHEAST GULF RIVER BASINS
ALABAMA, FLORIDA AND GEORGIA

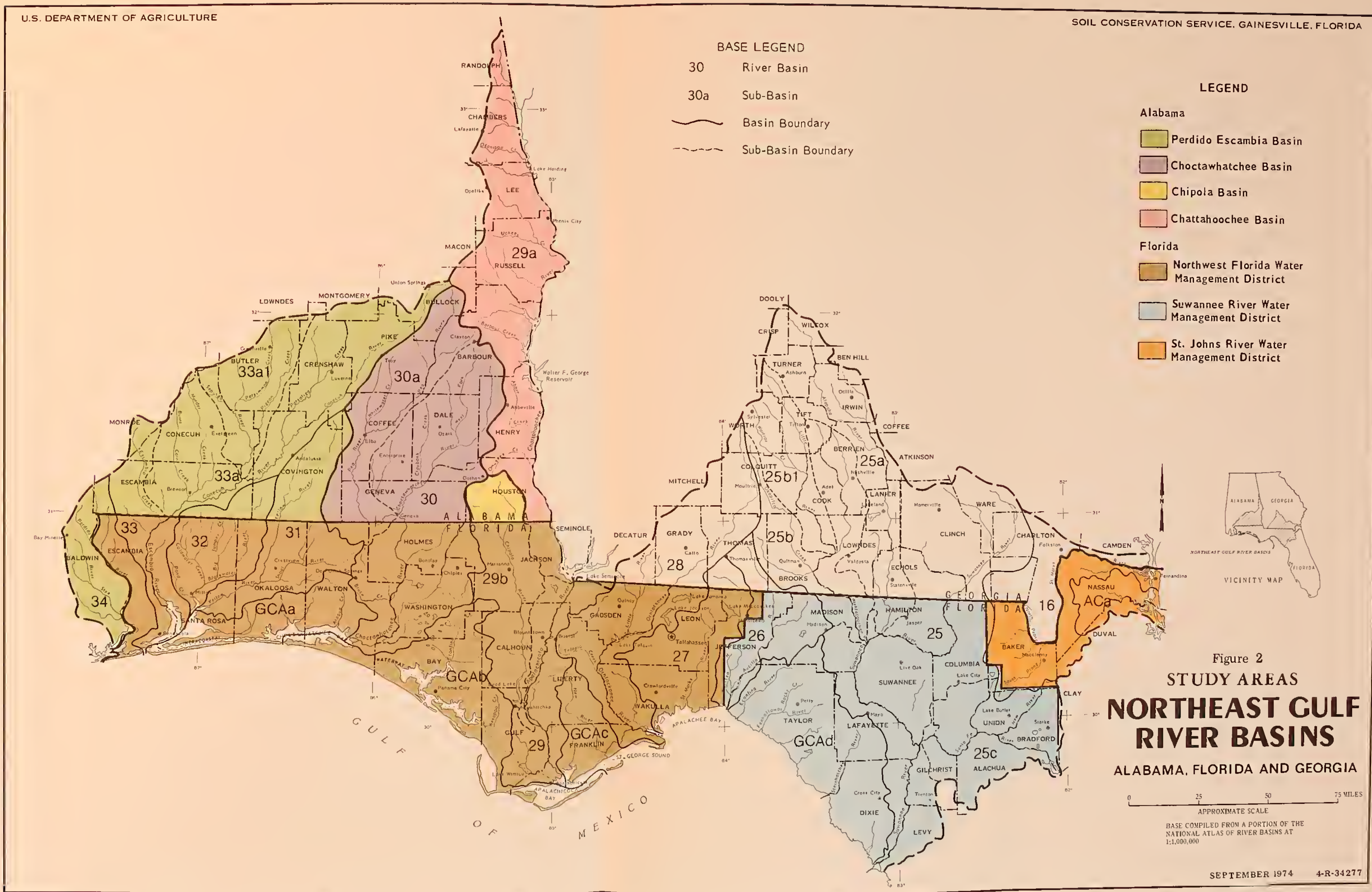


Figure 2
STUDY AREAS
NORTHEAST GULF RIVER BASINS
ALABAMA, FLORIDA AND GEORGIA

In Florida, where U.S.G.S. floodprone maps have not been made, the inventory was left incomplete for Volume I. When the maps become available the data will be placed in a supplement to the report.

Florida floodprone areas in the Northeast Gulf River Basins are summarized by Water Management Districts. The Northwest Florida Water Management District is entirely within the Northeast Gulf Basins, and the Suwannee River Water Management District is almost entirely within the Basins. A small portion of the St. Johns River Water Management District is located in the northeast corner of the Basins (Figure 2).

The Northwest Florida Water Management District has 7.45 million acres divided into eight major rivers and three Gulf Coastal areas. The total floodprone land in this district is 2.63 million acres or 35.3 per cent of the District. About 1.7 million acres in Escambia, Okaloosa, Santa Rosa, Walton, and Holmes counties do not have floodprone maps and when the inventory is completed, the per cent of floodprone land in the district will exceed 35.3 per cent. Of the 2.63 million acres of floodprone area, 0.6 per cent is in cropland, 0.6 per cent in pastureland, 0.8 per cent in urban or built-up areas, 3.5 per cent in planted forestland, and 15 per cent in open water. The remaining 79.5 per cent of the floodprone area was classified as natural state1/ (Table 1).

The Suwannee River Water Management District is comprised of 4.4 million acres divided into five major rivers with one large Gulf Coastal Area. The district has 2.0 million acres of floodprone land or 45.4 per cent of the total watershed. Maps were available for almost all of this district. Of the District acres classified as floodprone, 0.4 per cent is in cropland, 1.1 per cent in pastureland, 0.5 per cent in urban or built-up, 8.2 per cent in planted forestland, 2.6 per cent in open water, and 87.2 per cent in natural state (Table 2).

The small portion of the St. Johns River Water Management District within the study area has 0.87 million acres with one major river and one Atlantic Coastal Area. It has 0.34 million acres of floodprone area or 39.0 per cent of the District area surveyed in the Northeast Gulf River Basins. Floodprone maps are not available in the eastern part of Baker County and the northwestern part of Nassau County, so the inventory is incomplete on about 275,000 acres in this water management district. Of the 0.34 million acres classified as floodprone, 0.4 per cent is in pastureland, 0.5 per cent in urban or built-up, 2.5 per cent in planted forestland, 6.0 per cent in open water, and 90.6 in natural state (Table 3).

In summary, of the 12.7 million acres in the Florida subarea inventories at this time, 5.0 million acres are floodprone or 39.0 per cent of the total Basins. Of the areas classified as floodprone, 0.4 per cent is in cropland, 0.8 per cent in pastureland, 0.7 per cent in urban or built-up areas, 5.3 per cent in planted forestland, 9.4 per cent in open water, and 83.4 per cent in natural state.

1/ Natural forestland, swamps, and marshes

Table 1: Total Watershed Areas and Land Use Within the Floodprone Areas by Aggregations of CNI Watersheds, Counties and Sub-basins - Northeast Gulf River Basins

NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT, FLORIDA

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
26(1)	Upper Aucilla River		NA										
	Jefferson County	Tributary				297	297	-	-	-	-	-	-
		Total			382	297	297	-	-	-	-	-	-
	26(1) Total				382	297	297	-	-	-	-	-	-
26(2)	Middle Aucilla River		NA										
	Jefferson County	Tributary				1114	978	-	18	118	-	-	-
		Total			29691	1114	978	-	18	118	-	-	-
	26(2) Total				29691	1114	978	-	18	118	-	-	-
26(3)	Lower Aucilla River		NA										
	Jefferson County	Tributary				9041	7950	1070	10	-	-	11	-
		Coastal				8584	8400	-	-	-	-	-	184
		Total			30086	17625	16350	1070	10	-	-	11	184
	26(3) Total				30086	17625	16350	1070	10	-	-	11	184
	26 SUB-BASIN TOTAL	Tributary				10452	9225	1070	28	118	-	11	-
		Coastal				8584	8400	-	-	-	-	-	184
		Total			60159	19036	17625	1070	28	118	-	11	184

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
	SUB-BASIN 27 (St. Marks River)												
27(1)	Upper St. Marks River		34.5	Source									
	Leon County	Tributary				11730	10987	-	243	265	-	235	-
		Total			62351	11730	10987	-	243	265	-	235	-
	Jefferson County	Tributary				21141	20812	50	100	142	-	37	-
		Total			95837	21141	20812	50	100	142	-	37	-
	27(1) Totals				158188	32871	31799	50	343	407	-	272	-
27(2)	Lower St. Marks River		0.0	34.5									
	Leon County	Tributary				55911	53083	185	100	30	1320	1193	-
		Riverine				6934	6924	10	-	-	-	-	-
		Total			212250	62845	60007	195	100	30	1320	1193	-
	Jefferson County	Tributary				12062	12000	-	45	5	-	12	-
		Coastal				5435	5435	-	-	-	-	-	-
		Total			23717	17497	17435	-	45	5	-	12	-
	Wakulla County	Tributary				50635	49698	191	141	114	57	434	-
		Riverine				4747	4724	-	-	-	-	23	-
		Coastal				65979	53682	-	-	-	1133	-	11164
		Total			231252	121361	108104	191	141	114	1190	457	11164
	27(2) Totals				467219	201703	185546	386	286	149	2510	1662	11164
	27 SUB-BASIN TOTALS	Tributary				151479	146580	426	629	556	1377	1911	-
		Riverine				11681	11648	10	-	-	-	23	-
		Coastal				71414	59117	-	-	-	1133	-	11164
		Total			625407	234574	217345	436	629	556	2510	1934	11164

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water: Fresh	Floodprone: Open Water: Salt
					Acres								
	SUB-BASIN 28 (Ochlockonee River)												
28(2)	Lake Jackson		68.0	116.2									
	Gadsden County	Tributary				1758	1641	-	-	10	-	107	-
		Riverine				8170	7111	-	-	-	-	1059	-
		Total			49664	9928	8752	-	-	10	-	1166	-
	Leon County	Tributary				19300	14484	-	-	48	180	4588	-
		Riverine				6698	5149	-	-	-	-	1549	-
		Total			92160	25998	19633	-	-	48	180	6137	-
	28(2) Totals				141824	35926	28385	-	-	58	180	7303	-
28(3)	Little River		74.5	99.0									
	Gadsden County	Tributary				17338	16489	-	225	25	66	533	-
		Riverine				5235	897	-	-	-	15	4323	-
		Total			99584	22573	17386	-	225	25	81	4856	-
	28(3) Totals				99584	22573	17386	-	225	25	81	4856	-
28(4)	Lake Talquin		50.6	75.4									
	Leon County	Tributary				8276	8052	-	76	-	-	148	-
		Riverine				3897	1367	-	7	-	35	2488	-
		Total			57431	12173	9419	-	83	-	35	2636	-
	Gadsden County	Tributary				6878	6471	59	136	33	-	179	-
		Riverine				3619	1223	-	16	-	-	2380	-
		Total			114304	10497	7694	59	152	33	-	2559	-

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
28(4)	(Cont) Liberty County	Tributary				38322	37851	371	-	-	-	100	-
		Riverine				5965	5653	70	-	-	-	242	-
		Total			141096	44287	43504	441	-	-	-	342	-
	28(4) Totals				312831	66957	60617	500	235	33	35	5537	-
28(5)	Lower Ochlockonee River		0.0	50.6									
	Wakulla County	Tributary				100152	99734	17	61	-	-	340	-
		Riverine				12130	11728	-	105	-	-	297	-
		Coastal				21173	18631	-	9	-	90	-	2443
					175148	133455	130093	17	175	-	90	637	2443
	Liberty County	Tributary				31422	27726	3643	-	-	-	53	-
		Riverine				11129	10395	253	-	-	-	481	-
		Coastal				1997	1834	6	-	-	-	157	-
		Total			51609	44548	39955	3902	-	-	-	691	-
	Leon County	Tributary				12544	12424	-	9	-	-	111	-
		Riverine				552	527	-	-	-	-	25	-
		Total			21248	13096	12951	-	9	-	-	136	-
	Franklin County	Tributary				17861	7886	9766	102	-	4	103	-
		Coastal				23080	14059	1236	-	-	201	448	7136
		Total			47123	40941	21945	11002	102	-	205	551	7136
	28(5) Totals				295128	232040	204944	14921	286	-	295	2015	9579
	28 SUB-BASIN TOTALS	Tributary				253851	232758	13856	609	116	250	6262	-
		Riverine				57395	44050	323	128	-	50	12844	-
		Coastal				46250	34524	1242	9	-	291	605	9579
					849367	357496	311332	15421	746	116	591	19711	9579

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water: Fresh	Floodprone: Open Water: Salt
					Acres								
	SUB-BASIN 29 (Apalachicola River)												
29(1)	Upper Apalachicola River		76.7	107.6									
	Jackson County	Tributary				7873	6610	-	47	230	-	986	-
		Riverine				3773	3311	-	64	-	15	383	-
		Total			65536	11646	9921	-	111	230	15	1369	-
	Calhoun County	Tributary				6613	6473	-	12	109	-	19	-
		Riverine				19254	16623	358	12	1205	-	1056	-
		Total			77074	25867	23096	358	24	1314	-	1075	-
	Gadsden County	Tributary				3281	3034	20	65	56	75	31	-
		Riverine				3402	3258	-	-	-	-	144	-
		Total			71168	6683	6292	20	65	56	75	175	-
	Liberty County	Tributary				9	-	-	-	-	-	9	-
		Riverine				3713	2699	128	235	-	-	651	-
		Total			33256	3722	2699	128	235	-	-	660	-
	29(1) Totals				247034	47918	42008	506	435	1600	90	3279	-
29(2)	Middle Apalachicola River		43.6	76.7									
	Liberty County	Tributary				23332	22947	-	-	-	-	385	-
		Riverine				20362	18011	247	161	-	-	1943	-
		Total			63720	43694	40958	247	161	-	-	2328	-

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
29(2) (Cont)	Calhoun County	Tributary				707	705	-	-	-	-	2	-
		Riverine				24307	21945	800	112	525	-	925	-
		Total			29696	25014	22650	800	112	525	-	927	-
	Gulf County	Tributary				-	-	-	-	-	-	-	-
		Riverine				2884	2624	-	-	-	-	260	-
		Total			3074	2884	2624	-	-	-	-	260	-
	29(2) Totals				96490	71592	66232	1047	273	525	-	3515	-
29(3)	Lower Apalachicola River		0.0	43.6									
	Liberty County	Tributary				35071	33743	1308	-	5	-	15	-
		Riverine				24766	23518	302	-	-	-	946	-
		Total			82384	59837	57261	1610	-	5	-	961	-
	Gulf County	Tributary				39415	33707	2741	-	2940	17	10	-
		Riverine				2859	2594	-	-	-	-	265	-
		Coastal				115195	104090	388	2840	941	-	-	6936
		Total			170604	157469	140391	3129	2840	3881	17	275	6936
	Franklin County	Tributary				27027	25779	1176	-	-	-	72	-
		Coastal				51221	44662	1421	-	-	62	-	5076
		Total			92630	78248	70441	2597	-	-	62	72	5076
	29(3) Totals				345618	295554	268093	7336	2840	3886	79	1308	12012
	SUB-BASIN 29 TOTALS												
		Tributary				143328	132998	5245	124	3340	92	1529	-
		Riverine				105320	94583	1835	584	1730	15	6573	-
		Coastal				166416	148752	1809	2840	941	62	-	12012
		Total			689142	415064	376333	8889	3548	6011	169	8102	12012

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water: Fresh	Floodprone: Open Water: Salt
					Acres								
	SUB-BASIN 29a (Chattahoochee River)												
29a(9)	Lake Seminole		107.6	133.3									
	Jackson County	Tributary				19424	15385	76	2371	23	10	1559	-
		Riverine				15802	6980	-	141	-	-	8681	-
		Total			112600	35226	22365	76	2512	23	10	10240	-
	SUB-BASIN 29a	Tributary				19424	15385	76	2371	23	10	1559	-
		Riverine				15802	6980	-	141	-	-	8681	-
		Total			112600	35226	22365	76	2512	23	10	10240	-
	SUB-BASIN 29b (Chipola River)												
29b(1)	Cowarts-Big Creek		118.6	130.1									
	Jackson County	Tributary				26472	24939	-	937	300	-	296	-
		Total			98304	26472	24939	-	937	300	-	296	-
	29b(1) Total				98304	26472	24939	-	937	300	-	296	-
29b(2)	Upper Chipola River		92.6	118.6									
	Jackson County	Tributary				36689	33904	31	1980	11	14	749	-
		Riverine				11597	10775	-	561	-	-	261	-
		Total			194260	48286	44679	31	2541	11	14	1010	-
	Washington County	Tributary				2396	2367	-	-	-	-	29	-
		Total			11520	2396	2367	-	-	-	-	29	-
	29b(2) Total				205780	50682	47046	31	2541	11	14	1039	-

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water: Fresh	Floodprone: Open Water: Salt
					Acres								
29b(3)	Dead Lake		41.6	92.6									
	Jackson County	Tributary				11109	10598	-	82	-	-	429	-
		Riverine				4287	3488	-	647	-	-	152	-
		Total			54784	15396	14086	-	729	-	-	581	-
	Calhoun County	Tributary				39889	35558	3954	-	187	-	190	-
		Riverine				21489	17975	1400	44	251	38	1781	-
		Total			217198	61378	53533	5354	44	438	38	1971	-
	Gulf County	Tributary				4247	4139	-	-	-	-	108	-
		Riverine				10285	8252	-	-	-	-	2033	-
		Total			31232	14532	12391	-	-	-	-	2141	-
	Bay County	Tributary				1731	1731	-	-	-	-	-	-
		Total			6144	1731	1731	-	-	-	-	-	-
	29b(3) Totals				309358	93037	81741	5354	773	438	38	4693	-
29b(4)	Lower Chipola River		28.2	41.6									
	Gulf County	Tributary				4771	3962	215	-	560	-	34	-
		Riverine				6431	6137	-	-	-	-	294	-
		Coastal				5691	5439	-	-	-	-	-	252
		Total			18504	16893	15538	215	-	560	-	328	252
	29b(4) Totals				18504	16893	15538	215	-	560	-	328	252
	SUB-BASIN 29b	Tributary				127304	117198	4200	2999	1058	14	1835	-
		Riverine				54089	46627	1400	1252	251	38	4521	-
		Coastal				5691	5439	-	-	-	-	-	252
		Total			631946	187084	169264	5600	4251	1309	52	6356	252

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
	SUB-BASIN 30 (Choctawhatchee River)												
30(5)	Wright-Sandy Creek		26.4	87.1									
	Holmes County1/	Tributary				64932	62951	-	360	165	-	1456	-
		Riverine				29571	27441	-	700	310	-	1120	-
		Total			258304	94503	90392	-	1060	475	-	2576	-
	Washington County	Tributary				14096	13297	-	50	-	-	749	-
		Riverine				13205	12466	-	300	45	-	394	-
		Total			44032	27301	25763	-	350	45	-	1143	-
	Walton County1/	Total			54528								
	30(5) Totals				356864	121804	116155	-	1410	520	-	3719	-
30(6)	Holmes Creek		26.4	Source									
	Holmes County	Tributary				9195	8775	200	40	30	-	150	-
		Total			37888	9195	8775	200	40	30	-	150	-
	Jackson County	Tributary				17073	16735	-	302	-	-	36	-
		Total			64084	17073	16735	-	302	-	-	36	-
	Washington County	Tributary				59110	57165	-	847	11	-	1087	-
		Riverine				2059	1976	-	-	-	-	83	-
		Total			187270	61169	59141	-	847	11	-	1170	-
	30(6) Totals				289242	87437	84651	200	1189	41	-	1356	-

1/ Floodprone maps not available in portions of Santa Rosa, Okaloosa, Holmes, and Walton Counties. Inventory incomplete in this area.

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water: Fresh	Floodprone: Open Water: Salt
					Acres								
30(7)	Lower Choctawhatchee		0.0	26.4									
	Washington County	Tributary				31640	25241	495	-	-	-	5904	-
		Riverine				2046	1826	-	75	-	-	145	-
		Coastal				6275	5914	-	-	-	-	361	-
		Total			127738	39961	32981	495	75	-	-	6410	-
	Bay County	Tributary				5418	5239	-	-	179	-	-	-
		Riverine				5259	3567	1417	150	-	-	125	-
		Total			35584	10677	8806	1417	150	179	-	125	-
	Walton County 1/	Tributary				17417	16089	1115	115	10	-	88	-
		Riverine				16744	14430	1680	125	35	-	474	-
		Coastal				26313	18892	1193	-	-	287	-	5941
		Total			156190	60474	49411	3988	240	45	287	562	5941
	30(7) Totals				319512	111112	91198	5900	465	224	287	7097	5941
	30 SUB-BASIN TOTALS 1/												
		Tributary				218881	205492	1810	1714	395	-	9470	-
		Riverine				68884	61706	3097	1350	390	-	2341	-
		Coastal				32588	24806	1193	-	-	287	361	5941
		Total			965618	320353	292004	6100	3064	785	287	12172	5941

1/ Floodprone maps not available in portions of Walton County. Inventory incomplete in this area.

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
	SUB-BASIN 30a												
30a(4)	Lower Pea River		91.7	151.3									
	Holmes County1/	Tributary				1828	1722	-	90	-	-	16	-
		Riverine				516	404	-	60	20	-	32	-
		Total			52736	2344	2126	-	150	20	-	48	-
	Walton County1/	Tributary				-	-	-	-	-	-	-	-
		Riverine				-	-	-	-	-	-	-	-
		Total			13568	-	-	-	-	-	-	-	-
	30a(4) Totals				66304	2344	2126	-	150	20	-	48	-
	30a SUB-BASIN	Tributary				1828	1722	-	90	-	-	16	-
		Riverine				516	404	-	60	20	-	32	-
		Total			66304	2344	2126	-	150	20	-	48	-
	SUB-BASIN 31 (Yellow River)												
31(2)	Middle Yellow River		67.1	74.2									
	Okaloosa County1/	Tributary				-	-	-	-	-	-	-	-
		Riverine				-	-	-	-	-	-	-	-
		Total				-	-	-	-	-	-	-	-
	31(2) Total				103936								
31(3)	Upper Shoal River		57.2	Source									
	Walton County1/	Tributary				-	-	-	-	-	-	-	-
		Riverine				-	-	-	-	-	-	-	-
		Total			147971								
	Okaloosa County1/	Tributary				-	-	-	-	-	-	-	-
		Riverine				-	-	-	-	-	-	-	-
		Total			37888								
	31(3) Total				185859								

1/ Floodprone maps not available in portions of Walton, Okaloosa, and Holmes Counties. Inventory incomplete in these areas.

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					------------	A c r e s	------------						
31(4)	Lower Shoal River		36.3	57.2									
	Walton County1/	Tributary				-	-	-	-	-	-	-	-
		Riverine				-	-	-	-	-	-	-	-
		Total			14848								
	Okaloosa County1/	Tributary				-	-	-	-	-	-	-	-
		Riverine				-	-	-	-	-	-	-	-
		Total			106496	-	-	-	-	-	-	-	-
	31(4) Totals1/				121344								
31(5)	Lower Yellow River		0.0	36.3									
	Okaloosa County	Tributary				796	786	-	-	-	-	10	-
		Total			63736	796	786	-	-	-	-	10	-
	Santa Rosa County1/	Tributary				1908	1793	-	-	-	-	115	1051
		Coastal				24921	23870	-	-	-	-	-	-
		Total			78600	26829	25663	-	-	-	-	115	1051
	31(5) Totals				142336	27625	26449	-	-	-	-	125	1051
	31 SUB-BASIN	Tributary				2704	2579	-	-	-	-	125	1051
		Coastal				24921	23870	-	-	-	-	-	-
		Total			553475	27625	26449	-	-	-	-	125	1051
					SUB-BASIN 32 (Blackwater River)								
32(1)	Upper Blackwater River												
	Okaloosa County	Tributary				-	-	-	-	-	-	-	-
		Total			71424								
	Santa Rosa County	Tributary				-	-	-	-	-	-	-	-
		Total			12800								
	32(1) Total				84224								

1/ Floodprone maps not available in portions of Okaloosa, Walton, and Santa Rosa Counties. Inventory incomplete in these areas.

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
32(2)	Jumper-Coldwater-Pond Creeks		0.0	29.6									
	Santa Rosa County1/	Tributary				307	275	-	-	-	-	32	-
		Coastal				3255	3150	-	-	-	60	-	45
		Total			351408	3562	3425	-	-	-	60	32	45
	Okaloosa County1/	Tributary				-	-	-	-	-	-	-	-
		Total			18688								
	32(2) Totals1/				370096	3562	3425	-	-	-	60	-	-
	32 SUB-BASIN1/	Tributary				307	275	-	-	-	-	32	-
		Coastal				3255	3150	-	-	-	60	-	45
		Total			454320	3562	3425	-	-	-	60	32	45
33(2)	Escambia River		0.0	57.9									
	Escambia County1/	Tributary				988	980	-	-	-	2	6	-
		Coastal				2694	1480	-	-	-	552	-	662
		Total			206644	3682	2460	-	-	-	554	6	662
	Santa Rosa County	Tributary				278	278	-	-	-	-	-	-
		Coastal				14634	7971	-	-	-	25	-	6638
		Total			141312	14912	8249	-	-	-	25	-	6638
	33(2) Totals				347956	18594	10709	-	-	-	579	6	7300
	33 SUB-BASIN	Tributary				1266	1258	-	-	-	2	6	
		Coastal				17328	9451	-	-	-	577	-	7300
		Total			347956	18594	10709	-	-	-	579	6	7300

1/ Floodprone maps not available in portions of Okaloosa, Santa Rosa, and Escambia Counties. Inventory incomplete in these areas.

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
33a(4)	Lower Conecuh River		57.9	103.8									
	Santa Rosa County1/	Tributary				-	-	-	-	-	-	-	-
		Riverine				-	-	-	-	-	-	-	-
		Coastal				-	-	-	-	-	-	-	-
		Total			2560								
	33a SUB-BASIN1/	Tributary				-	-	-	-	-	-	-	-
		Riverine				-	-	-	-	-	-	-	-
		Coastal				-	-	-	-	-	-	-	-
		Total			2560								
	SUB-BASIN 34 (Perdido River)												
34(1)	Upper Perdido River		37.3	78.5									
	Escambia County1/	Tributary				-	-	-	-	-	-	-	-
		Coastal				-	-	-	-	-	-	-	-
		Total			105472	-	-	-	-	-	-	-	-
	34(1) Totals1/				105472								
34(2)	Middle Perdido River		22.8	37.3									
	Escambia County1/	Tributary				3241	2617	595	-	-	9	20	-
		Coastal				5053	3788	494	-	-	12	-	759
		Total			79872	8294	6405	1089	-	-	21	20	759
	34(2) Totals1/				79872	8294	6405	1089	-	-	21	20	759

1/ Floodprone maps not available in portions of Santa Rosa and Escambia Counties. Inventory incomplete in these areas.

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
34(3)	Black River & Perdido Bay		0.0	22.8									
	Escambia County1/	Tributary				5927	5738	-	-	-	-	189	-
		Coastal				32081	11896	-	-	-	2273	-	17912
		Total			50990	38008	17634	-	-	-	2273	189	17912
	34(3) Totals1/				50990	38008	17634	-	-	-	2273	189	17912
	34 SUB-BASIN1/	Tributary				9168	8355	595	-	-	9	209	18671
		Coastal				37134	15684	494	-	-	2285	-	18671
		Total			236334	46302	24039	1089	-	-	2294	209	18671
	SUB-BASIN GCAa (Choctawhatchee Bay)												
GCAa	Choctawhatchee Bay		NA										
	Santa Rosa County	Tributary				4955	4915	-	-	-	-	40	-
		Coastal				73318	11025	-	-	-	-	-	62293
		Total			150608	78273	15940	-	-	-	-	40	62293
	Okaloosa County	Tributary				21423	20812	-	-	-	444	167	-
		Coastal				38224	8478	-	-	-	1994	-	27752
		Total			224692	59647	29290	-	-	-	2438	167	27752
	Walton County1/	Tributary				8717	8673	9	-	-	-	35	-
		Coastal				34194	8998	538	-	75	435	-	24148
		Total			226382	42911	17671	547	-	75	435	35	24148

1/ Floodprone maps not available in portions of Escambia and Walton Counties. Inventory incomplete in these areas.

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
GCAa (Cont)	Escambia County	Coastal				41126	4177	-	-	-	618	-	36331
		Total			41522	41126	4177	-	-	-	618	-	36331
	GCAa SUB-BASIN TOTALS1/	Tributary				35095	34400	9	-	-	444	242	-
		Coastal				186862	32678	538	-	75	3047	-	150524
		Total			643204	221957	67078	547	-	75	3491	242	150524
					Gulf Coastal Area b								
GCAb	St. Andrews Bay												
	Bay County	Tributary				99983	90919	4915	669	579	882	2019	-
		Coastal				147555	64767	3724	637	-	6158	-	72269
		Total			509312	247538	155686	8639	1306	579	7040	2019	72269
	Calhoun County	Tributary				16562	16540	14	-	-	-	8	-
		Total			38912	16562	16540	14	-	-	-	8	-
	Franklin County	Coastal				24295	20737	-	-	-	825	170	2563
		Total			28598	24295	20737	-	-	-	825	170	2563
	Gulf County	Tributary				51012	42398	3172	341	5051	-	50	-
		Coastal				41933	37596	766	-	143	928	-	2500
		Total			146508	92945	79994	3938	341	5194	928	50	2500
	Jackson County	Tributary				2294	1679	-	-	-	-	615	-
		Total			17152	2294	1679	-	-	-	--	615	-

1/ Floodprone maps not available in portions of Walton County. Inventory incomplete in this area.

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					- - - - - -	- - - - - -	- - - - A	c r e s	- - - -	- - - -	- - - -	- - - -	- - - -
GCAb (Cont)	Okaloosa County	Coastal				12152	1915	-	-	-	672	74	9491
		Total			15052	12152	1915	-	-	-	672	74	9491
	Walton County	Tributary				7174	6964	-	-	-	-	210	-
		Coastal				34414	10614	95	-	-	1297	-	22408
		Total			73748	41588	17578	95	-	-	1297	210	22408
	Washington County	Tributary				3494	3205	-	-	-	-	289	-
		Total			20480	3494	3205	-	-	-	-	289	-
	GCAb SUB-BASIN	Tributary				180519	161705	8101	1010	5630	882	3191	-
		Coastal				260349	135629	4585	637	143	9880	244	10923
					849762	440868	297334	12686	1647	5773	10762	3435	10923
GCAc	New River		NA										
	Liberty County	Tributary				122863	113913	8768	-	-	-	182	-
		Total			168735	122863	113913	8768	-	-	-	182	-
	Franklin County	Tributary				125348	99222	25776	-	-	4	346	-
		Coastal				50029	38763	6557	-	-	394	404	3911
		Total			193249	175377	137985	32333	-	-	398	750	3911
	GCAc SUB-BASIN	Tributary				248211	213135	34544	-	-	4	528	-
		Coastal				50029	38763	6557	-	-	394	404	3911
		Total			361984	298240	251898	41101	-	-	398	932	3911

Table 1 (Cont.). Floodprone Areas, Northwest Florida Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
TOTAL - NORTHWEST FLORIDA WATER[1/] MANAGEMENT DISTRICT		Tributary				1403783	1283065	69932	9574	11236	3084	26892	-
		Riverine				313687	265998	6665	3515	2391	103	35015	-
		Coastal				910821	540263	16418	3486	1159	18016	1614	329865
		Total			7450138	2628291	2089326	93015	16575	14786	21203	63521	329865

1/ Floodprone totals incomplete due to unavailability of maps from which data were compiled in Holmes, Walton, Okaloosa, Santa Rosa, and Escambia Counties.

Table 2: Total Watershed Areas and Land Use Within the Floodprone Areas by Aggregations of CNI Watersheds, Counties and Sub-basins - Northeast Gulf River Basins

SUWANNEE RIVER WATER MANAGEMENT DISTRICT, FLORIDA

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
16(2)	Upper St. Marys River												
	Baker County	Tributary	NA			5491	5448	-	-	-	-	43	-
		Total			15418	5491	5448	-	-	-	-	43	-
	Columbia County	Tributary	NA			4741	4709	-	-	-	-	32	-
		Total			7000	4741	4709	-	-	-	-	32	-
	Union County	Tributary	NA			581	581	-	-	-	-	-	-
		Total			1542	581	581	-	-	-	-	-	-
	SUB-BASIN 16 TOTALS	Tributary				10813	10738	-	-	-	-	75	-
		Total			23960	10813	10738	-	-	-	-	75	-

Table 2 (Cont.). Floodprone Areas, Suwannee River Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone Natural State	Floodprone Planted Trees	Floodprone Pasture Land	Floodprone Crop Land	Floodprone Urban & Builtup	Floodprone Open Water Fresh	Floodprone Open Water Salt
					Acres								
	SUB-BASIN 25 (Suwannee River)												
25(2)	Upper Suwannee River		166.4	207.6									
	Columbia County	Tributary				127535	124242	2698	346	10	-	239	-
		Riverine				7694	5829	1483	-	-	-	382	-
		Total			237472	135229	130071	4181	346	10	-	621	-
	Hamilton County	Tributary				45080	44448	320	-	-	-	312	-
		Riverine				7242	6889	75	-	-	-	278	-
		Total			97816	52322	51337	395	-	-	-	590	-
	25(2) Totals				335288	187551	181408	4576	346	10	-	1211	-
25(3)	Upper Middle Suwannee River		127.9	166.4									
	Columbia County	Tributary				5478	3989	-	597	35	-	857	-
		Riverine				1573	313	1231	-	-	-	29	-
		Total			31232	7051	4302	1231	597	35	-	886	-
	Hamilton County	Tributary				14182	14122	30	-	-	-	30	-
		Riverine				7329	6681	90	150	-	105	303	-
		Total			79892	21511	20803	120	150	-	105	333	-
	Suwannee County	Tributary				20311	17410	377	1128	88	349	959	-
		Riverine				5637	5161	141	39	-	24	272	-
		Total			124324	25948	22571	518	1167	88	373	1231	-
	25(3) Totals				235448	54510	47676	1869	1914	123	478	2450	-

Table 2 (Cont.). Floodprone Areas, Suwannee River Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone Natural State	Floodprone Planted Trees	Floodprone Pasture Land	Floodprone Crop Land	Floodprone Urban & Builtup	Floodprone Open Water Fresh	Floodprone Open Water Salt
					------	A c r e s	------						
25(4)	Middle Suwannee River		90.1	127.9									
	Madison County	Tributary				35050	31328	2704	480	51	20	467	-
		Riverine				5655	3784	1264	-	270	100	237	-
		Total			90112	40705	35112	3968	480	321	120	704	-
	Suwannee County	Tributary				12906	10237	697	507	643	224	598	-
		Riverine				1434	909	-	132	103	282	8	-
		Total			150602	14340	11146	697	639	746	506	606	-
	Lafayette County	Tributary				25577	23419	1540	11	424	-	183	-
		Riverine				6463	3770	1152	759	439	-	343	-
		Total			57408	32040	27189	2692	770	863	-	526	-
	25(4) Totals				298122	87085	73447	7357	1889	1930	626	1836	-
25(5)	Lower Middle Suwannee River		65.9	90.1									
	Columbia County	Tributary				433	433	-	-	-	-	-	-
		Total			8960	433	433	-	-	-	-	-	-
	Suwannee County	Tributary				4819	3915	144	225	164	38	333	-
		Riverine				7157	3571	1717	725	523	323	298	-
		Total			142508	11976	7486	1861	950	687	361	631	-
	Lafayette County	Tributary				50121	46848	1804	288	187	-	994	-
		Riverine				19206	12484	2679	2081	1323	-	639	-
		Total			153151	69327	59332	4483	2369	1510	-	1633	-
	Dixie County	Tributary				5610	4707	860	-	-	-	43	-
		Riverine				1201	462	-	-	690	-	49	-
		Total			19456	6811	5169	860	-	690	-	92	-
	25(5) Totals				324075	88547	72420	7204	3319	2887	361	2356	-

Table 2 (Cont.). Floodprone Areas, Suwannee River Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
25(6)	Lower Suwannee River		0.0	65.9									
	Dixie County	Tributary				24170	21695	2155	-	-	-	320	-
		Riverine				11893	8453	-	1880	90	810	660	-
		Coastal				27224	21775	1786	-	-	867	39	2757
		Total			107374	63287	51923	3941	1880	90	1677	1019	2757
	Gilchrist County	Tributary				6246	3870	2040	-	-	-	336	-
		Riverine				13256	9602	35	934	60	1785	840	-
		Total			116320	19502	13472	2075	934	60	1785	1176	-
	Levy County	Tributary				13953	11347	574	1366	-	-	666	-
		Riverine				1270	1142	-	46	-	-	82	-
		Coastal				63112	54478	-	187	-	-	-	8447
					176680	78335	66967	574	1599	-	-	748	8447
	25(6) Totals				400374	161124	132362	6590	4413	150	3462	2943	11204
	SUB-BASIN 25 TOTALS	Tributary				391471	362010	15943	4948	1602	631	6337	-
		Riverine				97010	69050	9867	6746	3498	3429	4420	-
		Coastal				90336	76253	1786	187	-	867	39	11204
		Total			1593307	578817	507313	27596	11881	5100	4927	10796	11204

Table 2 (Cont.). Floodprone Areas, Suwannee River Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water: Fresh	Floodprone: Open Water: Salt
					- - - - - A c r e s - - - - -								
	SUB-BASIN 25a (Alapaha River)												
25a(2)	Lower Alapaha		135.7	158.8									
	Hamilton County	Tributary				27328	26898	316	-	-	-	114	-
		Riverine				5246	4693	-	236	80	-	237	-
		Total			92416	32574	31591	316	236	80	-	351	-
	SUB-BASIN 25a TOTALS	Tributary				27328	26898	316	-	-	-	114	-
		Riverine				5246	4693	-	236	80	-	237	-
		Total			92416	32574	31591	316	236	80	-	351	-
	SUB-BASIN 25b (Withlacoochee River)												
25b(2)	Lower Withlacoochee		127.9	155.4									
	Hamilton County	Tributary				6374	5940	20	-	-	5	409	-
		Riverine				6431	4434	1328	295	86	40	248	-
					59476	12805	10374	1348	295	86	45	657	-
	Madison County	Tributary				8732	7725	-	20	292	-	695	-
		Riverine				6727	5436	296	420	223	-	352	-
		Total			86320	15459	13161	296	440	515	-	1047	-
	25b(2) Totals				145796	28264	23535	1644	735	601	45	1704	
	SUB-BASIN 25b TOTALS	Tributary				15106	13665	20	20	292	5	1104	-
		Riverine				13158	9870	1624	715	309	40	600	-
		Total			145796	28264	23535	1644	735	601	45	1704	

Table 2 (Cont.). Floodprone Areas, Suwannee River Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Natural State	Planted Trees	Pasture Land	Crop Land	Urban & Builtup	Open Water: Fresh	Open Water: Salt
					----	----	----	Acres	----	----	----	----	----
	SUB-BASIN 25c (Santa Fe River)												
25c(1)	Upper Santa Fe River		116.1	Source									
	Alachua County	Tributary				37186	27203	2524	417	-	101	6941	-
		Total			81584	37186	27203	2524	417	-	101	6941	-
	Bradford County	Tributary				51983	47405	712	93	-	2	3771	-
		Total			102045	51983	47405	712	93	-	2	3771	-
	25c(1) Totals				183629	89169	74608	3236	510	-	103	10712	-
25c(2)	New River		NA										
	Bradford County	Tributary				21594	21287	295	-	-	-	12	-
		Total			87878	21594	21287	295	-	-	-	12	-
	Union County	Tributary				20896	20140	98	291	-	46	321	-
		Total			81699	20896	20140	98	291	-	46	321	-
	25c(2) Totals				169577	42490	41427	393	291	-	46	333	-
25c(3)	Lower Santa Fe River		65.9	116.1									
	Alachua County	Tributary				8789	8355	-	50	-	-	384	-
		Riverine				5292	5080	-	-	-	45	167	-
		Total			177356	14081	13435	-	50	-	45	551	-
	Baker County	Tributary				9502	7673	-	-	-	17	1812	-
		Total			18220	9502	7673	-	-	-	17	1812	-
	Columbia County	Tributary				23260	22563	156	-	-	-	541	-
		Riverine				8548	6142	83	-	-	2047	276	-
		Total			220336	31808	28705	239	-	-	2047	817	-

Table 2 (Cont.). Floodprone Areas, Suwannee River Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone Natural State	Floodprone Planted Trees	Floodprone Pasture Land	Floodprone Crop Land	Floodprone Urban & Builtup	Floodprone Open Water Fresh	Floodprone Open Water Salt
					Acres								
25c(3) (Cont.)													
	Gilchrist County	Tributary				18424	8946	9037	126	-	-	315	-
		Riverine				7879	4472	-	2699	259	223	226	-
		Total			55900	26303	13418	9037	2825	259	223	541	-
	Union County	Tributary				34472	32537	173	192	-	-	1570	-
		Riverine				1422	1393	-	4	-	-	25	-
		Total			71621	35894	33930	173	196	-	-	1595	-
	Suwannee County	Tributary				664	513	-	34	-	42	75	-
		Riverine				2543	2333	28	52	32	26	72	-
		Total			22246	3207	2846	28	86	32	68	147	-
	25c(3) Totals				565679	120795	100007	9477	3157	291	2400	5463	-
	25c SUB-BASIN	Tributary				226770	196622	12995	1203	-	208	15742	-
		Riverine				25684	19420	111	2755	291	2341	766	-
		Total			918885	252454	216042	13106	3958	291	2549	16508	-

Table 2 (Cont.). Floodprone Areas, Suwannee River Water Management District, Florida

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
	SUB-BASIN 26 (Aucilla River)												
26(1)	Upper Aucilla River		34.1	62.4									
	Jefferson County	Tributary				21586	20827	18	253	219	10	259	-
		Total			50306	21586	20827	18	253	219	10	259	-
	Madison County	Tributary				32385	31728	255	104	74	6	218	-
		Total			62344	32385	31728	255	104	74	6	218	-
	26(1) Totals				112650	53971	52555	273	357	293	16	477	-
26(2)	Middle Aucilla River		25.8	34.1									
	Jefferson County	Tributary				20219	18689	82	887	509	52	-	-
		Riverine				2733	2715	-	-	7	-	11	-
		Total			23813	22952	21404	82	887	516	52	11	-
	Madison County	Tributary				67987	66104	615	623	141	50	454	-
		Riverine				3569	3405	-	-	-	-	164	-
		Total			135752	71556	69509	615	623	141	50	618	-
	26(2) Totals				159565	94508	90913	697	1510	657	102	629	-
26(3)	Lower Aucilla River		0.0	25.8									
	Jefferson County	Tributary				52210	43980	7187	315	162	130	436	-
		Riverine				8835	5354	3311	47	38	30	55	-
		Coastal				13992	12245	1097	-	-	14	177	459
		Total			128890	75037	61579	11595	362	200	174	668	459

Table 2 (Cont.). Floodprone Areas, Suwannee River Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
26(3)	(Cont.)												
	Taylor County	Tributary				1066	922	144	-	-	-	-	-
		Riverine				3051	2505	525	-	-	-	21	-
		Coastal				15501	13427	1664	-	-	30	-	380
		Total			51200	19618	16854	2333	-	-	30	21	380
	26(3) Totals				180090	94655	78433	13928	362	200	204	689	839
	26 SUB-BASIN	Tributary				195453	182250	8301	2182	1105	248	1367	-
		Riverine				18188	13979	3836	47	45	30	251	-
		Coastal				29493	25672	2761	-	-	44	177	839
		Total			452305	243134	221901	14898	2229	1150	322	1795	839
27(1)	Upper St. Marks River												
	Jefferson County	Tributary	NA			302	246	-	12	-	-	44	-
		Total			4311	302	246	-	12	-	-	44	-
	27(1) Totals				4311	302	246	-	12	-	-	44	-
27(2)	Lower St. Marks River												
	Jefferson County	Tributary	NA			176	176	-	-	-	-	-	-
		Total			2737	176	176	-	-	-	-	-	-
	27(2) Totals				2737	176	176	-	-	-	-	-	-
	27 SUB-BASIN	Tributary				478	422	-	12	-	-	44	-
		Total			7048	478	422	-	12	-	-	44	-

Table 2 (Cont.). Floodprone Areas, Suwannee River Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Flood-prone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
	SUB-BASIN GCAd												
GCAd(1)	Econfina River		NA										
	Madison County	Tributary				19293	17238	1582	240	233	-	-	-
		Total			58112	19293	17238	1582	240	233	-	-	-
	Taylor County	Tributary				88111	68483	18818	678	34	-	98	-
		Riverine				59	59	-	-	-	--	-	-
		Coastal				26960	23916	2422	-	-	-	-	622
		Total			116992	115130	92458	21240	678	34	-	98	622
	GCAd(1) Totals				175104	134423	109696	22822	918	267	-	98	622
GCAd(2)	Upper Fenholloway River		13.8	Source									
	Madison County	Tributary				9495	9491	-	-	-	-	4	-
		Total			20480	9495	9491	-	-	-	-	4	-
	Lafayette County	Tributary				18067	13431	4636	-	-	-	-	-
		Total			33792	18067	13431	4636	-	-	-	-	-
	Taylor County	Tributary				106078	86419	18555	535	9	373	187	-
		Riverine				1039	811	213	15	-	-	-	-
		Total			162840	107117	87230	18768	550	9	373	187	-
	GCAd(2) Totals				217112	134679	110152	23404	550	9	373	191	-
GCAd(3)	Lower Fenholloway River		0.0	13.8									
	Taylor County	Tributary				24294	21226	3060	8	-	-	-	-
		Riverine				2585	1991	401	193	-	-	-	-
		Coastal				38115	34539	2304	-	-	58	-	1214
		Total			105440	64994	57756	5765	201	-	58	-	1214
	GCAd(3) Totals				105440	64994	57756	5765	201	-	58	-	1214

Table 2 (Cont.). Floodprone Areas, Suwannee River Water Management District, Florida

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water: Fresh	Floodprone: Open Water: Salt
					Acres								
GCAd(4)	Steinhatchee River												
	Taylor County	Tributary				106889	99816	6351	388	69	11	254	-
		Coastal				34929	26872	4915	-	21	1227	-	1894
		Total			236808	141818	126688	11266	388	90	1238	254	1894
	Lafayette County	Tributary				119785	100436	19176	-	59	-	114	-
		Total			108288	119785	100436	19176	-	59	-	114	-
	Dixie County	Tributary				141275	120360	20650	74	-	-	191	-
		Coastal				116495	108099	3147	80	-	630	74	4465
		Total			326930	257770	228459	23797	154	-	630	265	4465
	GCAd(4) Totals				672026	519373	455583	54239	542	149	1868	633	6359
	GCAd SUB-BASIN	Tributary				633287	536900	92828	1923	404	384	848	-
		Riverine				3683	2861	614	208	-	-	-	-
		Coastal				216499	193426	12788	80	21	1915	74	8195
		Total			1169682	853469	733187	106230	2211	425	2299	922	8195
TOTAL -	SUWANNEE RIVER WATER MANAGEMENT DISTRICT	Tributary				1500706	1329505	130403	10288	3403	1476	25631	-
		Riverine				162969	119873	16052	10707	4223	5840	6274	-
		Coastal				336328	295351	17335	267	21	2826	290	20238
		TOTAL			4403398	2000003	1744729	163790	21262	7647	10142	32195	20238

Table 3: Total Watershed Areas and Land Use Within the Floodprone Areas by Aggregations of CNI Watersheds, Counties and Sub-basins - Northeast Gulf River Basins

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT, FLORIDA

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Natural State	Planted Trees	Pasture Land	Crop Land	Urban & Builtup	Open Water: Fresh	Open Water: Salt
					Acres								
16(2)	Upper St. Marys River		111.0	139.6									
	Baker County1/	Tributary				95799	94125	1377	-	-	-	297	-
		Total			273070	95799	94125	1377	-	-	-	297	-
	Union County1/	Tributary				581	581	-	-	-	-	-	-
		Total			1938	581	581	-	-	-	-	-	-
	16(2) Totals				275008	96380	94706	1377	-	-	-	297	-
16(3)	Lower St. Marys River		0.0	111.0									
	Baker County1/	Tributary				287	287	-	-	-	-	-	-
		Total			22272	287	287	-	-	-	-	-	-
	Duval County	Tributary				10920	10594	-	248	-	35	43	-
		Total			28672	10920	10594	-	248	-	35	43	-
	Nassau County1/	Tributary				37746	34624	2902	218	-	2	-	-
		Riverine				14253	12543	706	-	-	2	1002	-
		Coastal				29943	22401	-	-	-	448	-	7094
		Total			221208	81942	69568	3608	218	-	452	1002	7094
	16(3) Totals				272152	93149	80449	3608	466	-	487	1045	7094
	16 SUB-BASIN TOTALS	Tributary				145333	140211	4279	466	-	37	340	-
		Riverine				14253	12543	706	-	-	2	1002	-
		Coastal				29943	22401	-	-	-	448	-	7094
		Total			547160	189529	175155	4985	466	-	487	1342	7094

1/ Floodprone maps not available in parts of Baker, Nassau, and Union Counties. Inventory not complete in these areas.

Table 3 (Cont.). Floodprone Areas, St. Johns River Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					Acres								
	SUB-BASIN 25 (Suwannee River)												
25(2)	Upper Suwannee River												
	Baker County	Tributary	NA			24135	22200	1812	-	-	-	123	-
		Total				24135	22200	1812	-	-	-	123	-
	25(2) Total				28000	24135	22200	1812	-	-	-	123	-
	SUB-BASIN 25c (Santa Fe River)												
25c(1)	Upper Santa Fe River		NA										
	Bradford County	Tributary				643	308	-	-	-	-	335	-
		Total				643	308	-	-	-	-	335	-
	25c(1) Totals				2677	643	308	-	-	-	-	335	-
25c(2)	New River												
	Baker County	Tributary				8382	8382	-	-	-	-	-	-
		Total				8382	8382	-	-	-	-	-	-
	25c(2) Totals				18872	8382	8382	-	-	-	-	-	-
25c(3)	Lower Santa Fe River												
	Baker County	Tributary				66	66	-	-	-	-	-	-
		Total				66	66	-	-	-	-	-	-
	25c(3) Totals				468	66	66	-	-	-	-	-	-
	SUB-BASIN 25c TOTALS	Tributary				9091	8756	-	-	-	-	335	-
		Total			22017	9091	8756	-	-	-	-	335	-

Table 3 (Cont.). Floodprone Areas, St. Johns River Water Management District, Florida

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup	Floodprone: Open Water Fresh	Floodprone: Open Water Salt
					A c r e s								
	SUB-BASIN - Atlantic Coastal Area (Nassau River)												
ACa	Nassau River		NA										
	Nassau County1/	Tributary				42040	39503	1568	352	-	548	69	-
		Coastal				33224	26917	-	15	-	79	17	6196
		Total			68128	75264	66420	1568	367	-	627	86	6196
	Duval County	Tributary				16288	15272	72	731	-	179	34	-
		Coastal				25794	20280	-	-	-	352	3	5159
		Total			208232	42082	35552	72	731	-	531	37	5159
	ACa Totals	Tributary				58328	54775	1640	1083	-	727	103	-
		Coastal				59018	47197	-	15	-	431	20	11355
		Total			276360	117346	101972	1640	1098	-	1158	123	11355
ST. JOHNS WATER MANAGEMENT DISTRICT TOTAL													
		Tributary1/				236887	225942	7731	1549	-	764	901	-
		Riverine				14253	12543	706	-	-	2	1002	-
		Coastal				88961	69598	-	15	-	879	20	18449
		TOTAL			873537	340101	308083	8437	1564	-	1645	1923	18449

1/ Floodprone maps not available in part of Nassau County. Inventory incomplete in this area.

2/ Totals incomplete due to unavailability of maps for Nassau, Baker, and Union Counties.

Floodprone Areas - Alabama

The Alabama floodprone survey was recorded on 7.5-minute series U.S.G.S. maps. Some 15-minute series maps were used where the 7.5-minute maps were not available. Maps for many areas in the northern and western part of the Basins were not available in either series. In these areas, county transportation maps were used as base maps. An experienced Soil Conservation Service Soil Scientist delineated the floodprone boundaries by correlating soil types to flood frequency, after reviewing all available floodprone data. General and detailed soils maps were used in making the delineations. These delineations were made on all main and tributary streams until the stream flood plain narrowed to 400 feet in width.

The floodprone boundaries were not field checked to determine accuracy except at a limited number of known points.

The land use in the floodprone areas was done by Soil Conservation Service technicians in each of the respective counties. The developed land was classified into cropland, pastureland, planted trees, and urban and built-up. The remainder was classified as natural state, which included all open water areas. In Alabama, the delineation between tributary and riverine areas was made at the mouth of the tributary.

The Alabama floodprone areas were summarized by counties, aggregations of CNI Watersheds within sub-basins, and by sub-basins (Figure 2). The sub-basins were further summarized into four major basins: Chattahoochee, Chipola, Choctawhatchee, and Perdido-Escambia (Figure 1 and Tables 4, 5, 6, and 7).

The Chattahoochee Basin is comprised of one major river system having about 1.60 million acres of watershed within the study area, of which 0.24 million acres are classified as floodprone. Land use in the floodprone area includes 3.1 per cent in cropland, 3.8 per cent in pastureland, 0.8 per cent in planted trees, 0.5 per cent in urban and built-up areas, and 91.8 per cent in natural state.

The Perdido-Escambia Basin is made up of three river systems with eight large creek tributaries, having a total watershed area of 3.32 million acres. The floodprone land within this basin is 0.38 million acres, of which 0.3 per cent is in cropland, 2.2 per cent in pastureland, 2.7 per cent in planted trees, and 0.3 per cent in urban and built-up. The remaining 94.5 per cent was classified as natural state.

In summary, Alabama has 7.12 million acres within the Northeast Gulf Basins, 0.90 million acres (12.6 per cent) of which are floodprone. The floodprone area is in planted trees (1.9 per cent), cropland (1.3 per cent), pastureland (3.0 per cent), urban and built-up (0.3 per cent), and natural state (93.5 per cent).

Table 4. Total Watershed Areas and Land Use Within the Floodprone Areas by Aggregations of CNI Watersheds, Counties and Sub-basins - Northeast Gulf River Basins

CHATTAHOOCHEE RIVER, ALABAMA

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
	SUB-BASIN 29a (Chattahoochee River)											
29a(1)	Hardley-Wehadkee Creek		197.7	Source								
	Randolph County	Tributary					4525	3026	-	1499	-	-
		Total			1,2,3,4	52058	4525	3026	-	1499	-	-
	Chambers County	Tributary					10867	10426	-	441	-	-
		Riverine					1096	1096	-	-	-	-
		Total			4,5,6,7,8	104065	11963	11522	-	441	-	-
	29a(1) Totals					156123	16488	14548	-	1940	-	-
29a(2)	Lake Harding		172.2	197.7								
	Chambers County	Tributary					7298	6885	-	381	-	32
		Riverine					421	393	-	-	-	28
		Total			9,10,11	91449	7719	7278	-	381	-	60
	Lee County	Tributary					9643	8992	-	651	-	-
		Riverine					1342	1342	-	-	-	-
		Total			10,11,12	91353	10985	10334	-	651	-	-
	29a(2) Totals					182802	18704	17612	-	1032	-	60
29a(3)	Uchee Creek		139.3	172.2								
	Lee County	Tributary					6234	5743	-	363	128	-
		Riverine					839	839	-	-	-	-
		Total			13,14,15,16	122228	7073	6582	-	363	128	-
	Russell County	Tributary					17010	14953	38	1249	742	28
		Riverine					12171	10603	-	232	1252	84
		Total			14,15,16	156609	29181	25556	38	1481	1994	112
	29a(3) Totals					278837	36254	32138	38	1844	2122	112

Table 4 (Cont.). Floodprone Areas, Chattahoochee River, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						---- A c r e s ----						
29a(4)	Hatchechubee		107.6	139.3								
	Russell County	Tributary					17423	16449	241	434	299	-
		Riverine					5587	4431	-	181	835	140
		Total			17	154429	23010	20880	241	615	1134	140
	Barbour County	Tributary					1186	1186	-	-	-	-
		Riverine					1561	1535	-	-	26	-
		Total			17	14134	2747	2721	-	-	26	-
	29a(4) Total					168563	25757	23601	241	615	1160	140
29a(5)	Cowikee Creek		102.8	107.6								
	Russell County	Tributary					42218	42102	-	20	96	-
		Total			18,19	90370	42218	42102	-	20	96	-
	Bullock County	Tributary					1956	1821	-	90	45	-
		Total			19,20	60614	1956	1821	-	90	45	
	Barbour County	Tributary					17054	15463	784	334	473	-
		Riverine					2066	2022	44	-	-	-
		Total			19,20	124473	19120	17485	828	334	473	-
	Macon County	Total				15770	-	-	-	-	-	-
	29a(5) Total				18,19	291227	63294	61408	828	444	614	-

Table 4 (Cont.). Floodprone Areas, Chattahoochee River, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						A c r e s						
29a(6)	Barbour Creek		84.0	102.8								
	Barbour County	Tributary					15705	15637	-	68	-	-
		Riverine					3239	3239	-	-	-	-
		Total			21,22,23,24	145228	18944	18876	-	68	-	-
	Henry County	Tributary					1655	1655	-	-	-	-
		Riverine					852	852	-	-	-	-
		Total			24	18691	2507	2507	-	-	-	-
	29a(6) Total					163919	21451	21383	-	68	-	-
29a(7)	Abbie Creek		52.0	84.0								
	Barbour County	Tributary					135	135	-	-	-	-
		Total			25	2111	135	135	-	-	-	-
	Henry County	Tributary					16649	16056	26	133	434	-
		Riverine					7777	5191	-	490	2096	
		Total			25,26,27	176121	24426	21247	26	623	2530	-
	29a(7) Total					178232	24561	21382	26	623	2530	

Table 4 (Cont.). Floodprone Areas, Chattahoochee River, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
29a(8)	Omussee Creek		25.6	52.0								
	Henry County	Tributary					3949	3929	-	-	20	-
		Total			28,29	52884	3949	3929	-	-	20	-
	Houston County	Tributary					14918	14732	10	42	96	38
		Riverine					11784	6993	687	2362	880	862
		Total			28,29,30	127844	26702	21725	697	2404	976	900
	29a(8) Total					180728	30651	25654	697	2404	996	900
	SUB-BASIN 29a TOTALS	Tributary					188425	179190	1099	5705	2333	98
		Riverine					48735	38536	731	3265	5089	1114
		TOTAL				1600431	237160	217726	1830	8970	7422	1212

Table 5. Total Watershed Areas and Land Use Within the Floodprone Areas by Aggregations of CNI Watersheds, Counties and Sub-basins - Northeast Gulf River Basins

CHIPOLA BASIN, ALABAMA

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres	Acres	Acres	Acres	Acres	Acres	Acres
	SUB-BASIN 29b (Chipola Basin)											
29b(1)	Cowarts - Big Creek		90.4	Source								
	Houston County	Tributary					31997	30722	48	906	286	35
		Total			1,2,3,4,5,6,7	185650	31997	30722	48	906	286	35
	Geneva County	Tributary					259	259	-	-	-	-
		Total			7	4809	259	259	-	-	-	-
	SUB-BASIN 29b	Tributary					32256	30981	48	906	286	35
		Total				190459	32256	30981	48	906	286	35

Table 6. Total Watershed Areas and Land Use Within the Floodprone Areas by Aggregations of CNI Watersheds, Counties and Sub-basins - Northeast Gulf River Basins

CHOCTAWHATCHEE BASIN, ALABAMA

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
	SUB-BASIN 30 (Choctawhatchee River)											
30(1)	West Fork- Choctawhatchee			NA								
	Barbour County	Tributary					8327	8294	33	-	-	-
		Total			1,2,3,4	118070	8327	8294	33	-	-	-
	Dale County	Tributary					14264	13889	-	375	-	-
		Total			1,2,4	109589	14264	13889	-	375	-	-
	30(1) Total					227659	22591	22183	33	375	-	-
30(2)	East Fork- Choctawhatchee		138.5	Source								
	Barbour County	Tributary					3987	3815	14	158	-	-
		Total			1	44757	3987	3815	14	158	-	-
	Dale County	Tributary					4830	4702	-	15	113	-
		Total			1,2	50917	4830	4702	-	15	113	-
	Henry County	Tributary					17144	16678	182	271	13	-
		Total			1,2	113967	17144	16678	182	271	13	-
	30(2) Total					209641	25961	25195	196	444	126	-
30(3)	Little Choctawhatchee & Claybank		113.3	138.5								
	Coffee County	Tributary					2156	2135	-	21	-	-
		Total			3,4,5	47348	2156	2135	-	21	-	-
	Dale County	Tributary					13547	13350	-	114	71	12
		Riverine					3598	3476	-	46	76	-
		Total			3,4,5,6,9	186156	17145	16826	-	160	147	12

Table 6 (Cont.). Floodprone Areas, Choctawhatchee Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
30(3)	(Cont.)											
	Geneva County	Tributary					6692	6667	-	25	-	-
		Total			12,13,14,15,4	69451	6692	6667	-	25	-	-
	Houston County	Tributary					3894	3864	-	10	-	20
		Riverine					1022	980	-	42	-	-
		Total			9,13,14,15	57066	4916	4844	-	52	-	20
	30(3) Total					360021	30909	30472	-	258	147	32
30(4)	Double Bridge		91.7	113.3								
	Dale County	Tributary					840	840	-	-	-	-
		Total			10	1703	840	840	-	-	-	-
	Coffee County	Tributary					5373	5373	-	-	-	-
		Total			7,8,10	88702	5373	5373	-	-	-	-
	Geneva County	Tributary					11896	11881	15	-	-	-
		Riverine					7844	7147	15	587	85	10
		Total			7,8,10,11,16	137838	19740	19028	30	587	85	10
	30(4) Total					228243	25953	25241	30	587	85	10
30(5)	Wrights-Sandy Creek		26.4	91.7								
	Geneva County	Tributary					4553	4513	-	-	40	-
		Riverine					304	304	-	-	-	-
		Total			17,18,19	37484	4857	4817	-	-	40	-
	30(5) Total					37484	4857	4817	-	-	40	-

Table 6 (Cont.). Floodprone Areas, Choctawhatchee Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
30(6)	Holmes Creek			NA								
	Geneva County	Tributary					989	957	-	32	-	-
		Total			20	3500	989	957	-	32	-	-
	Houston County	Tributary					1241	1105	-	76	60	-
		Total			20	4013	1241	1105	-	76	60	-
	30(6) Total					7513	2230	2062	-	108	60	-
	SUB-BASIN 30 TOTAL	Tributary					99733	98063	244	1137	257	32
		Riverine					12768	11907	15	675	161	10
		Total				1070561	112501	109970	259	1812	418	42
30a(1)	Upper Pea River		101.3	Source								
	Bullock County	Tributary					15074	12748	26	2300	-	-
		Total			1,2	98400	15074	12748	26	2300	-	-
	Barbour County	Tributary					12531	12172	-	359	-	-
		Total			1,2,3	95075	12531	12172	-	359	-	-
	Pike County	Tributary					7152	6758	-	209	185	-
		Total			1	37174	7152	6758	-	209	185	-
	30a(1) Total					230649	34757	31678	26	2868	185	

Table 6 (Cont.). Floodprone Areas, Choctawhatchee Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Total Floodprone	Floodprone Natural State	Floodprone Planted Trees	Floodprone Pasture Land	Floodprone Crop Land	Floodprone Urban & Builtup
						Acres						
30a(2)	Middle Pea River		59.6	101.3								
	Barbour County	Tributary					1705	1645	20	40	-	-
		Riverine					1200	1091	51	32	26	-
		Total			8	31505	2905	2736	71	72	26	-
	Coffee County	Tributary					1568	1542	26	-	-	-
		Riverine					10249	6321	2294	1290	264	80
		Total			8	75813	11817	7863	2320	1290	264	80
	Dale County	Tributary					319	319	-	-	-	-
		Riverine					1434	1290	-	144	-	-
		Total			8	10035	1753	1609	-	144	-	-
	Pike County	Tributary					5019	4979	-	-	40	-
		Riverine					1865	1849	-	16	-	-
		Total			8	56449	6884	6828	-	16	40	-
	30a(2) Total					173802	23359	19036	2391	1522	330	80
30a(3)	White Water		NA									
	Coffee County	Tributary					9382	7887	1276	-	219	-
		Riverine					360	278	-	-	-	82
		Total			4,7	83473	9742	8165	1276	-	219	82
	Crenshaw County	Tributary					169	169	-	-	-	-
		Total			4	4301	169	169	-	-	-	-
	Pike County	Tributary					10686	10652	-	34	-	-
		Total			4,5,6,7	130351	10686	10652	-	34	-	-
	30a(3) Total					218125	20597	18986	1276	34	219	82

Table 6 (Cont.). Floodprone Areas, Choctawhatchee Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
30a(4)	Lower Pea River		0.0	59.6								
	Coffee County	Tributary					6146	5946	122	-	56	22
		Riverine					10818	7411	1073	1304	712	318
		Total			9,10,11	132744	16964	13357	1195	1304	768	340
	Covington County	Tributary					9717	9640	-	60	17	-
		Total			10,11,12,13	68227	9717	9640	-	60	17	-
	Geneva County	Tributary					12414	12414	-	-	-	-
		Riverine					16549	14665	20	675	1139	50
		Total			10,11,12,13,14,15	112826	28963	27079	20	675	1139	50
	30a(4) Total					313797	55644	50076	1215	2039	1924	390
	SUB-BASIN 30a	Tributary					91882	86871	1470	3002	517	22
		Riverine					42475	32905	3438	3461	2141	530
		Total				936373	134357	119776	4908	6463	2658	552
CHOCTAWHATCHEE BASIN TOTAL		Tributary					191615	184934	1714	4139	774	54
		Riverine					55243	44812	3453	4136	2302	540
		Total				2006934	246858	229746	5167	8275	3076	594

Table 7. Total Watershed Areas and Land Use Within the Floodprone Areas by Aggregations of CNI Watersheds, Counties and Sub-basins - Northeast Gulf River Basins

PERDIDO-ESCAMBIA BASIN, ALABAMA

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						-------	-------	A c r e s	-------	-------	-------	-------
					SUB-BASIN 31							
31(1)	Upper Yellow River		74.2	Source								
	Coffee County	Tributary					149	149	-	-	-	-
		Total			3	5200	149	149	-	-	-	-
	Covington County	Tributary					17188	17188	-	-	-	-
		Total			1,2,3,4,6	187172	17188	17188	-	-	-	-
	Crenshaw County	Tributary					1066	1066	-	-	-	-
		Total			2,3	8994	1066	1066	-	-	-	-
	31(1) Total					201366	18403	18403	-	-	-	-
31(2)	Middle Yellow River		67.1	74.2								
	Covington County	Tributary					6733	6684	-	49	-	-
		Riverine					1477	1477	-		-	-
		Total			5,7,8	134092	8210	8161	-	49	-	-
	31(2) Total					134092	8210	8161	-	49	-	-
	SUB-BASIN 31	Tributary					25136	25087	-	49	-	-
		Riverine					1477	1477	-	-	-	-
		Total				335458	26613	26564	-	49	-	-
32(1)	Upper Black Water		54.1	Source								
	Covington County	Tributary					3866	3866	-	-	-	-
		Total			4,5	42394	3866	3866	-	-	-	-
	Escambia County	Tributary					2723	2723	-	-	-	-
		Total			4,5	25434	2723	2723	-	-	-	-
	32(1) Total					67828	6589	6589	-	-	-	-

Table 7 (Cont.). Floodprone Areas, Perdido-Escambia Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
32(2)	Pond-Coldwater-Juniper Creek			NA								
	Escambia County	Tributary					553	553	-	-	-	-
		Total			1,2,3	12738	553	553	-	-	-	-
	32(2) Total					12738	553	553	-	-	-	-
	SUB-BASIN 32 TOTAL					80566	7142	7142	-	-	-	-
					SUB-BASIN 33							
33(1)	Escambia Creek			NA								
	Conecuh County	Tributary					3296	3296	-	-	-	-
		Total			1	38080	3296	3296	-	-	-	-
	Escambia County	Tributary					10613	10432	150	-	20	11
		Total			1,2	127476	10613	10432	150	-	20	11
	Monroe County	Tributary					3361	3361	-	-	-	-
		Total			1	46682	3361	3361	-	-	-	-
	33(1) Total					212238	17270	17089	150	-	20	11
33(2)	Escambia River		0.0	57.9								
	Escambia County	Tributary					2109	1274	-	213	470	152
		Total			3,4	20287	2109	1274	-	213	470	152
	33(2) Total					20287	2109	1274	-	213	470	152
	SUB-BASIN 33 TOTAL					232525	19379	18363	150	213	490	163

Table 7 (Cont.). Floodprone Areas, Perdido-Escambia Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
					SUB-BASIN 33a							
33a(1)	Upper Conecuh River		141.9	Source								
	Bullock County	Tributary					1820	1587	6	227	-	-
		Total			1,2	65338	1820	1587	6	227	-	-
	Montgomery County	Tributary					426	207	130	89	-	-
		Total			1,3	6320	426	207	130	89	-	-
	Pike County	Tributary					18726	17107	-	1584	35	-
		Total			1,2,3,4	139357	18726	17107	-	1584	35	-
	33a(1) Total					211015	20972	18901	136	1900	35	-
33a(2)	Upper Middle Conecuh		79.5	141.9								
	Crenshaw County	Tributary					6111	6091	20	-	-	-
		Riverine					7662	7571	-	-	91	-
		Total			5	80921	13773	13662	20	-	91	-
	Covington County	Tributary					628	628	-	-	-	-
		Riverine					1114	1090	-	24	-	-
		Total			5,6	56260	1742	1718	-	24	-	-
	Pike County	Tributary					2069	2069	-	-	-	-
		Riverine					4449	4449	-	-	-	-
		Total			5	39023	6518	6518	-	-	-	-
	33a(2) Total					176204	22033	21898	20	24	91	-

Table 7 (Cont.). Floodprone Areas, Perdido-Escambia Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
33a(3)	Lower Middle Conecuh		46.0	79.5								
	Covington County	Tributary					5174	4594	580	-	-	-
		Riverine					9923	8662	140	683	438	-
		Total			7,8,9,10	92342	15097	13256	720	683	438	
	Escambia County	Riverine					619	619	-	-	-	-
		Total			10	4687	619	619	-	-	-	-
	Conecuh County	Riverine					826	826	-	-	-	-
		Total			9	6774	826	826	-	-	-	-
	33a(3) Total					103803	16542	14701	720	683	438	-
33a(4)	Lower Conecuh		0.0	46.0								
	Conecuh County	Tributary					618	618	-	-	-	-
		Total			17	14637	618	618	-	-	-	-
	Escambia County	Tributary					7760	7760	-	-	-	-
		Riverine					29648	29503	90	-	27	28
		Total			17,20	231669	37408	37263	90	-	27	28
	33a(4) Total					246306	38026	37881	90	-	27	28

Table 7 (Cont.). Floodprone Areas, Perdido-Escambia Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
33a(5)	Upper Patsaliga		41.3	Source								
	Crenshaw County	Tributary					20026	19615	60	351	-	-
		Total			1,2,3	131389	20026	19615	60	351	-	-
	Montgomery County	Tributary					5182	2276	2153	753	-	-
		Total			2,3,4	54736	5182	2276	2153	753	-	-
	Pike County	Tributary					5287	5092	-	195	-	-
		Total			3,4	28366	5287	5092	-	195	-	-
	33a(5) Total					214491	30495	26983	2213	1299	-	-
33a(6)	Lower Patsaliga		0.0	41.3								
	Butler County	Tributary					1599	1599	-	-	-	-
		Total			5,6	24241	1599	1599	-	-	-	-
	Crenshaw County	Tributary					10295	10263	-	-	32	-
		Riverine					1123	1123	-	-	-	-
		Total			5,6	132587	11418	11386	-	-	32	-
	Covington County	Tributary					4491	4491	-	-	-	-
		Riverine					511	511	-	-	-	-
		Total			5,7	40844	5002	5002	-	-	-	-
	33a(6) Total					197672	18019	17987	-	-	32	-
33a(7)	Upper Murder Creek		23.0	Source								
	Conecuh County	Tributary					11654	11654	-	-	-	-
		Total			11,12,15,16	182293	11654	11654	-	-	-	-

Table 7 (Cont.). Floodprone Areas, Perdido-Escambia Basin, Alabama

Sub-Basin No.	Stream Name / County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
33a(7)	(Cont.)											
	Monroe County	Tributary					332	332	-	-	-	-
		Total			11	8514	332	332	-	-	-	-
	33a(7) Total					190807	11986	11986	-	-	-	-
33a(8)	Lower Murder Creek		0.0	23.0								
	Conecuh County	Tributary					2015	2015	-	-	-	-
		Total			18,19	33790	2015	2015	-	-	-	-
	Escambia County	Tributary					3296	3296	-	-	-	-
		Riverine					3185	3078	-	-	-	107
		Total			18,19	59877	6481	6374	-	-	-	107
	33a(8) Total					93667	8496	8389	-	-	-	107
33a(9)	Burnt Corn Creek		NA									
	Conecuh County	Tributary					4445	4445	-	-	-	-
		Total			13,14	66602	4445	4445	-	-	-	-
	Escambia County	Tributary					4739	4535	90	110	-	4
		Riverine					1561	1452	-	-	-	109
		Total			14	52858	6300	5987	90	110	-	113
	Monroe County	Tributary					-	-	-	-	-	-
		Total			13,14	5486	-	-	-	-	-	-
	33a(9) Total					124946	10745	10432	90	110	-	113
	SUB-BASIN 33a	Tributary					116693	110274	3039	3309	67	4
		Riverine					60621	58884	230	707	556	244
		Total				1558911	177314	169158	3269	4016	623	248

Table 7 (Cont.). Floodprone Areas, Perdido-Escambia Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
	SUB-BASIN 33al											
33al(1)	Sepulga River		NA									
	Butler County	Tributary					28727	22380	3370	2927	50	-
		Total			3,4,7,8	175854	28727	22380	3370	2927	50	-
	Conecuh County	Tributary					-	-	-	-	-	-
		Total			7	505	-	-	-	-	-	-
	33al(1) Total					176359	28727	22380	3370	2927	50	-
33al(2)	Upper Sepulga		20.2	Source								
	Butler County	Tributrry					9065	7775	970	260	60	-
		Total			6	46307	9065	7775	970	260	60	-
	Conecuh County	Tributary					6344	6344	-	-	-	-
		Riverine					4134	3534	600	-	-	-
		Total			6	108807	10478	9878	600	-	-	-
	33al(2) Total					161114	19589	17699	1570	260	60	-
33al(3)	Pigeon Creek		NA									
	Conecuh County	Tributary					1254	1254	-	-	-	-
		Total			9	19571	1254	1254	-	-	-	-
	Lowndes County	Tributary					873	611	19	224	-	19
		Total			1,2	13805	873	611	19	224	-	19
	Crenshaw County	Tributary					973	954	-	19	-	-
		Total			2	17205	973	954	-	19	-	-

Table 7 (Cont.). Floodprone Areas, Perdido-Escambia Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
33al(3) (Cont.)												
	Covington County	Tributary					4341	3780	561	-	-	-
		Total			9	33255	4341	3780	561	-	-	-
	Butler County	Tributary					24908	23679	1229	-	-	-
		Total			1,2,5,9	149374	24908	23679	1229	-	-	-
	33al(3) Total					233390	32349	30278	1809	243	-	19
33al(4)	Lower Sepulga		0.0	20.2								
	Conecuh County	Tributary					4180	4180	-	-	-	-
		Riverine					1963	1963	-	-	-	-
		Total			10,11,12	72761	6143	6143	-	-	-	-
	Covington County	Tributary					93	93	-	-	-	-
		Riverine					128	128	-	-	-	-
		Total			12	7814	221	221	-	-	-	-
	Escambia County	Tributary					1905	1847	-	58	-	-
		Total			12	13545	1905	1847	-	58	-	-
	33al(4) Total					94120	8269	8211	-	58	-	-
	SUB-BASIN 33al TOTALS											
		Tributary					82709	72943	6149	3488	110	19
		Riverine					6225	5625	600	-	-	-
		Total				664983	88934	78568	6749	3488	110	19

Table 7 (Cont.). Floodprone Areas, Perdido-Escambia Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Floodprone: Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
					SUB-BASIN 34							
34(1)	Upper Perdido River		37.3	Source								
	Baldwin County	Tributary					2863	2783	80	-	-	-
		Riverine					5860	5825	-	35	-	-
		Total			1,7	114704	8723	8608	80	35		
	Escambia County	Tributary					2830	2806	-	-	24	-
		Total			2,3,4	42482	2830	2806	-	-	24	-
	34(1) Total					157186	11553	11414	80	35	24	-
34(2)	Middle Perdido		22.8	37.3								
	Baldwin County	Tributary					20298	20298	-	-	-	-
		Riverine					7638	7088	-	550	-	-
		Coastal					422	422	-	-	-	-
	34(2) Total				5,6,9	179246	28358	27808	-	550	-	-
34(3)	Blackwater, Perdido Bay											
	Baldwin County	Tributary	0.0	22.8			9788	9788	-	-	-	-
		Riverine					1684	1684	-	-	-	-
		Coastal					12961	12205	-	-	-	756
	34(3) Total				8,10,11	111950	24433	23677	-	-	-	756
	SUB-BASIN 34	Tributary					35779	35675	80	-	24	-
		Riverine					15182	14597	-	585	-	-
		Coastal					13383	12627	-	-	-	756
		Total				448382	64344	62899	80	585	24	756

Table 7 (Cont.). Floodprone Areas, Perdido-Escambia Basin, Alabama

Sub-Basin No.	Stream Name County	Type Flooding	River Mile Reach From	River Mile Reach To	CNI Watershed Numbers	Total Watershed	Total Floodprone	Floodprone: Natural State	Floodprone: Planted Trees	Floodprone: Pasture Land	Floodprone: Crop Land	Floodprone: Urban & Builtup
						Acres						
PERDIDO-ESCAMBIA BASIN TOTALS												
		Tributary					286838	269484	9418	7059	691	186
		Riverine					83505	80563	830	1292	556	244
		Coastal					13383	12627	-	-	-	756
		TOTAL				3320825	383726	362694	10248	8351	1247	1186

Wetlands - Florida Subarea

In order to better serve the populace, the Florida Department of Natural Resources has submitted to the legislature a method of delineating wetlands so that these valuable resources may be identified and preserved where deemed necessary for the continuance of a satisfactory and enjoyable life for the inhabitants of the State. In the past, some swamps and marshes have been drained and filled for housing developments, highways, airports, shopping centers, and other uses. It has been common to "get these useless lands on the tax rolls" without proper consideration of the costs to the taxpayer for services required for such developments and the loss of fish and wildlife production areas. During wet periods of the year, the wetlands help control excess water by building up and holding higher water levels. This water is slowly released to help maintain stream flows.

Of particular importance to Florida and the adjacent states are the estuarine areas where fresh water from land drainage is mixed with sea water. Nutrients from land and sea combine to produce more protein than some of the most intensively managed farms. Many commercial fish such as spotted sea trout, mullet, and redfish spend most of their lives in these productive areas as do crabs, oysters, and some species of clams. Several species of commercially important shrimp live and spawn as adults offshore and come to the estuaries as larvae for protection and the abundant food, then return to sea where they mature. Any destruction of the salt marsh means reduction of commercial and sports fisheries which attract both tourists and residents. The economic considerations alone may be sufficient reasons for preservation of these self-sustaining ecosystems.

The marshes provide storm protection to inland areas and the estuarine system acts as a reservoir to retard high waters during the most severe hurricanes. The value of the system for tertiary waste treatment far exceeds the amounts paid for marshes to the most aggressive developer. However, as a receptacle for primary wastes, the marshes would be practically worthless, as highly organic effluent would rapidly overload the system, thereby depleting the oxygen to the detriment of most living organisms.[1/]

1/ Gosselink, J. G., E. P. Odum, and R. M. Pope, 1973. The Value of the Tidal Marsh. LSU-SG--74-03.

The wetlands, as measured and located in this study, are based on vegetation common to each type. These vegetative communities are as follows:

A. Freshwater Swamps

1. River, creek, and lake overflow areas -

These communities will have predominantly one or more of the following species:

Pond cypress - *Taxodium ascendens*
Baldcypress - *Taxodium distichum*
Red maple - *Acer rubrum*
River birch - *Betula nigra*
Black willow - *Salix nigra*
Coastal plain willow - *Salix caroliniana*
Blackgum - *Nyssa sylvatica*
Ogeechee tupelo - *Nyssa ogeche*
Water hickory - *Carya aquatica*
Water ash - *Fraxinus caroliniana*
Buttonbush - *Cephalanthus occidentalis*

2. Bogs and bayheads -

These communities will have predominantly one or more of the following species:

Pond pine - *Pinus serotina*
Loblolly bay - *Gordonia lasianthus*
Sweet bay - *Magnolia virginiana*
Swampbay - *Persea palustris*
Titi - *Cyrilla racemiflora*
Sphagnum moss - *Spagnum sp.*

3. Inland ponds and sloughs -

These communities will have predominantly one or more of the following species:

Pond cypress - *Taxodium ascendens*
Blackgum - *Nyssa sylvatica*
Water tupelo - *Nyssa aquatica*
Titi - *Cyrilla racemiflora, cyrilla parviflora*
Black titi - *Cliftonia monophylla*
Willow - *Salix sp.*
Primrose willow - *Ludwigia peruviana*
Pond apple - *Annona glabra*

B. Freshwater Marshes

1. Sawgrass marsh -

These communities will have predominantly one or more of the following species:

Sawgrass - Cladium jamaicensis
Arrowhead - Sagittaria sp.
Maidencane - Panicum hemitomon
Cattail - Typha domingensis, T. latifolia
Pickerel weed - Pontederia lanceolata, P. cordata
Buttonbush - Cephalanthus occidentalis
Spartina - Spartina bakeri
Switchgrass - Panicum virgatum

2. Cattail - bulrush - maidencane marsh -

These communities have predominatly one or more of the following species:

Bulrush - Scirpus validus, S. americus, S. robustus
Cattail - Typha latifolia, T. domingensis
Maidencane - Panicum hemitomon
Spartina - Spartina bakeri
Pickerel weed - Pontederia lanceolata, P. cordata
Water lily - Nymphea sp.
Spatterdock - Nuphar advena
Buttonbush - Cephalanthus occidentalis
Soft rush - Juncus effusus
Common reed - Phragmites communis (australis)
Bladderwort - Utricularia sp.

3. Wet prairies -

These communities have predominantly one or more of the following species:

Maidencane - Panicum hemitomon
Cordgrasses - Spartina bakeri, S. patens
Spike rush - Eleocharis sp.
Beak rush - Rhynchospora sp.
St. Johns wort - Hypericum sp.
Spiderlilly - Hymenocallis palmeri
Swamplilly - Crinum americanum
Yellow eyed grass - Xyris ambigua
Whitetop sedge - Dichromena colorata

C. Saltwater Marshes

1. Spartina and needlerush marshes -

These communities will have predominantly one or more of the following species:

Cordgrasses - *Spartina alterniflora, S. patens, S. cynosuroides, S. spartinae*
Needlerush - *Juncus roemerianus*
Seashore saltgrass - *Distichlis spicata*
Saltwort - *Batis maritima*
Glassworts - *Salicornia sp.*
Fringerush - *Fimbristylis castanea*
Salt dropseed - *Sporobolus virginicus*
Seaside daisy - *Borrichia frutescens*
Salt jointgrass - *Paspalum vaginatum*

Because of photographic and time limitations, wetlands smaller than 25 acres were not delineated; however developments - cropland, pastureland, planted trees, and urban areas within the wetlands were delineated down to 10 acres. Where there were considerable amounts of wetlands on a photo, but in increments smaller than 25 acres, the amount of each type was estimated by percentage and added to the total. The wetlands were summarized by counties, sub-basins, and by Water Management Districts (Figure 2 for location, and Tables 8-14 for other data).

The areas were examined on the ground where possible and mapped on aerial photographs. Inaccessible areas which appeared on the photographs to be the same type as areas already examined were mapped similarly. For further delineation and clearer definition, stereoscopic, infra-red prints were examined. This study is believed to be the first of its kind on such a large area and may prove to be a valuable tool for land-regulating agencies.

Table 8. Florida Wetlands of the Northeast Gulf River Basins by Counties

County	Sub-Basin	A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
		Acres by Wetland Type							
Alachua	25c	1838	1490	4710	125	115			8278
Baker	16	6148	13692	29765					49605
	25	420	12360	4670					17450
	25c	1304	1021	6104					8429
		7872	27073	40539					75484
Bay	GCab	9549	1093	29485		1032		2572	43731
	29b	2593	55	1667					4315
	30	2445	55	1646					4146
		14587	1203	32798		1032		2572	52192
Bradford	25c	4661	3380	7915		15			15971
Calhoun	GCAb	618	4343	7946					12907
	29	25844		5412					31256
	29b	15292	1490	9909					26691
		41754	5833	23267					70854
Columbia	16		1300	855					2155
	25	2609	21738	39028	215	495			64085
	25c	1233	100	5927		300			7560
		3842	23138	45810	215	795			73800
Dixie	25	6465	155	7192	1599	517		3370	19298
	GCAd	1940	351	83800	204	78		18248	104621
		8405	506	90992	1803	595		21618	123919
Duval	16	817		2776					3593
	ACa	4323		9397	490			14747	28957
		5140		12173	490			14747	32550
Escambia	33	18995							18995
	33a	95							95
	34	11160		2042	659			215	14076
		30250		2042	659			215	33166

Table 8 (Cont.) - Florida Wetlands of the Northeast Gulf River Basins by Counties

County	Sub-Basin	A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
		Acres by Wetland Type							
Franklin	GCAb			280	740			3120	4140
	GCAc	7569	3809	113022			3615	4743	132758
	28	5780	4563	2048	58			2046	14495
	29	17142	1285	19618	1950		1265	7795	49055
		30491	9657	134968	2748		4880	17704	200448
Gadsden	28	30422		1952		65			32439
	29	2652							2652
		33074		1952		65			35091
Gilchrist	25	2632	63	2618					5313
	25c	225		10136	282	116			10759
		2857	63	12754	282	116			16072
Gulf	GCAb	5400	980	16499	1110			1375	25364
	29	63559	1681	32221	5145				102606
	29b	13285	52	3715					17052
		82244	2713	52435	6255			1375	145022
Hamilton	25	1138	1565	22829					25532
	25a	378	688	6318		87			7471
	25b	40		1310		140			1490
		1556	2253	30457		227			34493
Holmes	30	17867	873	10086					28826
	30a	216		417					633
		18083	873	10503					29459
Jackson	GCAb	1765	35	665					2465
	29	4188	1030	2375		1075			8668
	29a	3660		525		85			4270
	29b	14150	120	8655		225			23150
	30	1405		1160					2565
		25168	1185	13380		1385			41118
Jefferson	26	11251	907	24978		1118		2920	41174
	27	6368		6900		5441		1287	19996
		17619	907	31878		6559		4207	61170

Table 8 (Cont.) - Florida Wetlands of the Northeast Gulf River Basins by Counties

County	Sub-Basin	A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
		Acres by Wetland Types							
Lafayette	25	425	12746	18536		216			31923
	GCAd	645	9768	52484		61			62958
		1070	22514	71020		277			94881
Leon	27	3263	892	15970		3220			23345
	28	3967	1895	7944		7616			21422
		7230	2787	23914		10836			44767
Levy	25	5790		7285	6896	33		7267	27271
Liberty	GCAc	9384	23807	52160			3326		88677
	28	44377	9882	19863					74122
	29	50310	2677	29384		90	9230		91691
		104071	36366	101407		90	12556		254490
Madison	25		2305	10793		302			13400
	25b			1237		545			1782
	26	4400	4126	29687		412			38625
	GCAd	1025	1040	34818		606			37489
		5425	7471	76535		1865			91296
Nassau	16	14689	546	12022	110			12804	40171
	ACa	25498		14957	955			13480	54890
		40187	546	26979	1065			26284	95061
Okaloosa	GCAa	19530	290	1645					21465
	GCAb		240	275					515
	31	34968		3885					38853
	32	8896		457					9353
		63394	530	6262					70186
Santa Rosa	GCAa	8925	72	4503				121	13621
	31	10987		4928			465	1070	17450
	32	15344	55	1004		110	4290	1055	21858
	33	18942	210	555			5590	2850	28147
	33a	250							250
		54448	337	10990		110	10345	5096	81326
Suwannee	25	387	100	741	117	141			1486
	25c	420							420
		807	100	741	117	141			1906

Table 8 (Cont.) - Florida Wetlands of the Northeast Gulf River Basins by Counties

County	Sub-Basin	A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
		Acres by Wetland Types							
Taylor	26	274		1735				1255	3264
	GCAd	5926	15349	144520	1507	20		24711	192033
		6200	15349	146255	1507	20		25966	195297
Union	16			133					133
	25c	7555	1718	9338					18611
		7555	1718	9471					18744
Wakulla	27	4536	4221	15342	1831	2097		15601	43628
	28	12052	26221	15150	105			4106	57634
		16588	30442	30492	1936	2097		19707	101262
Walton	GCAa	17769	225	2551	80			95	20750
	GCAb	1035	209	1855				2760	5859
	30	38038		4266	640	70		95	43109
	30a	510		1505					2015
	31	15269	20	7741		235			23265
		72621	484	17918	720	305		2950	94998
Washington	GCAb	1454	20	329	30				1833
	29b		205	450					655
	30	20512	890	15079		120			36601
		21966	1115	15858	30	120			39089
TOTAL		736793	200033	1093700	24848	26798	27781	149708	2259661

Table 9. Florida Wetlands of the Northeast Gulf River Basins by Sub-Basins

Sub-Basin:	Acres By Wetland Type							
	A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
16	21654	15538	45551	110			12804	95657
25	19866	51032	113692	8827	1704		10637	205758
25a	378	688	6318		87			7471
25b	40		2547		685			3272
25c	17236	7709	44130	407	546			70028
26	15925	5033	56400		1530		4175	83063
27	14167	5113	38212	1831	10758		16888	86969
28	96598	42561	46957	163	7681		6152	200112
29	163695	6673	89010	7095	1165	10495	7795	285928
29a	3660		525		85			4270
29b	45320	1922	24396		225			71863
30	80267	1818	32237	640	190		95	115247
30a	726		1922					2648
31	61224	20	16554		235	465	1070	79568
32	24240	55	1461		110	4290	1055	31211
33	37937	210	555			5590	2850	47142
33a	345							345
34	11160		2042	659			215	14076
ACa	29821		24354	1445			28227	83847
GCAa	46224	617	8699	80			216	53598
GCAb	19821	6920	57334	1880	1032		9827	96814
GCAc	16953	27616	165182			6941	4743	221435
GCAd	9536	26508	315622	1711	765		42959	397101
TOTAL	736793	200033	1093700	24848	26798	27781	149708	2259661

Table 10. Developed Areas Within the Wetlands of the Northeast Gulf Basins - Florida

County	Sub-Basin	Land Use	A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
			Acres by Wetland Types							
Baker	16	Planted Trees			110					110
Calhoun	29	Planted Trees	143		150					293
Dixie	25	Urban	136							136
Duval	ACa	Planted Trees	75							75
Escambia	33	Urban	125							125
Franklin	28	Planted Trees		678	55					733
	29	"		275				365		640
	GCAc	"	1593		35073			1360		38026
Gulf	29	Planted Trees	75							75
	29	Pasture				660				660
	29b	Planted Trees	275							275
	GCAb	Urban	260							260
Hamilton	25	Planted Trees	82	29	11					122
	25a				27					27
Jackson	29	Crops	85							85
Liberty	28	Planted Trees		376	602					978
	29	"	440		330			2670		3440
	GCAc	"		1041	2526			1447		5014
Okaloosa	31	Urban	50							50
Santa Rosa	32	Urban						120		120
	33	Urban	85					530	110	725
	33	Planted Trees						1455		1455
	GCAa	Urban			15					15
Union	25c	Urban			80					80
Wakulla	28	Urban	170						89	259
Walton	31	Crops	20							20
TOTAL			3614	2399	38979	660	0	7947	199	53798

Table 11. Wetlands of the Northwest Florida Water Management District

County	Sub-Basin	Acres by Wetland Type							
		A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
Bay	GCAb	9549	1093	29485		1032		2572	43731
	29b	2593	55	1667					4315
	30	2445	55	1646					4146
		14587	1203	32798		1032		2572	52192
Calhoun	GCAb	618	4343	7946					12907
	29	25844		5412					31256
	29b	15292	1490	9909					26691
		41754	5833	23267					70854
Escambia	33	18995							18995
	33a	95							95
	34	11160		2042	659			215	14076
		30250		2042	659			215	33166
Franklin	GCAb			280	740			3120	4140
	GCAc	7569	3809	113022			3615	4743	132758
	28	5780	4563	2048	58			2046	14495
	29	17142	1285	19618	1950		1265	7795	49055
		30491	9657	134968	2748		4880	17704	200448
Gadsden	28	30422		1952		65			32439
	29	2652							2652
		33074		1952		65			35091
Gulf	GCAb	5400	980	16499	110			1375	25364
	29	63559	1681	32221	5145				102606
	29b	13285	52	3715					17052
		82244	2713	52435	6255			1375	145022
Holmes	30	17867	873	10086					28826
	30a	216		417					633
		18083	873	10503					29459

Table 11 (Cont.) - Wetlands of the Northwest Florida Water Management District

County	Sub-Basin	Acres by Wetland Type							
		A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
Jackson	GCAb	1765	35	665					2465
	29	4188	1030	2375		1075			8668
	29a	3660		525		85			4270
	29b	14150	120	8655		225			23150
	30	1405		1160					2565
		25168	1185	13380		1385			41118
Jefferson	26	10333	628	17949		970		2415	32295
	27	6153		6885		5441		1287	19766
		16486	628	24834		6411		3702	52061
Leon	27	3263	892	15970		3220			23345
	28	3967	1895	7944		7616			21422
		7230	2787	23914		10836			44767
Liberty	GCAc	9384	23807	52160			3326		88677
	28	44377	9882	19863					74122
	29	50310	2677	29384		90	9230		91691
		104071	36366	101407		90	12556		254490
Okaloosa	GCAa	19530	290	1645					21465
	GCAb		240	275					515
	31	34968		3885					38853
	32	8896		457					9353
		63394	530	6262					70186
Santa Rosa	GCAa	8925	72	4503				121	13621
	31	10987		4928			465	1070	17450
	32	15344	55	1004		110	4290	1055	21858
	33	18942	210	555			5590	2850	28147
	33a	250							250
		54448	337	10990		110	10345	5096	81326
Wakulla	27	4536	4221	15342	1831	2097		15601	43628
	28	12052	26221	15150	105			4106	57634
		16588	30442	30492	1936	2097		19707	101262

Table 11 (Cont.) - Wetlands of the Northwest Florida Water Management District

County	: Sub-: :Basin:	A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
		Acres by Wetland Type							
Walton	GCAa	17769	255	2551	80			95	20750
	GCAb	1035	209	1855				2760	5859
	30	38038		4266	640	70		95	43109
	30a	510		1505					2015
	31	15269	20	7741		235			23265
		72621	484	17918	720	305		2950	94998
Washington	GCAb	1454	20	329	30				1833
	29b		205	450					655
	30	20512	890	15079		120			36601
		21966	1115	15858	30	120			39089
Total	All	632455	94153	503020	12348	22451	27781	53321	1345529

Summary of Wetland Types By Sub-Basins
of
Northwest Florida Water Management District

26	10333	628	17949		970		2415	32295
27	13952	5113	38197	1831	10758		16888	86739
28	96598	42561	46957	163	7681		6152	200112
29	163695	6673	89010	7095	1165	10495	7795	285928
29a	3660		525		85			4270
29b	45320	1922	24396		225			71863
30	80267	1818	32237	640	190		95	115247
30a	726		1922					2648
31	61224	20	16554		235	465	1070	79568
32	24240	55	1461		110	4290	1055	31211
33	37937	210	555			5590	2850	47142
33a	345							345
34	11160		2042	659			215	14076
GCAa	46224	617	8699	80			216	55836
GCAb	19821	6920	57334	1880	1032		9827	96814
GCAc	16953	27616	165182			6941	4743	221435
	632455	94153	503020	12348	22451	27781	53321	1345529

Table 12. Developed Areas Within the Wetlands of the Northwest Florida Water Management District

County	Sub-Basin	Land Use	Acres of Developed Land Within the Wetlands							
			A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
Calhoun	29	Planted Trees	143		150					293
Escambia	33	Urban	125							125
Franklin	28	Planted Trees		678	55					733
	29	"		275				365		640
	GCAc	"	1593		35073			1360		38026
Gulf	29	Planted Trees	75							75
	29	Pasture				660				660
	29b	Planted Trees	275							275
	GCAb	Urban	260							260
Jackson	29	Crops	85							85
Liberty	28	Planted Trees		376	602					978
	29	"	440		330			2670		3440
	GCAc	"		1041	2526			1447		5014
Okaloosa	31	Urban	50							50
Santa Rosa	32	Urban						120		120
	33	Urban	85					530	110	725
	33	Planted Trees						1455		1455
	GCAa	Urban			15					15
Wakulla	28	Urban	170						89	259
Walton	31	Crops	20							20
Total			3321	2370	38751	660	0	7947	199	53248

Table 13. Wetlands of the Suwannee River Water Management District Within the Northeast Gulf River Basin

County	Sub-Basin	Acres By Wetland Type							
		A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
Alachua	25c	1838	1490	4710	125	115			8278
Baker	16		85	2476					2561
	25c	1304	117	1743					3164
		1304	202	4219					5725
Bradford	25c	4661	3380	7915		15			15971
Columbia	16		1300	855					2155
	25	2609	21738	39233	217	495			64292
	25c	1233	100	5927		300			7560
		3842	23138	46015	217	795			74007
Dixie	25	6465	155	7192	1599	517		3370	19298
	GCAd	1940	351	83800	204	78		18248	104621
		8405	506	90992	1803	595		21618	123919
Gilchrist	25	2632	63	2618					5313
	25c	225		10136	282	116			10759
		2857	63	12754	282	116			16072
Hamilton	25	1138	1165	22829					25532
	25a	378	688	6318		87			7471
	25b	40		1310		140			1490
		1556	2253	30457		227			34493
Jefferson	26	918	279	7029		148		505	8879
	27	215		15					230
		1133	279	7044		148		505	9109
Lafayette	25	425	12746	18536		216			31923
	GCAd	645	9768	52484		61			62958
		1070	22514	71020		277			94881
Levy	25	5790		7285	6896	33		7267	27271
Madison	25		2305	10793		302			13400
	25b			1237		545			1782
	26	4400	4126	29687		412			38625
	GCAd	1025	1040	34818		606			37489
		5425	7471	76535		1865			91296

Table 13 (Cont.) - Wetlands of the Suwannee River Water Management District Within the Northeast Gulf River Basins

County	: Sub-: :Basin:	Acres By Wetland Types A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
Suwannee	25	387	100	741	117	141			1486
	25c	420							420
		807	100	741	117	141			1906
Taylor	26	274		1735				1255	3264
	GCAd	5926	15349	144520	1507	20		24711	192033
		6200	15349	146255	1507	20		25966	195297
Union	16			133					133
	25c	7555	1718	9338					18611
		7555	1718	9471					18744
Total		52443	78463	515208	10945	4347	0	55356	716762

Summary of Wetland Types by Sub-Basins
of
Suwannee River Water Mangement District

16		1385	3464					4849
25	19446	38672	109022	8827	1704		10637	188308
25a	378	688	6318		87			7471
25c	17236	6805	39769	407	546			64763
25b	40		2547		685			3272
26	5592	4405	38451		560		1760	50768
27	215		15					230
GCAd	9536	26508	315622	1711	765		42959	397101
Total	52443	78463	515208	10945	4347	0	55356	716762

Developed Areas Within the Wetlands of
Suwannee River Water Management District

Dixie	25	136			Urban	136
Hamilton	25	82	29	11	Planted Trees	122
Hamilton	25a			27	Planted Trees	27
Union	25c			80	Urban	80
						365

Table 14. Wetlands of the St. Johns River Water Management District Within the Northeast Gulf River Basin

County	Sub-Basin	A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
		Acres By Wetland Types							
Baker	16	6148	13607	27289					47044
	25	420	12360	4670					17450
	25c		904	4361					5265
		6568	26871	36320					69759
Duval	16	817		2776					3593
	ACa	4323		9397	490			14747	28957
		5140		12173	490			14747	32550
Nassau	16	14689	546	12022	110			12804	40171
	ACa	25498		14957	955			13480	54890
		40187	546	26979	1065			26284	95061
Total	All	51895	27417	75472	1555			41031	197370

Summary of Wetland Types By Sub-Basins
of
St. Johns River Water Management District

Sub-Basin	A-1	A-2	A-3	B-1	B-2	B-3	C-1	Total
16	21654	14153	42087	110			12804	90808
25	420	12360	4670					17450
25c		904	4361					5265
ACa	29821		24354	1445			28227	83847
	51895	27417	75472	1555			41031	197370

Developed Areas Within the Wetlands
St. Johns River Water Management District

Baker	16		110	Planted Trees	110
Duval	ACa	75		Planted Trees	75
		75	110		185

Wetlands - Alabama Subarea

Alabama used a different approach than Florida for identifying and classifying the wetlands. Each district conservationist in the county involved was assisted by a biologist or conservation officer from the Alabama Department of Conservation and Natural Resources where requested. In some counties, employees of other state and federal agencies contributed to the field surveys. In the majority of the counties, floodprone maps as provided by the U. S. Geological Survey were used to delineate the wetland types according to Circular 39[1/]. This classification is based on vegetation, period of inundation, and water depth. The delineations were measured down to 25 acres; however, where there were considerable areas on one map which were less than 25 acres, the investigators estimated the amount and added it to the total acres by type. Considerable personal knowledge and judgment was used in this inventory (Tables 15 and 16).

The wetlands as measured in Alabama are of the following types:

Inland Fresh Areas

Type 1. Seasonally flood basins - bottomland hardwoods with some herbaceous growth.

Type 2. Meadows - shallow lake basins and sloughs with cordgrass, beakrush, and paspalums.

Type 3. Shallow marshes - shallow basins or sloughs usually covered to 6 inches or more of water with maidencane, arrowhead, and pickerelweed.

Type 4. Deep marshes - covered by 6 inches to 3 feet or more of water during the growing season with pondweeds, naiads, coontail, watermilfoil, waterlilies, spatterdock, hyacinth or waterprimrose.

Type 5. Open water - shallow ponds and reservoirs with water usually less than 10 feet fringed by borders of pondweeds, naiads, wild celery, coontail, waterlilies, spatterdock, and water hyacinths.

Type 6. Shrub swamps - found along sluggish streams and occasionally in the flood plain covered by as much as 6 inches of water with alders, willow, buttonbush, and swamp-privet.

1/ Wetlands of the United States, Fish & Wildlife Service, U.S.D.I, 1956

Type 7. Wooded swamps - covered by as much as one foot of water along sluggish streams, on flood plains and very shallow lake basins with water-oak, tupelo gum, black gum, and cypress.

(No types 8-14 in Alabama subarea)

Coastal Saline Areas

Types 15-19. Varying sites of salt flats, meadows, and marshes covered either by tidal action or periodically by wind-driven waters with vegetation of rushes, cordgrass, widgeongrass, eelgrass, and turtlegrass.

Table 15. Alabama Wetlands of the Northeast Gulf River Basins by Counties

County	Sub-Basin	1	2	3	4	5	6	7	15-19	Total
		Acres by Wetland Type								
Baldwin	34	1610				25		863	7000	9498
		1610				25		863	7000	9498
Barbour	29a	6183	200	441	75		120	50		7069
	30	4198	200	363	138	80	101	106		5186
	30a	3085	200	388	75	113	172	126		4159
		13466	600	1192	288	193	393	282		16414
Bullock	29a			157						157
	30a	2252		274			140	115		2781
	33a	390		184				80		654
		2642		615			140	195		3592
Butler	33a	14533					182	2022		16737
	33al	12121	130	44	1228	344	550	2064		16481
		26654	130	44	1228	344	732	4086		33218
Chambers	29a	4940		100	110		1875	290		7315
		4940		100	110		1875	290		7315
Coffee	30	6645	200	160	40	400	40	520		8005
	30a	12730	1074	370	55	530	130	1140		16029
	31	210	25	20	10	200	10	30		505
		19585	1299	550	105	1130	180	1690		24539
Conecuh	33	1580		200	100	150	100	100		2230
	33a	12405	700	2170	655	1004	1050	19200		37184
	33al	6090	300	750	450	450	500	19100		27640
		20075	1000	3120	1205	1604	1650	38400		67054
Covington	30a	456	7	38	101	26	142	329		1099
	31	3481	28	10	17		38	397		3971
	32	316	28	10	17		38	3752		4161
	33a	682	7	2	5		10	15		721
	33al	157	5	1	6		4	4		177
		5092	75	61	146	26	232	4497		10129
Crenshaw	31	48								48
	33a	12940			484	708		1188		15320
		12988			484	708		1188		15368

Table 15 (Cont.) - Alabama Wetlands of the Northeast Gulf River Basins
By Counties

County	: Sub: :Basin:	Acres By Wetland Type 1	2	3	4	5	6	7	15-19	Total
Dale	30	9687				775	100	354		10916
	30a	1189					26			1215
		10876				775	126	354		12131
Escambia	32			73	24			589		686
	33	1800		96	31			949		2876
	33a	9209		837	111			3566		13723
	33a1			11	4			91		106
	34			45	15			466		526
		11009		1062	185			5661		17917
Geneva	29b			35		9				44
	30	4387	2747	3101	1203	432	967	80		12917
	30a	2896	2222	1790	480	56	271			7715
		7283	4969	4926	1683	497	1238	80		20676
Henry	29a	7465		325			354	6408		14552
	30	1918		350			800	4649		7717
		9383		675			1154	11057		22269
Houston	29a	7571		80		230	139	1348		9368
	29b	19983		100		371	145	1076		21675
	30	3026		40		165	154	216		3601
		30580		220		766	438	2640		34644
Lee	29a	2888						679		3567
		2888						679		3567
Lowndes	33a1	3322		75			51	73		3521
		3322		75			51	73		3521
Monroe	33	4570		125				1435		6130
	33a	625						75		700
	33a1	275								275
		5470		125				1510		7105
Montgomery	33a	2818	80					150		3048
		2818	80					150		3048

Table 15 (Cont.) - Alabama Wetlands of the Northeast Gulf River Basins By Counties

County	Sub-Basin	Acres by Wetland Type 1	2	3	4	5	6	7	15-19	Total
Pike	30a	10715				287		8450		19452
	33a	11340			40		25	14650		26055
		22055			40	287	25	23100		45507
Randolph	29a	2428			50	188	124	524		3314
		2428			50	188	124	524		3314
Russell	29a	2810	130				200	435		3575
		2810	130				200	435		3575
TOTAL		217974	8283	12765	5524	6543	8558	97754	7000	364401

Table 16. Alabama Wetlands of the Northeast Gulf River Basins By Sub-Basins

Sub-Basin	Acres by Wetland Types 1	2	3	4	5	6	7	15-19	Total
29a	34285	330	1103	235	418	2812	9734		48917
29b	19983		135		380	145	1076		21719
30	29861	3147	4014	1381	1852	2162	5925		48342
30a	33323	3503	2860	711	1012	881	10160		52450
31	3739	53	30	27	200	48	427		4524
32	316	28	83	41		38	4341		4847
33	7950		421	131	150	100	2484		11236
33a	64942	787	3193	1295	1712	1267	40946		114142
33al	21965	435	881	1688	794	1105	21332		48200
34	1610		45	15	25		1329	7000	10024
	217974	8283	12765	5524	6543	8558	97754	7000	364401

FORESTRY

Erosion on Forest Land

A field study carried out by the Forest Service in the summer of 1974 measured the effects of forest related activities on hydrologic conditions within the Basins. Field plots were located and measured throughout the three major land resource areas--Southern Coastal Plain, North Central Florida Ridge, and the Gulf Coast Flatwoods. Estimates of erosion rates and volumes were made for the 14,096,100 acres of forest land. The modified Musgrave equation was used for calculating sheet erosion. Gully erosion was estimated by determining the volume lost over the age of the gully system. A stratified sampling was made of forest land to obtain data on soils, slopes, slope length, cover factors, and forest related activities.

In the following tables, erosion is defined as the detachment and transport of soil material from upland areas to a defined water course; that is, an ephemeral, intermittent, or perennial stream channel. The term logging refers to the felling of the trees and unconcentrated yarding. Skid trails are trails traversed more than once in hauling logs to the log deck. Spur roads are those roads connecting the log deck to the public road system.

The total estimated erosion volume and rates for the Northeast Gulf River Basins are given in Table 17. The majority of the erosion is the result of two disturbances: spur roads and site preparation using a double roller chop and burn. These produce 88 percent of the erosion within the basin. Natural or geologic erosion of the river basins is almost insignificant.

Table 18 shows the distribution of the erosion by Land Resource Area (LRA).1/ The Southern Coastal Plain (LRA 133), while having 68 percent of the area, produces 97 percent of the erosion. Of this 97 percent, 25 percent is the result of spur roads and 63 percent is the result of a double chop and burn site preparation method. The North Central Florida Ridge (LRA 138), with 2 percent of the area, has 3 percent of the erosion and the Gulf Coast and Atlantic Coast Flatwoods (LRA's 152/153), while covering 30 percent of the area, have virtually no erosion. An examination of Table 19, along with either 20 (LRA 133) or 21 (LRA's 138, 152/153), shows which disturbances have the greatest impact within each LRA and whether the erosion results from sheet or gully erosion.

1/ Land Resource Regions and Major Land Resource Areas of the United States, Agriculture Handbook 296, Soil Conservation Service, U. S. Department of Agriculture.

The Flatwoods (LRA 152/153) erosion is restricted entirely to skid trails and spur roads. These problem areas could be improved with better advance planning and proper drainage. No significant gully erosion was found to be occurring in this section of the basin.

Within the Florida Ridge (LRA 138) section of the river basins, the major cause of erosion is the KG blade--straight blade method of site preparation. This disturbance accounts for 72 percent of the erosion within this LRA. Restricting the use of this site preparation method to shallow slopes, and careful advance planning will reduce the impact of this disturbance. Skid trails were responsible for 15 percent of the erosion in LRA 138. Again, proper advance planning and adequate drainage must be emphasized.

The vast majority (97 percent) of the erosion in the river basins occurs in the Coastal Plain (LRA 133). Mechanical site preparation employing double roller chopping and prescribed burning accounts for 63 percent of the erosion caused by forestry operations in the basin. This practice induces erosion to occur at an estimated annual rate of 18.3 tons per acre: gully erosion yields 17.9 tons and sheet erosion yields 0.4 tons annually per acre. Sites undergoing preparation for reforestation generally alter soil cover and expose mineral soil to raindrop impacts. All techniques employed in site preparation should be modified to minimize disturbance of ground cover. Prescribed burning should be discontinued or employed as a light burn that does not consume all the organic litter and ground cover. Use of annual grasses or legumes to provide cover during the most erosive seasons would reduce erosion and enhance soil conditions. Spur roads are another significant source of sediment, eroding at an estimated rate of 38 tons per acre per year, 86 percent of which is due to gully erosion. Proper advance planning and better drainage could reduce erosion on spur roads tremendously.

Careful design and layout using construction standards, such as those prescribed by the Forest Service, will reduce erosion from spur roads. These standards include restrictions for road gradients, stream crossings, and drainage designs for various soil-slope conditions. A common error, allowing road drainage to flow directly into stream channels, is corrected by directing road drainage into filter strips, allowing water to infiltrate into the forest floor and trapping the sediment. The road system should be managed under strict traffic control, closing the system to vehicular traffic during wet periods. This management protects the road surface, reduces erosion, and cuts maintenance costs.

Table 17. Estimated erosion, Northeast Gulf River Basins, 1975

Disturbance[1/]	Area[2/]	Estimated Erosion	Estimated Average Erosion Rate	Percent of Total Erosion
	(Acres)	(Tons/Yr)	(Tons/Ac/Yr)	
NATURAL	14,096,100	0	0	0
HARVESTING				
Logging	2,071,218	278,555	0.13	3.7
Skid Trails	62,400	96,358	1.54	1.3
Spur Roads	65,375	1,911,919	29.25	25.4
WILDFIRES				
Burning	148,009	20,888	0.14	0.3
SITE PREPARATION				
Discing	38,155	96,062	2.52	1.3
KG/Bulldoze	52,601	393,742	7.48	5.2
Bedding	135,907	3,424	0.02	0.1
Double chop and burn	268,084	4,732,228	17.65	62.9
TOTALS	14,096,100	7,526,175	0.53	100.00

1/ The erosion rate of "natural disturbance" is considered the geologic erosion rate for the Basins.

2/ The area for disturbed conditions is the area experiencing erosion due to that cause. These disturbances require three to four years to heal; therefore, areas recorded are three to four times the area disturbed each year.

Table 18. Distribution (percent) of forest land erosion by Land Resource Areas, Florida and Alabama Subareas

Disturbance	Southern Coastal Plain LRA 133	North Central Florida Ridge LRA 138	Gulf Coast and Atlantic Coast Flatwoods LRA 152/153
Natural	0	0	0
Logging	2.87	0.14	0
Skid Trails	0.75	0.52	0.01
Spur Roads	25.09	0.14	0.18
Burning	0.28	0	0
Discing	1.20	0.08	0
KG/Bulldoze	2.91	2.32	0
Bedding	0.04	0.01	0
Double chop and burn	62.85	0.03	0
Percent total River Basin Erosion	96.58	3.23	0.19
Estimated Erosion (tons)	7,268,854	243,389	13,932
Forest acres	9,591,441	265,371	4,239,288
Percent of Forest acres	68.04	1.88	30.07

Table 19. Erosion within major land resource areas (LRA)

Disturbance	Southern Coastal Plain LRA 133		North Central Florida Ridge LRA 138		Gulf and Atlantic Coast Flatwoods LRA 152/153	
	Percent of Area	Percent of Erosion	Percent of Area	Percent of Erosion	Percent of Area	Percent of Erosion
Natural	79.84	0	79.84	0	79.84	0
Logging	14.57	2.97	14.63	4.30	14.98	0
Skid Trails	0.51	0.78	0.67	16.08	0.27	4.92
Spur Roads	0.51	25.97	0.30	4.37	0.36	95.08
Burning	1.05	0.29	1.05	0	1.05	0
Discing	0.30	1.24	0.34	2.49	0.20	0
KG/Bulldoze	0.35	3.02	1.58	71.72	0.35	0
Bedding	0.17	0.04	0.81	0.23	2.81	0
Double chop and burn	2.69	65.08	1.40	0.80	0.15	0

Table 20. Estimated erosion by cause and type in the Coastal Plain (LRA 133), Northeast Gulf River Basins

Disturbance	Sheet Erosion Erosion T/Y	Sheet Erosion Rate T/A/Y	Gully Erosion Erosion T/Y	Gully Erosion Rate T/A/Y	Total Erosion Erosion T/Y	Total Erosion Rate T/A/Y
Natural	0	0	0	0	0	0
Logging	108,757	0.08	152,329	0.11	216,086	0.18
Skid Trails	56,537	1.14	0	0	56,537	1.14
Spur Roads	262,163	5.31	1,625,885	32.93	1,888,048	38.24
Burning	20,888	0.21	0	0	20,888	0.21
Discing	32,537	1.13	57,462	2.00	89,999	3.13
KG/Bulldoze	140,955	4.20	78,218	2.33	219,173	6.53
Bedding	2,853	0.18	0	0	2,853	0.18
Double chop and burn	109,311	0.42	4,620,959	17.91	4,730,270	18.33
Total	734,001	0.08	6,534,853	0.68	7,268,854	0.76

	Percent Erosion Volume
Sheet Erosion	10.10 percent
Gully Erosion	89.90 percent

Table 21. Estimated sheet erosion by cause in the North Central Florida Ridge (LRA 138) and the Gulf and Atlantic Flatwoods (LRA 152/153), Northeast Gulf River Basins*

Disturbance	North Central Florida Ridge LRA 138		Gulf and Atlantic Coast Flatwoods LRA 152/153	
	Erosion Tons/Yr	Erosion Rate Tons/Ac/Yr	Erosion Tons/Yr	Erosion Rate Tons/Ac/Yr
Natural	0	0	0	0
Logging	10,469	0.27	0	0
Skid Trails	39,136	21.99	685	0.06
Spur Roads	10,624	13.50	13,247	0.87
Burning	0	0	0	0
Discing	6,063	6.72	0	0
KG/Bulldoze	174,569	41.63	0	0
Bedding	571	1.20	0	0
Double chop and burn	1,958	0.53	0	0
Total	243,389	0.92	13,932	0.00

*Gullies were not encountered in the sample plots and therefore no data for Gully erosion were available.

Forest Land as Wildlife Habitat

Numerous systems have been devised for measuring quality and quantity of wildlife habitat found on forest land. One system, currently employed within the Southeastern Area (USDA--Forest Service) on river basin studies, was developed jointly by Forest Service, Soil Conservation Service, and federal and state fish and game experts. The system, Wildlife Habitat Evaluation Program (WHEP), samples and evaluates forest habitat and translates information, through automatic data processing, into potential game populations, allowable harvest, and number of hunter days for each of four game species--gray squirrel, quail, turkey, and white-tail deer.

Games biologists with the states of Alabama and Florida assisted with selection of habitat evaluation factors. The Basins area was stratified for organizing field sampling work as well as for evaluation purposes. All plot data, recorded on form FIELD RECORD, Wildlife Habitat Evaluation Survey entered the ADP program as punched cards from which all tables were derived.

The WHEP system can serve a number of purposes, namely to:

1. Identify the impact of various timber management programs on game species.
2. Describe the condition of forest land as game habitat.
3. Aid in selecting the best species for which to manage habitat.
4. Determine the effects of grazing on quail and deer habitat.
5. Assist in classifying and managing the ecosystem.

Evaluation of game habitat in the Basins is revealed in the following tables.

Table 22 gives amount of land in the three condition classes--Good, Fair, and Poor--for each of the four game species. Plots were located to fall within the different soil groupings (consolidation of similar soil associations) and within the different forest types. It was necessary, however, to adjust the acreage of squirrel habitat to reflect the occurrence of Good habitat for that species. The random distribution of field plots did not allow enough coverage of the oak-gum-cypress and oak-pine types to sample habitation in the Good condition class for squirrel.

Table 22. Forest Land Habitat by Condition Classes

SPECIES	STATE	GOOD	FAIR	POOR	TOTAL
		----------------	1000 Acres	----------------	
Squirrel	Alabama	134.5	1,033.9	3,315.0	4,483.4
	Florida	237.2	1,761.9	7,613.6	9,612.7
	TOTAL	371.7	2,795.8	10,928.6	14,096.1
Quail	Alabama	124.5	2,588.9	1,770.0	4,483.4
	Florida	787.1	6,052.6	2,773.0	9,612.7
	TOTAL	911.6	8,641.5	4,543.0	14,096.1
Turkey	Alabama	395.1	2,352.2	1,736.1	4,483.4
	Florida	713.2	5,689.6	3,209.9	9,612.7
	TOTAL	1,108.3	8,041.8	4,946.0	14,096.1
Deer	Alabama	364.4	2,794.4	1,324.6	4,483.4
	Florida	1,004.2	6,362.6	2,245.9	9,612.7
	TOTAL	1,368.6	9,157.0	3,570.5	14,096.1

Table 23 is based upon information provided by respective state game biologists (Alabama and Florida) on carrying capacities fo each acre of forest land habitat for various game species.

Table 23. Potential Game Population on Forest Land by Condition Classes

SPECIES	STATE	GOOD	FAIR	POOR	TOTAL
		----------------	1000	----------------	
Squirrel	Alabama	201.8	775.4	828.8	1,806.0
	Florida	355.8	1,321.4	1,903.4	3,580.6
	TOTAL	557.6	2,096.8	2,732.2	5,386.6
Quail	Alabama	31.1	258.9	123.9	413.9
	Florida	196.8	605.3	194.1	996.2
	TOTAL	227.9	864.2	318.0	1,410.1
Turkey	Alabama	4.0	11.8	6.9	22.7
	Florida	7.1	28.4	12.8	48.3
	TOTAL	11.1	40.2	19.7	71.0
Deer	Alabama	7.3	27.9	9.3	44.5
	Florida	20.1	63.6	15.7	99.4
	TOTAL	27.4	91.5	25.0	143.9

Reasonable rates (allowable harvest) of removal of various game species during hunting seasons are reflected in Table 24. These rates were determined by state game biologists.

Table 24. Allowable Harvest

SPECIES	STATE	NUMBERS (1000)
Squirrel	Alabama	722.4
	Florida	1,432.2
	TOTAL	2,154.6
Quail	Alabama	248.4
	Florida	597.7
	TOTAL	846.1
Turkey	Alabama	7.5
	Florida	16.0
	TOTAL	23.5
Deer	Alabama	8.9
	Florida	19.9
	TOTAL	28.8

The number of hunter days available for a given game population is important to the planner who seeks information on ability of a given area to provide hunting opportunities. Table 25, developed from information provided by the states of Alabama and Florida and from data collected during the field sampling, gives potential hunter days for each game species.

Table 25. Potential Hunter Days

SPECIES	STATE	DAYS (1000)
Squirrel	Alabama	375.6
	Florida	744.8
	TOTAL	1,120.4
Quail	Alabama	104.3
	Florida	251.0
	TOTAL	355.3
Turkey	Alabama	96.4
	Florida	206.1
	TOTAL	302.5
Deer	Alabama	292.8
	Florida	654.3
	TOTAL	947.1

The following are factors used in the various formulas selected for habitat evaluation (Table 26). These figures were established for the Northeast Gulf River Basins through consultation with respective state game biologists. Although each respective state game biologist provided factors for his area, the difference between the states of Alabama and Florida were not significant enough to employ two different sets of factors. A compromise was established to arrive at one set of factors in order to simplify the computer program.

Table 26. Factors Used in Wildlife Habitat Evaluation Program, Northeast Gulf River Basins

	GRAY SQUIRREL	BOBWHITE QUAIL	TURKEY	WHITE-TAIL DEER
Population (animal units per acre)				
Good	1.5	.25	.01	.020
Fair	.75	.10	.005	.01
Poor	.25	.07	.004	.007
Harvest (recommended allowable harvest of total population)	40%	60%	33%	20%
Hunter Days (required to harvest one animal unit)	.52	.42	12.9	32.9

Soil Resource Groups

A classification of the land base by use was one of the data inputs for analyzing the Basins' production potential and developing land use projections. The 1967 Conservation Needs Inventory identified land use by land capability class, subclass, and unit. Such a classification provided more detail than was generally obtainable for the other basic inputs in the analysis and resulted in more soil resource groups than desired. Soil scientists and agronomists were consulted to group the land capability units (LCU's) based upon three characteristics: productivity, natural hazards, and management and production practices. These characteristics are not mutually exclusive, and the grouping is somewhat arbitrary.

All of the basic data inputs for the analysis were developed separately for the States of Alabama and the Florida subarea. The soils resource groups thus developed are described below:

Florida Subarea

Group 1

Classes I-1, I-3, I-4, IIs-6. Nearly level, well-drained soils on upland ridges and stream terraces. They have loamy sand or sandy loam layers less than 20 inches thick over moderately slowly to moderately permeable sandy loam or sandy clay loam subsoils. The root zone is more than 60 inches thick and has an average available water capacity of moderate to high. There is little runoff and the hazard of erosion is slight. These soils are well suited for cultivated crops and pastures without special conservation treatment. Soils can be used continuously for row crops. Major soils are Cahaba, Faceville, Hague, Kalmia, Magnolia, Marlboro, Maxton, Orangeburg, Tifton, Wickham, and Zuber.

Group 2

Class I-2. Nearly level, well-drained soils on upland ridges. They have loamy sand or sandy loam layers less than 20 inches thick over moderately to moderately rapidly permeable sandy loam or sandy clay loam subsoils. The root zone is more than 60 inches thick and has an average available water capacity of moderate to high. There is little runoff and the hazard of erosion is slight. These soils are well suited for cultivated crops and pastures without special conservation treatment. Soils can be used continuously. Major soils are Benndale, Greenville, and Red Bay.

Group 3

Classes IIe-5, IIe-6, IIs-1, IIIe-10. Nearly level and gently sloping well-drained soils on upland ridges. They have sand, loamy sand or sandy loam layers over slowly permeable clay loam or clay subsoils. The root zone is limited to less than 30 inches by the slowly permeable subsoil. The available water capacity averages low to moderate in the root zone. Runoff is moderate during heavy rains and the hazard of erosion is moderate. These soils are moderately well suited for cultivated crops and pasture, but require moderate erosion control practices. Soil can be used three out of four years. Major soils are Angie, Archer, Esto, Gilead, Gritney, Shubuta, and Vaucluse.

Group 4

Classes IIe-10, IIs-2, IIw-1. Nearly level and gently sloping, well-drained to moderately well-drained soils on upland ridges. They have loamy sand or sandy loam layers less than 20 inches thick over moderately slowly permeable sandy clay loam subsoils. The root zone is normally more than 60 inches thick but in wet seasons may be restricted to less than 50 inches by free water in the lower part of the subsoil. The available water capacity averages moderate in the root zone. The hazard of erosion is slight. These soils are well suited for most cultivated crops and pastures with simple conservation treatment. Soils can be used three out of four years. Major soils are Dothan and Goldsboro.

Group 5

Classes IIe-1, IIe-2, IIe-3. Gently sloping, well-drained soils on upland ridges and stream terraces. They have loamy sand or sandy loam layers less than 20 inches thick over moderately slowly to moderately rapidly permeable sandy loam or sandy clay loam subsoils. The root zone is more than 60 inches thick and has an average available water capacity of moderate to high. Runoff from unprotected areas is moderate to rapid and the hazard of erosion is moderate to severe. These soils are well suited for cultivated crops and pastures, but require moderate to intensive erosion control practices. Soils can be used three out of four years. Major soils are Benndale, Cahaba, Faceville, Greenville, Hague, Kalmia, Magnolia, Marlboro, Maxton, Orangeburg, Red Bay, Tifton, Wickham, and Zuber.

Group 6

Classes IIIe-1, IIIe-2, IIIe-4, IIIe-8, IIIe-9. Sloping, well-drained soils on upland ridges and stream terraces. They have loamy sand or sandy loam layers less than 20 inches thick over moderately slowly to moderately rapidly permeable sandy loam or sandy clay loam subsoils. The root zone is more than 60 inches thick and has an average available water capacity of moderate to high. Runoff from unprotected areas is moderate to rapid and the hazard of erosion is moderate to severe.

These soils are well suited for cultivated crops and pastures, but require moderate to intensive erosion control practices. Soils can be used two out of four years. Major soils are Benndale, Cahaba, Faceville, Greenville, Hague, Kalmia, Magnolia, Marlboro, Maxton, Orangeburg, Red Bay, Tifton, Wickham, and Zuber.

Group 7

Classes IIIs-7, IVs-4. Nearly level and gently sloping, moderately well to somewhat excessively drained soils on upland ridges. They have sand layers more than 40 inches thick. Some have moderately permeable to moderately rapidly permeable sandy loam subsoils below 40 inches and some have sand layers to more than 60 inches thick. The available water capacity averages low to moderate. There is little runoff from unprotected areas and the hazard of erosion is slight. These soils are moderately suitable for cultivated crops and pastures. They require moderate soil improving practices. Soils can be used two out of three years. Major soils are Blanton, Chiefland, and Jonesville.

Group 8

Classes IIIs-1, IIIs-6. Nearly level and gently sloping, well to excessively drained soils on upland ridges. They have sand or loamy sand layers more than 40 inches thick. Some have moderately permeable to moderately rapidly permeable sandy loam or sandy clay loam subsoils below 40 inches and some have sand or loamy sand layers to more than 60 inches. These soils have root zones that are more than 60 inches thick. The available water capacity averages low to moderate. There is little runoff from unprotected areas and the hazard of erosion is slight. These soils are moderately suitable for cultivated crops and pastures. They require moderate soil improving practices. Soils can be used two out of three years. Major soils are Americus, Bonifay, Eustis, Lakeland, and Troup.

Group 9

Classes IIe-8, IIe-9, IIIs-4, IIIs-9, IIIs-10. Nearly level and gently sloping, well-drained soils on upland ridges. They have sand or loamy sand layers more than 40 inches thick. Some have moderately permeable to moderately rapidly permeable sandy loam or sandy clay loam subsoils and some have sand or loamy sand layers to more than 60 inches. The available water capacity averages low to moderate. There is little runoff from unprotected areas and the hazard of erosion is slight. These soils are moderately suitable for cultivated crops and pastures. They require moderate soil improving practices. Soils can be used for row crops a maximum of two out of three years. Major soils are Arredondo and Gainesville.

Group 10

Classes IVs-14, VIs-4. Nearly level and gently sloping, excessively drained soils on upland ridges. They have sand layers to more than 60 inches deep. These soils have a root zone that is more than 60 inches thick. The available water capacity averages low to very low. There is little runoff from unprotected areas and the hazard of erosion is slight. These soils are poorly suited to moderately suited for cultivated crops and pastures. They require intensive soil improving practices. Soils can be used two out of four years. Major soils are Astatula, Kershaw, and Lakeland.

Group 11

Class IIs-3. Nearly level and gently sloping, well-drained soils of the uplands. They have sand or loamy sand layers more than 20 inches thick over moderately permeable to moderately rapidly permeable sandy loam or sandy clay loam subsoils. The root zone is more than 60 inches thick. Average available water capacity of the root zone is low to moderate. There is little runoff from unprotected areas and the hazard of erosion is slight. The soils are moderately suited for cultivated crops and pastures. Simple soil improving practices are needed. Soils can be used three out of four years. Major soils are Kenansville, Lucy, and Wagram.

Group 12

Classes IIIs-2, IVs-1, IVs-6, IVs-7, IVs-8, IVs-9, IVs-11, IVs-12. Sloping, well-drained to somewhat excessively drained soils on side slopes of low ridges. They have sand or loamy sand layers more than 20 inches thick. Some have moderately permeable to moderately rapidly permeable sandy loam or sandy clay loam subsoils and others have sand layers to more than 72 inches deep. The root zone is more than 60 inches thick. The available water capacity of the root zone averages low to moderate. The hazard of erosion is moderate on unprotected areas. These soils have only fair suitability for cultivated crops and pastures due to poor soil quality and slope. They require moderate erosion control practices and intensive soil improving practices. Soils can be used a maximum of two out of four years for row crops. Major soils are Americus, Arredondo, Blanton, Bonifay, Chiefland, Gainesville, Jonesville, Kenansville, Lakeland, Lucy, Troup, and Wagram.

Group 13

Class IVe-1. Strongly sloping, well-drained soils on side slopes of upland ridges. They have loamy sand or sandy loam layers less than 20 inches thick over moderately slowly permeable to moderately rapidly permeable sandy loam, sandy clay loam or sandy clay subsoils. The root zone is more than 60 inches thick. Available water capacity of the root zone averages moderate to high. Runoff from unprotected areas is very rapid and the hazard of erosion is very severe. These soils are poorly suited for cultivated crops and only moderately suited for pasture because of slope and the hazard of erosion. Soils can be used two out of four years. Major soils are Benndale, Cahaba, Carnegie, Faceville, Greenville, Hague, Magnolia, Orangeburg, Red Bay, Tifton, and Zuber.

Group 14

Classes IVs-2, VIs-1, VIs-2, VIs-3. Sloping to strongly sloping, well-drained to excessively drained soils on side slopes of upland ridges. They have sand or loamy sand layers more than 40 inches thick and moderately permeable to moderately rapidly permeable sandy loam subsoils. In some places the subsoil is below 60 inches. The root zone is more than 60 inches thick. Available water capacity of the root zone is very low to low. Water moves moderately rapidly over unprotected slopes and the hazard of erosion is moderate. The soils are not suitable for cultivated crops because of poor soil quality and steepness of slope. They are poorly suited for pastures. Soils cannot be used for row crops. Major soils are Bonifay, Lake, Lakeland, Lucy, Troup, and Wagram.

Group 15

Classes IIIe-5, IIIe-11, IVe-7. Sloping, well-drained soils on side slopes and low knolls in the upland. They have loamy sand or sandy loam layers over slowly permeable clay loam or clay subsoils. The root zone is limited to less than 40 inches by the subsoil. Available water capacity of the root zone averages low to moderate. Runoff is very rapid from unprotected areas and the hazard of erosion is very severe. The soils are poorly suited for cultivated crops because of slope and the hazard of erosion. They are moderately suited for pastures. Soils can be used once out of four years. Major soils are Angie, Archer, Blaney, Esto, Gilead, Gritney, Shubuta, and Vaucluse.

Group 16

Classes IVe-3, IVe-5, IVe-10, IVe-11, IVe-14, VIe-1, VIe-2, VIe-4, VIe-5, VIIe-1, VIIe-2, VIIe-4, VIIs-3, VIIs-7, VIIw-3. Strongly sloping to steep, excessively drained to poorly drained soils on side slopes. They have sand layers to more than 72 inches deep or they have loamy sand or sandy loam layers over moderately permeable to slowly permeable sandy clay loam or sandy clay subsoils. The root zone is more than 60 inches thick. Available water capacity of the root zone averages low to high. Runoff is very rapid on unprotected areas and the hazard of erosion is very severe. These soils are not suitable for cultivated crops and are capable of producing only fair pastures. Soils cannot be used for row crops. Major soils are Angie, Arredondo, Blaney, Cahaba, Dothan, Esto, Faceville, Goldsboro, Greenville, Gritney, Hague, Hernando, Lakeland, Orangeburg, Red Bay, Shubuta, Susquehanna, Tifton, Troup, Vaucluse, and Zuber.

Group 17

Classes IIIs-11, IIIs-12, IIIw-8, IIIw-9, IVs-13. Nearly level to sloping, moderately well to somewhat poorly drained soils on broad low ridges. They have rapidly permeable sandy layers to depths of more than 80 inches. The root zone is limited by a water table that fluctuates between 30 and 60 inches. Available water capacity of the root zone averages low to very low. The hazard of erosion is slight on unprotected areas. These soils are moderately suited for cultivated crops and pastures. They require intensive soil improving practices. Soils can be used two out of four years. Major soils are Adamsville, Chipley, and Tavares.

Group 18

Classes IIe-12, IIe-13, IIe-15, IIe-17, IIe-18, IIe-19, IIs-10, IIw-2, IIw-4, IIw-6, IIw-8, IIw-15. Nearly level to sloping, moderately well to somewhat poorly drained soils on flats of the lowlands and depressions in the uplands. They have loamy sand or sandy loam layers over slowly to moderately permeable sandy clay loam or sandy clay subsoil. The root zone is limited by a water table within 30 inches of the surface much of the time. Available water capacity of the root zone averages low to moderate. These soils are well suited for cultivated crops and pastures, but the nearly level areas require water control practices for best yields. Soils can be used three out of four years. Major soils are Ardilla, local Alluvial soils, Dunbar, Duplin, Hernando, Irvington, Leefield, and Stilson.

Group 19

Classes IIIe-14, IIIe-15, IIIe-16, IIIe-17, IIIw-2, IIIw-4, IIIw-6, IVw-1. Nearly level to sloping, moderately well to somewhat poorly drained soils of the lowlands and depressions in the uplands. They have loamy sand or sandy loam layers over slowly to moderately slowly permeable sandy clay loam or sandy clay subsoil. The root zone is limited by a water table within 30 inches of the surface much of the time. Available water capacity of the root zone averages low to moderate. These soils are well suited for cultivated crops and pasttures, but require water control practices for best yields. Soils can be used two out of four years. Major soils are Albany, Bushnell, Matmon, Ocilla, and Stilson.

Group 20

Classes IIIw-10, IIIw-17, IIIw-19, IIIw-20, IIIw-21, IIIw-22, IIIw-23, IIIw-33, IIIw-34, IIIw-35, IIIw-36, IVw-8, IVw-10, IVw-11, IVw-14, IVw-15, IVw-17, IVw-18, Vw-4, Vw-5. Nearly level, poorly drained soils of the flatwoods and swamps. They have thick sand layers some of which are underlain by moderately permeable sandy loam or sandy clay loam subsoils. Limestone underlies some soils between 20 and 40 inches deep. The soil has a thick dark colored surface layer. Also included are very poorly drained organic soils. The root zone is limited by a water table that rises to within 10 inches of the surface in wet seasons. Available water capacity of the root zone averages low to moderate. These soils are suitable for cultivated crops only after they have a well designed and maintained water control system. They are all suited for pastures. Soils cannot be used for row crops. Major soils are Anclote, Astor, Basinger, Bradenton, Delray, Felda, Floridana, Kanapaha, Leon, Lynn Haven, Mascotte, Olustee, Ona, Osier, Pamlico, Parkwood, Pelham, Placid, Plummer, Pompano, Ponzer, Ridgeland, Rutlege, and St. Johns.

Group 21

Classes IIw-11, IIw-12, IIw-13, IIw-14, IIIw-11, IIIw-13, IIIw-14, IIIw-15, IIIw-24, IIIw-25, IIIw-27, IIIw-29, IIIw-41, IIIw-42, IIIw-44, IIIw-46, IVw-5, IVw-16, IVw-20, Vw-2, Vw-3, Vw-9, Vw-8, VIw-2. Nearly level to sloping. poorly to very poorly drained soils in depressions or on sideslopes of the lowlands and undulating uplands. They have sand or loamy sand layers over moderately permeable sandy clay loam or slowly permeable clay loam or clay subsoils. The root zone is limited by a water table that is within 10 inches of the surface much of the time and by the subsoils of some soils. The available water capacity averages moderate to high in the root zone. These soils are not suitable for cultivated crops without a well designed and carefully maintained water control system. With good water control, they are very well suited for cultivated crops and pastures. Soils cannot be used for row crops. Major soils are Bayboro, Bibb, Bladen, Blichton, Coxville, Chobee, Fellowship, Grady, Leaf, Manatee, Mantachee, Meggett, Myatt, Pantego, Portsmouth, Rains, and Wahee.

Group 22

Classes IIIw-31, IVs-17, IVw-3, IVw-4, IVw-6, VIs-7, VIs-8, VIIs-1, VIIs-5, VIIw-2, VIIIs-1, VIIIs-2, VIIIs-3, VIIIs-4, VIIIw-1. Miscellaneous soils not normally used for producing crops or improved pasture.

Alabama Subarea

Group 1

Classes I-12, I-11, I-13. Deep, well-drained soils on uplands and stream terraces, 0 to 2 per cent slopes with slight erosion. Gray, brown or reddish-brown fine sandy loam surfaces and yellowish-brown, yellowish-red, or red friable fine sandy clay loam to clay loam subsoils. May be underlain by loamy sand at three to five feet. Rapid to medium rate of infiltration. Permeability is moderate. Major soils are Cahaba, Kalmia, Norfolk, Orangeburg, Red Bay, and Ruston.

Group 2

Classes IIe-12, IIIe-12, IIe-11, IIs-11, IIe-112, IIIe-10, IIIe-11. Deep, well-drained soils on uplands and stream terraces, 2 to 8 per cent slopes with slight to moderate erosion. Gray, brown or reddish-brown surfaces and yellowish-brown, yellowish-red or red friable fine sandy loam, fine sandy clay loam to clay loam subsoils. May be underlain by beds of loamy sand at three to five feet. Water moves through the soil at a moderate rate. Storage of water for plant use is low to medium. Principally Cahaba, Kalmia, Norfolk, Orangeburg, Red Bay, Ruston, and Saffell soils.

Group 3

Classes IIe-15, IIe-13, IIe-14, IIe-16, IIs-12, IIs-14, IIs-15, IIIe-16, IIIe-17, IIIe-111, IVe-11, IVe-12, IVe-111. Moderately deep to deep, moderately well to well-drained soils on uplands and stream terraces, 2 to 5 per cent slopes with slight erosion. Dark gray to light gray fine sandy loam or silt loam surfaces and yellowish-brown, yellowish-red to red firm clay subsoils which become plastic when wet and hard when dry. Water moves through the soils at a slow to very slow rate. Storage of water for use by plans is low to medium. Mostly Angie, Sawyer, and Shubuta soils.

Group 4

Classes IIIe-14, IIIe-15, IIIe-19, IVe-15. Deep to moderately deep, moderately well-drained soils on uplands, 2 to 8 per cent slopes with slight to moderate erosion. Grayish brown fine sandy loam surface soils and brownish-yellow or red friable to firm sandy clay subsoils which become mottled with gray at 15 to 30 inches. Subsoils are sticky when wet and hard when dry. Water moves through the soil at a slow rate. Storage of water for plant use is low to medium. Major soils are Sawyer and Shubuta.

Group 5

Classes IIw-11, IIw-12, IIw-14. Deep, moderately well-drained to well-drained soils in depressions in the uplands, around stream heads, and on broad flood plains. Brown friable fine sandy loam and loam surfaces and subsoil. Water enters these soils at a medium rate and moves through the subsoil at a moderate rate. Storage of water and natural fertility are moderately high. Water may stand on these soils for short periods after rains. Principally Iuka and Ochlockonee soils.

Group 6

Classes IIw-16, IIw-13, IIw-15, IIw-17. Deep and moderately deep, moderately well-drained to somewhat poorly drained soils on uplands and stream terraces, 0 to 2 per cent slopes with slight erosion. Dark gray to gray sandy loam surfaces, yellowish-brown to pale yellow fine friable sandy loam or fine sandy clay loam upper subsoil, and yellowish-brown mottled with gray and brown sandy clay loam or sandy clay lower subsoil. Water moves through the soils at a moderately slow rate. Storage of water is medium to low. Surface runoff after rains is slow. Major soils are Goldsboro, Irvington, Dothan, Ora, Angie, and Lynchburg.

Group 7

Classes IIIs-11, IIIs-110, IIIs-120, IIIs-19, IIIs-111. Deep, well-drained to excessively drained soils on uplands and stream terraces with slight erosion on 0 to 5 per cent slopes. Gray to brown loamy fine sand surfaces and subsoils. Water enters and moves through these soils at a very rapid rate. Storage of water is low to very low. Fertility and organic matter are very low. Fertilizer is leeched out rapidly. Mostly Americus, Eustis, Lakeland, and Alago soils.

Group 8

Classes IVe-130, IIIe-112, IIIe-114, IIIe-115, IIIe-130, IIIe-174, IVe-113, IVe-014, IVe-115, IVe-140. Moderately deep, moderately well-drained soils on uplands, 5 to 12 per cent slopes with slight to moderate erosion. Gray to brown fine sandy loam or gravelly fine sandy loam surfaces. Subsoils are yellowish-brown or yellowish-red friable sandy clay loam. Water moves through the upper subsoil at a moderate rate and through the lower subsoil at a slow rate. Storage of water is low. Principally Dothan, Gilead, Ora, and Prentiss soils.

Group 9

Classes IVw-11, IIIw-11 through IIIw-16, IVw-12, IVw-14, IVw-19. Deep, poorly drained and somewhat poorly drained on stream flood plains and uplands. Nearly level areas with slight erosion. Brown or gray fine sandy loam, loam or silt loam surfaces and gray mottled with yellow and brown fine sandy loam, loam, silt loam, or sandy clay subsoils. Subsoils of the Leaf and Chastain series are sticky and plastic. These soils have a high water table and the Mantachie, Bibb, and Chastian are subject to frequent overflow. Major soils include Bibb, Chastain, Leaf, Mantachie, Myatt, and Rains.

Group 10

Classes Vw-12, Vw-11, Vw-13. Deep, poorly drained to somewhat poorly drained soils on stream flood plains. These soils have gray to brown silt loam, loam or sandy loam surfaces and subsoils. Gray and yellow mottles occur at 0 to 24 inches below the surface. These soils will flood occasionally for long periods or frequently for short periods. Mostly wet alluvial land and poorly drained sandy alluvial soils. Severe flood damage conditions.

Group 11

Classes IVs-11, IVs-12, IVs-14, IVs-19, IVe-19. Excessively drained to moderately well-drained soils on uplands with 5 to 8 per cent slopes and slight erosion. Gray or brown loam fine sandy surfaces and subsoils. Water moves through these soils at a rapid rate. Low in organic matter and natural fertility, and fertilizer leeches at a rapid rate. Principally Americus, Eustis, Chipley, Lakeland, and Flomaton soils.

Group 12

Classes VIs-11, Vs-11, VIe-11 through VIe-14, VIe-19, VIs-12, VIs-19. Deep, excessively drained, somewhat excessively drained soils on uplands with 8 to 12 per cent slopes and slight erosion. These soils have gray, brown, or reddish-brown loamy fines and surfaces and yellowish-brown or red loamy fine sand subsoils. Water enters and moves through these soils at a rapid rate. Major soils include Americus, Eustis, and Lakeland.

Group 13

Classes VIe-113, VIe-111. Deep and moderately deep, well-drained soils on uplands with 8 to 12 per cent slopes that have lost more than 75 per cent of the top soil. Reddish-brown or brown, clay loam or sandy clay loam surfaces with a few areas of fine sandy loam. Subsoils are red, brown or yellow friable fine sandy loam or fine sandy loam. Water enters soil at a slow to medium rate and runoff may be very rapid. Mostly Lucedale, Carnegie, Greenville, Gilead, Luverne, Ora, Orangeburg, Red Bay, Ruston, and Saffell soils.

Group 14

Classes IIe-22, IIe-24, IIe-21, IIe-26, IIs-21 IIIe-21. Moderately deep, well-drained alkaline and acid soils on prairie uplands with 1 to 3 per cent slopes. Sumter soils have olive gray to dark gray clay or silty clay surfaces and gray or pale olive gray clay subsoils. Oktibbeha soils have greyish-brown sandy surfaces and red clay subsoils that are intensely mottled in the lower part. Infiltration and permeability are slow. Storage of water is moderately high. Fertility is medium. Primary soils are Sumter, Oktibbeha, and Houston.

Group 15

Classes IIIe-23, IIIe-22, IIe-23, IIIe-24 through IIIe-26, IVe-23, IVe-29, IVe-22. Moderately deep, moderately well-drained, strongly acid soils on uplands in the prairie section with slopes ranging from 1 to 5 per cent. These soils are underlain by calcareous material at 24 to 48 inches. They have reddish-brown clay surfaces and red clay subsoils that are mottled in the lower part. Water enters these soils slowly but their capacity to store water for plant use is moderately high. Principally Oktibbeha soils.

Group 16

Classes IVe-25, IIe-24, IIIe-222, IIIe-253, IVe-222, IVe-223, IVe-225. Shallow to moderately deep, moderately well-drained and somewhat poorly drained acid soils on prairie uplands with slopes from 3 to 8 per cent. Erosion has been moderate to severe. In some areas the underlying calcareous material is less than 20 inches below the surface. Water enters these soils slowly and surface runoff is rapid. Fertility is low. Mostly Vaiden soils.

Group 17

Classes IIw-23, IIw-21, IIw-22. Deep, moderately well-drained to somewhat poorly drained, alkaline, local alluvial soils at the head of small streams and on prairie stream flood plains. Dark gray to black plastic clay surfaces and gray to dark olive gray plastic clay subsoils. Infiltration and permeability are slow. Natural fertility is high and capacity to store water for plant use is moderately high. Major soils are Trinity and Catalpa.

Group 18

Classes IVw-23, IIIw-21,through IIIw-24, IVw-21, IVw-22. Deep, poorly drained, somewhat poorly drained, medium to strongly acid soils on prairie uplands and stream terraces with 0 to 1 per cent slopes. These soils have dark grayish-brown sandy loam, silty clay or clay surfaces and gray mottled clay subsoils. Infiltration, permeability, and surface runoff are slow. Capacity to store water for plant use is medium. Fertility is medium. These soils flood frequently. Primary soils include Eutaw, Una, and Leeper.

Group 19

Classes VIe-24, VIe-22, VIe-29. Shallow to moderately deep, well-drained to somewhat poorly drained acid and alkaline soils on prairie uplands and stream terraces with slopes ranging from 3 to 12 per cent. Oktibbeha and Vaiden soils have grayish-brown thin sandy or clayey soils surface and red or yellowish-brown clay or silty clay subsoils that are mottled in the lower part. Binnsville soils have gray to dark gray surfaces and light gray very hard chalk subsoils. Fertility and organic matter content are low. Permeability is very slow and surface runoff is rapid. Major soils include Oktibbeha, Vaiden, and Binnsville.

Group 20

Classes IIe-31, I-31, I-32, IIe-32. Deep, and moderately deep well-drained soils on uplands and stream terraces. Slopes are 0 to 6 per cent with slight to moderate erosion. Brown or reddish-brown sandy loam, loam, or silt loam surfaces and red or dark red friable to firm sandy clay or clay subsoil. Infiltration is moderate to rapid and permeability is moderate. Storage of water is medium. Mostly Cecil, Madision, Davidson, and Wickham soils.

Group 21

Classes IIIw-32, IIw-32, IIw-34. Deep, moderately well-drained to somewhat poorly drained soils on stream flood plains with 0 to 2 per cent slopes. They have brown fine sandy loam or silt loam surfaces and brown mottled with gray silt loam or fine sandy loam friable subsoils. Water and air move through the soils at a rapid rate. The soils are flooded frequently for periods of one to two days. Includes Chewacla soils.

Group 22

Classes IIIw-31, IIw-31. Moderately deep, moderately well to somewhat poorly drained soils on stream terrace and uplands. Slopes are 0 to 6 per cent. Grayish-brown sandy loam surfaces and grayish-brown mottled with brown firm silty clay or sandy clay subsoils. Movement of air and water through these soils is slow. Water may stand for short periods after rains. Major soils are Augusta, Colfax, and Altavista.

Group 23

Classes IIIe-31, IVe-31, IIIe-32, IIIe-34, IVe-32. Deep and moderately deep, well-drained soils on uplands and stream terraces. Slopes are 6 to 15 per cent with slight to moderate erosion. Brown or reddish-brown sandy loam, gravelly silt loam or gravelly sandy loam and friable to firm sandy clay or silty clay subsoils. Infiltration is medium and permeability is moderate. Storage of water is low to moderately high. Primary soils are Appling, Cecil, Madison, Helena, Gwinnett, Mecklenburg, and Wickham.

Group 24

Classes IVe-331, IIe-312, IIe-330, IIe-340, IIIe-33, IIIe-39, IIIe-312, IIIe-331, IIIe-335, IIIs-31, IVe-33, IVe-39, IVe-332. Moderately deep, well-drained soils on uplands and stream terraces. Slopes are 10 to 15 per cent with severe erosion. Yellowish-brown, brown or reddish-brown sandy loam, gravelly silt loam or gravelly sandy loam surfaces and yellowish-brown, yellowish-red or red friable to firm sandy clay subsoils. Movement of air and water through these soils is moderate. Storage of water is medium. Includes Appling, Cecil, Helena, Gwinnett, Mecklenburg, Madison, Vance, and Wickham soils.

Group 25

Classes IVw-31, Vw-31, Vw-32. Deep, poorly drained soils on nearly level stream terraces and flood plains. Dark gray silt loam and sandy loam surfaces and mottled gray, yellow, and brown silty clay and sandy clay subsoils. Water stands on these soils for long periods. Mostly Roanoke, Wehadkee, and poorly drained alluvial soils.

Group 26

Classes VIs-31, VIe-31, VIe-32, VIe-34, VIe-39. Moderately deep and shallow well-drained soils on uplands are on 6 to 25 per cent slopes with slight to severe erosion. These soils have stony sandy loam or stony sandy clay loam surfaces and yellowish-red to red sandy clay or clay subsoils. Water and air move through these soils at a moderate rate. Storage of water in these soils for plant use is low to medium. Major soils are Appling, Cecil, Gwinnett, Louisa, Louisburg, Madison, and Wilkes.

Group 27

Classes VIe-331, VIe-335, VIe-339, VI3-341. Moderately deep, well-drained soils on uplands. Slopes are 15 to 25 per cent with severe erosion. They have yellowish-brown, brown or reddish-brown sandy clay loam or gravelly sandy clay loam surfaces and yellowish-brown, yellowish-red or red friable to firm sandy clay subsoils. Water and air move through the soil at a moderate rate. Storage of water for plant growth is low to medium. Principally Appling. Cecil, Gwinnett, and Madison soils.

Group 28

Classes I-43, I-41, I-42, I-460, I-510. Deep, well-drained, nearly level, friable soils, developing in local alluvium. Commonly in depressional areas, and along narrow drainageways and draws. Grasmere soils are red to dark reddish-brown throughout. Staser and Pruitton soils generally are somewhat coarser in texture than the Grasmere. Major soils are Grasmere, Pruitton, and Staser.

Group 29

Classes IIe-42, IIe-45, IIe-41, IIe-43, IIe-44, IIe-48, IIe-49, IIe-451. Moderately deep and deep, well-drained, and moderately well-drained permeable soils on uplands, stream terraces, and footslopes on the plateau, and on stream terraces and footslopes in the valleys. Slopes range from 2 to 6 per cent, and the erosion is slight to moderate. Friable grayish-brown, and dark reddish-brown fine sandy loam, or silty loam surface soils, five to eight inches thick, that may be gravelly or shaly, and friable to firm, yellowish-brown, yellowish-red to dark red sandy clay loam, clay loam, or silty clay loam subsoils which may also be gravelly or shaly. Mostly Allen, Linker, Hartsell, Dickson, Locust, Decatur, Dewey, and Wynnville. Dickson, Locust, and Wynnville soils have a fragipan.

Group 30

Classes IIw-41, IIw-42, IIw-45. Deep, well-drained and moderately well-drained soils with somewhat poorly drained inclusions. In local and general alluvium positions on the plateaus and in the valleys. Surface soil and subsoil textures range from fine sandy loam, loam, silt loam, and silty clay loam. The moderately well-drained soils will have drainage mottles at about 18 inches in depth, whereas the well-drained soils are mottle-free to a depth of at least 30 inches. Subject to not more than moderate damage from ponding or stream overflow. Major soils are Pruitton, Lobelville, and Ellisville.

Group 31

Classes IIIw-41, IIIw-42, IIIw-43, IIIw-48. Deep, moderately well-drained to poorly drained, nearly level, medium and fine-textures soils developing in local and general alluvium in depressional areas, at the heads of and along narrow drainageways and draws, on first bottoms and flood plains, and on plateaus. The soils are subject to not more than moderate crop damage from excess standing water, ponding, or stream overflow. The water table is at or near surface during wet seasons. Primarily Taft, Lee, Gaylesville, and Tupelo soils.

Group 32

Classes IIIe-42, IIIe-43, IIs-42, IIs-44, IIs-45, IIIe-41, IIIe-45, IIIe-441, IIIe-442, IIIe-443, IIs-43, IIs-451. Moderately deep and deep, well-drained, permeable soils on uplands, stream terraces, and footslopes on the plateaus, and on stream terraces and footslopes in the valleys. Baxter, Fullerton, Minvale, and Bodine soils are Cherty derived principally from limestone. Slopes range from 6 to 10 per cent, and the erosion is slight to moderate. They have friable grayish-brown, dark brown, and dark, reddish-brown, fine sandy loam and loam surface soils, that may be gravelly or shaly, five to eight inches thick, and friable to firm, yellowish-brown, yellowish-red to dark red sandy clay loam or clay loam subsoils which may also be gravelly or shaly. Includes Allen, Hartsells, Holston, Minvale, Fullerton, and Waynesboro soils.

Group 33

Classes IVe-43, IVe-41, IVe-42, IVs-42. Moderately deep and deep, well-drained permeable cherty soils on uplands and footslopes in the limestone valleys and chert ridges derived principally from cherty limestone. Slopes range from 10 to 15 percent. Erosion is slight to moderate. Friable grayish-brown to dark brown, cherty silt loam surfaces five to eight inches thick, and friable yellowish-brown, yellowish-red, or dark red cherty silty clay subsoils. Mostly Fullerton, Dellrose, and Bodine.

Group 34

Classes IVe-441, IVe-442 through IVe-445, IIIe-444, IIIe-445, IVe-448, IVe-449, IIIe-446, IIIe-449, IVe-446. Moderatly deep and deep, well-drained, permeable severely eroded soils on uplands, stream terraces, and footslopes in the limestone valleys. Some friable cherty soils. Slopes range from 6 to 10 per cent. Thin reddish clay loam, silty clay loam, silty clay or clay surface layers over red to dark-red firm clay loam, silty clay loam, silty clay, or clay subsoils. May be shaly in places. Major soils are Decatur, Dewey, Fullerton, Minvale, and Etowah.

Group 35

Classes IVw-41. Deep, poorly drained, medium and fine-textured soils in upland depressions and on low stream terraces. Surface soils are faintly to distinctly mottled silt loams and fine sandy loams, 6 to 18 inches thick. Subsoils are distinctly to prominently mottled silt loams to silty clay loams. Water may stand on these soils for long periods after intensive rains or prolonged wet periods. Chiefly Guthrie and Dowellton soils.

Group 36

Classes IIIe-44, IIIe-49, IVe-44, IVe-45. Moderately deep to deep, well-drained soils on uplands derived primarily from shales with some sandstone influence. Slopes range from 2 to 15 per cent and the erosion is slight to moderate. Friable grayish-brown very fine sandy loam, loam, or silt loam surface soils, five to seven inches thick, and yellowish-brown to yellowish-red or red friable silty clay loam to firm silty clay or clay subsoils. Mostly Albertville, Nectar, and Enders soils.

Group 37

Classes IVe-49, IIIs-41, IIIe-46, IIIe-48, IVe-46, IVe-48. Moderately deep to shallow, well-drained soils on uplands derived from sandstones and shales. Slopes range from 6 to 10 per cent, and the erosion is slight to moderate. Friable, medium textured surface soils that may or may not be gravelly or shaly, and friable to firm medium to fine-textured subsoils. Depth to bedrock ranges from 12 to 40 inches. Major soils are Hector, Montevallo, and Townley.

Group 38

Classes VIe-49, VIe-43, VIe-42, VIe-44, VIe-46, VIe-48, VIs-42, VIs-48, VIs-49. Deep to shallow, well-drained to excessively drained upland soils derived from sandstone, shale, and cherty limestone. Slopes range from 10 to 25 per cent, and the erosion is slight to moderate. Friable, medium-textured surface soils and friable to firm medium to fine-textured subsoils. Depth to bedrock ranges from 10 to 60 inches or more. Mostly Enders, Hartsells, Montevallo, Fullerton, and Bodine soils.

Group 39

Classes VIe-441, VIe-443, VIe-442, VIe-446, VIe-448, VIe-449. Moderately deep and deep, well-drained permeable, cherty, and severely eroded soils on uplands, stream terraces, and footslopes in the limestone valleys and on the plateaus. Slopes range from 10 to 25 per cent. Friable, fine-textured surface soils and subsoils that may be gravelly, shaly, or cherty in places. Primary soils include Decatur, Dewey, Albertville, and Enders.

ALABAMA URBAN WATER USE BY SYSTEMS INCLUDING PROJECTED USE

County	Town	Name of System	Population Served	Average Daily Use	Maximum Daily Use	Source of Water	Normal Production Capacity	Per Capita (gpd)	Projected Use 1990	Projected Use 2000	Projected Use 2020
				(Million Gallons Per Day)							
BALDWIN	Bay Minette	Pine Grove Water System	1000			Bay Minette					
		Rock-Hill Red-Hill Water System	210			Bay Minette					
		Utilities Board City Bay Minette	6727	.60	1.0	Wells	1.8	89.2	1.16	1.77	3.00
		White House Water Authority	900			Bay Minette					
	Lillian	Spanish Cove Development Corporation	1/			Well	.432				
	Loxley	Town of Loxley	950	.072	.095	Well	.288	75.8	1.10	1.55	2.46
	Perdido	Perdido Junior High School	400[4/]			Well					
	Robertsdale	City of Robertsdale	2078	.500	1.152	Well Field 2	2.300	240.6	1.14	1.67	2.73
		Elsanor Elementary School	140[4/]			Well					
	Rosinton	Rosinton School	160[4/]			Well Field					
	Stapleton	Stapleton Water System	2000	.030	.031	Well	.144	15.0			
	Summerdale	Summerdale Water Works	560	.040	.200	Well	.720	71.4	.07	.12	.22
BARBOUR	Baker Hill	Baker Hill High School	439[4/]			Well					
		Baker Hill Water and Fire Authority	284	.050	.050	Well		176.1			
	Clayton	Clayton Water Works and Sewer Board	1626	.090	.120	Field	.500	55.4	.15	.18	.25
	Clio	Clio Water Works	1200	.045	.075	Well	.500	37.5	.06	.08	.12
		Town of Blue Springs	300	.015		Well	.108	50.0	.02	.03	.04
	Eufaula	Water Works and Sewer Board	10000	1.300	2.000	Well	3.600	130.0	1.95	2.47	3.50
	Louisville	Louisville Water Works Board	775	.180	.240	Well	.450	232.3	.23	.26	[illegible]
		Mt. Andrew Water & Fire Protection Authority	490			Midway					
BULLOCK	Midway	-	591	.040	.060	Well	.720				
	Union Springs	-	-	.700	1.000	Well	.190				
BUTLER	Chapman	Chapman Area Water and Fire Protection Authority		.500	.700	Field 3	1.800				
	Georgiana	Atlas Truckstop	100			Wells					
		Georgiana Water System	2500	.160	.205	Wells	.500	64.0	.24	.31	.46
	Greenville	Big R Restaurant and Trailers	110[3/]			Well Field					
		Edgeview Heights		.007		Wells	.101				
		Lakeview Mobile Homes	288[3/]			Wells					
		Water Works and Sewer Board	8033	.500	1.000	Wells	1.050	62.2	.75	.96	1.37
	McKenzie	McKenzie Water Board	494	.025	.028	Wells	.500	50.6	.03	.04	.05
CHAMBERS	Five Points	Five Points High School	275[4/]			Well					
	Lanett	City of Lanett	7500			Westpoint Pepperell Inc.					
		Huguley Water System	4500			Westpoint Pepperell Inc.					
	Langdale	East Alabama Water, Sewer and Fire Protection District	13125[A/]			Westpoint Pepperell Inc.					
		Westpoint Pepperell Inc.	25000	3.700	4.400	Chattahoochee River	4.400	148.0			
COFFEE	Brundidge	New Hope Water System	650	.025	.100	Well	.180	38.5			
		City of Elba	6000	.620	.756	Field	2.000	103.3	1.09	1.59	2.58
		Curtis Water Authority		.015		Well	.144				
		Damascus Water Association		.010		Well	.144				
	Enterprise	City of Enterprise Water Works Board	18000	3.000	4.000	Field	6.000	166.7	5.11	7.32	11.73
		Conogra Inc.		1.000	1.080	Well	1.080				
		Goodman Junior High School	250			Wells					
		Macedonia Water System				Enterprise					

A/ Includes Fairfax, Shawmut, Little Shawmut, Langdale, Riverview

Source: Inventoried water use supplied by Public Water Supply Division of the Alabama Department of Public Health. Projected use developed by SCS and based upon projected population. (per capita consumption increasing at 1.25% per year average)

County	Town	Name of System	Population Served	Average Daily Use	Maximum Daily Use	Source of Water	Normal Production Capacity	Per Capita (gpd)	Projected Use 1990	2000	2020
				(Million Gallons Per Day)							
COFFEE	Enterprise (Cont)	Martins Trailer Court	225[3/]			Wells					
		Mount Pleasant School	190[4/]			Wells					
		Mount Pleasant Water Authority		.014	.020	Well	.216				
	Jack	Jack Water Systems Inc.	600	.030	.040	Well	.144	50.0			
	Kinston	Kinston Water Works	570	.045		Field	.300	78.9	.06	.08	.12
	New Brockton	Bethany Water Systems	1000			Enterprise					
		Camp Alaflo	150			Wells					
		Coffee Drive-in Theatre	300			Wells					
		New Brockton Water Department	1400	.050	.075	Field	.360	35.7	.08	.13	.22
CONECUH	Castleberry	Alex Food	100[2/]			Well					
		Castleberry Water System	666	.048		Well	.100	72.1	.06	.07	.08
	Evergreen	Evergreen	3924	.800	1.162	Wells 1-2-3	1.862	203.9	1.05	1.20	1.50
		Fairview Water Systems Inc.		.025	.100	Well Field	.216				
		Lyeffion Elementary School	200[4/]			Well					
		Lyeffion High School	575[4/]			Well					
		Rest Area Northbound	400[5/]			Well					
		Rest Area Southbound I I-65	500[5/]			Well					
		River Spring Campground	100[0/]			Well					
	Repton	Nichburg Junior High School	237[4/]			Well					
		Repton Water Works	300	.025	.040	Well	.144	83.3	.03	.03	.03
COVINGTON	Andalusia	Amuets Club	750[2/]			Well					
		Dutca and Nells Restaurant	150[2/]			Well					
		Green Pit BBQ	125[2/]			Well					
		Heath Water Systems	200			Andalusia					
		Key Motel and Restaurant	150[6/]			Well					
		Pleasant Home School	508[4/]			Well					
		Straughn High School	790[4/]			Wells					
		Water Works Board of Andalusia	10500	1.000	1.800	Field 7	3.000	95.2	1.36	1.63	2.17
		Williams Grocery and Sandwiches	725[2/]			Wells					
	Florala	Dairy King Cafe	750[2/]			Well Field					
		Florala Water Works and Sewer Board	3000	.250	.325	Field	1.500	83.3	.29	.33	.92
	Gantt	Gantt Water System	312			Heath Water System					
	Lockhart	Town of Lockhart	698	.069	.104	Well	.576	98.9	.08	.09	.11
	Opp	Blue Springs School	140[4/]			Well					
		Fleeta School	275[4/]			Well	1.440				
		City of Opp Utility Board	6493	.500	.800	Field 4		77.01	.72	.88	1.19
	Red Level	Red Level Water Works	600	.050	.100	Spring	.100	83.3	.06	.07	.09
	River Falls	River Falls Water System	580	.030		Well	.144	51.72	.04	.04	.05
CRENSHAW	Brantley	Armstrongs Place	100[2/]			Well					
		City of Brantley	1066	.100		Field Well	.216	93.8	.14	.17	.22
	Dozier	City of Dozier	335	.120		Well	.144	358.2	.15	.18	.24
	Glenwood	Town of Glenwood	378	.065		Well	.175	172.0	.09	.11	.14
	Goshen	Honoraville School	230[4/]			Well					
	Grady	NE Crenshaw County Water and Fire Protection Authority	700	.040	.075	Well	.144	57.1			
	Highland Home	Hi Pine	300	.015		Well	.158	50.0			
		City of Luverne	2400	.329		Well Field 4	1.836	137.1	.48	.58	.79
		Crenshaw County Lake	40[7/]			Well					
	Rutledge	City of Rutledge	350	.020		Well	.108	80.0	.04	.05	.07

County	Town	Name of System	Population Served	Average Daily Use	Maximum Daily Use	Source of Water	Normal Production Capacity	Per Capita (gpd)	Projected Use 1990	Projected Use 2000	Projected Use 2020
				(Million Gallons Per Day)							
DALE	Ariton	Town of Ariton Water Works	678	.040		Well	.300	59.0	.06	.08	.11
		City of Dale	5500	.520	.800	Well Field	1.44	94.5	.73	.95	1.40
		Deer Run Estates	298[3/]			Well Field					
		Kelly and Sons Trailer Court	105[3/]			Well Field					
		Level Plains Mobile Home Park	200[3/]			Well Field					
		Wildwood Trailer Park	182[3/]			Well Field					
	Enterprise	Dogwood Acres Trailer Court	193[3/]			Well Field					
		Hillview Trailer Court	123[3/]			Well Field					
		Holiday Village	175[3/]			Well Field					
	Level Plains	Level Plains Water System	2000	.045	.050	Well	.250	22.5	.07	.09	.14
	Midland City	Dothan Union 76 Truck Stop	100[2/]			Well Field					
		Kampus Corners	250[2/]			Well					
		Midland City Water Department	1172	.085	.100	Well 2	.800	72.5	.11	.13	.18
	Newton	Choctawhatchee Wells	175[1/]			Well					
		Newton Water Works Board	1865	.090	.100	Well	.288	48.3	.15	.21	.33
	Ozark	Chisms Truck Stop	125[2/]			Well					
		Lake Gayle Trailer Court	140[3/]			Well Field					
		Utility Board of Ozark	13500	1.500	2.300	Field 5	5.112	111.1	3.06	4.28	6.72
	Pinckard	Pinckard Water Dept.	725	.036	.050	Field	.216	49.7	.05	.07	.11
	Skipperville	George W. Long School	530[4/]			Well					
ESCAMBIA	Atmore	Atmore Prison Farm	1000[8/]	.200	.600	Well	.600	200.0			
		Bratt-Davisville Water Systems Inc.	1850			Well					
		Camp Nakomis Trailer Park	126[3/]			Well Fields					
		City of Atmore Utility Board	10000	1.400	2.051	Wells	3.520	140.0	2.50	3.62	5.87
		Fountain Correctional Center	1100[8/]			Well Fields					
		Freemanville Water System Inc.	1500			Atmore					
		Little River State Park	110[1/]			Wells					
	Brewton	City of Brewton	6963	.525	.630	Wells	1.580	75.4	.99	1.41	2.25
		McCall Water System Inc.		.070	.225	Well	.500				
		North Brewton Junior High School	325[4/]			Wells					
		Pea Ridge Water System	420			Brewton					
		Riverview Inc.	120	.011		Well	.288	91.7			
	Canoe	Canoe Water and Fire Protection Authority	500	.050	.075	Well	.216	100.0			
	East Brewton	Water Works Sewer Board	2500	.180	.339	Well	.432	72.0	.35	.55	.82
	Flomaton	South Flomaton Water System	2500	.200		Well	.576	80.0			
		Town of Flomaton	1800	.336	.504	Wells	.504	186.7	.62	.87	1.37
	Huxford	Huxford Water and Fire Protection Authority	500	.024	.030	Well	.144	48.0			
GENEVA	Black	Black Water Works	171	.008	.207	Well	.008	46.8	.01	.01	.01
	Coffee Springs	Coffee Springs Water System	329	.025	.086	Well		76.0	.04	.05	.08
	Enterprise	Camp Wiregrass	120[1/]			Well Fields					
	Geneva	Geneva Water Works and Sewer Board	5180	.480	.630	Wells	1.480	92.7	.70	.85	1.14
		Tastee Freeze	200[2/]			Wells					
	Hartford	Hartford Water and Light System	3850	.210	.294	Wells	1.512	54.5	.30	.36	.48

				-------(Million Gallons Per Day)-------							
ty	Town	Name of System	Population Served	Average Daily Use	Maximum Daily Use	Source of Water	Normal Production Capacity	Per Capita (gpd)	Projected Use 1990	2000	2020
VA nt)	Malvern	Town of Malvern Water Department	400	.023	.097	Well	.144	57.5	.03	.03	.0
	Samson	Samson Water Works	2267	.146	.292	Wells	.720	64.4	.20	.24	.3
		Top Drive-In	150 2/			Wells					
	Slocomb	Slocomb Water Works and Sewer Board	2008	.250	.504	Well Field	.504	124.5	.37	.46	.6
Y	Abbeville	Abbeville Water Works Board	3750	.420	.750	Wells	1.500	112.0	.64	.87	1.3
		Bethlam Water Authority	325			Abbeville					
		Wills Cross Roads Water System	350			Well					
	Columbia	Town of Haleburg	104	.015	.030	Well	.187	144.2	.20	.25	.3
	Headland	City of Headland Water Works Board	2500	.192	.250	Wells	.195	76.8	.32	.43	.6
	Newville	Newville Water System	465	.096	.288	Wells	.096	206.5	.14	.17	.2
	Shorterville	Shorterville Water Authority	350	.015	.065	Well	.144	42.9			
TON	Ashford	City of Ashford	2500	.200	.100	Wells	.093	80.0	.33	.46	.7
		Thompsonville Trailer Court	105 3/			Well Field					
	Columbia	Columbia Water and Sewer Board	1800	.200	.576	Well	.220	111.1	.48	.53	.6
	Cottonwood	Cottonwood Water and Sewer Board	1180	.080	.200	Wells	1.200	67.8	.12	.16	.2
	Cowarts	Cowarts Water System	439	.030	.030	Well/Dothan	.144	68.3	.04	.06	.0
	Dothan	City of Dothan (Napier Field)				Well					
		City of Dothan Alabama Water Department	40000	6.244	13.369	Field/Well	10.669	156.1	10.9	15.8	25.7
		Dairy Fresh Milk Process Plant	9/			Well Field					
		Kings Mobile Home Court	123 3/			Well Field					
		Kinsey Water System	240	.020	.160	Well	.070	83.3	.03	.04	.
		Lakeside Mobile Village	263 3/			Well					
		Olympia Spa	100 1/			Well Field					
		Red Seafood Bay	350 2/			Well					
		Rehobeth High School	1000 4/			Well Field					
		Taylor Water System	492			Well					
		Thomas Trailer Court	123 3/			Well Field					
	Gordon	Bonfire Club and Cafe	100 2/			Well					
		McIntyre Mobile Villa	248 3/			Well					
		Water Works Board of Gordon	1000	.017	.106	Well	.144	17.0	.03	.04	.
	Pansey	Harmon School	170 4/			Well					
	Webb	Webb Water System	355	.019	.144	Well	.020	53.5	.03	.04	.
	Cussetta	Lee-Chambers Water System	6000			West Point Pepperill					
	Opelika	Cedar Cafe	100 2/			Well					
		Pine Motel and Restaurant	225 6/			Well					
		Sanford Junior High School	681 4/			Well					
	Salem	Georgia Power Company	8/			Well					
		Halawaka Restaurant	100 2/			Well					
		Sonias Morina and Cafe	600 6/			Well					
		Wacoochee Junior High School	715 4/		.036	Well					
	Smiths	Smiths Water Authority	10000			Phenix City					

County	Town	Name of System	Population Served	Average Daily Use	Maximum Daily Use	Source of Water	Normal Production Capacity	Per Capita (gpd)	Projected Use 1990	Projected Use 2000	Projected Use 2020
				(Million Gallons Per Day)							
LOWNDES	Fort Deposit	Ft. Deposit Water and Sewer Board	1407	.107	.126	2 Well	.864	76.0	.17	.21	.28
		Logan Water System Inc.	650			Ft. Deposit					
MACON	(No Towns)										
MONROE	Excel	The Excel Water System	1200	.040	.050	Well	.288	33.33	.04	.04	.05
	Megargel	Megargel Water System	150	.005		Well	.144	33.33			
MONTGOMERY	Lapine	Sellers Stations Water System Inc.	500	.050	.100	Well	.200	100.0			
	Pine Level	Pine Level Water and Fire Protection Authority	3000	.040	.070	Well	.250	13.3			
	Ramer	Ramer Water Co. Inc.	500	.017	.025	Well	.144	34.0			
PIKE	Ansley	Shellhorn Elementary	190 4/			Well					
	Banks	Town of Banks	173	.046	.052	Well (Troy, Brundidge)	.072	265.9	.06	.07	.09
	Brundidge	City of Brundidge	2709	.541	.800	Wells - 2	1.25	199.7	.75	1.10	1.54
	Goshen	Goshen	300 4/			Well					
		Goshen Water Works	475	.020		Well	.144	42.1			
	Luverne	Village Trailer Park	100 3/			Well Field					
	Troy	Bowdens Restaurant	205 2/			Well					
		Hester Trailer Park	115 3/			Well Field					
		North Pike County Water System	300			City of Troy					
		Parkway Truck Stop	125 2/			Well					
		Southland Trailer Park	160 3/			Well Field					
		Springhill Elementary	161 4/			Well					
		Troy Utilities Dept.	12500	1.500	2.000	Wells - 5	4.000	120.0	2.02	2.67	3.93
RANDOLPH	Rock Mills	Rock Mills Elementary School	185 4/			Well					
RUSSELL	Fort Mitchell	Shady Meadows	168 3/			Well Field					
		Ft. Mitchell Water System	3000	.150	.216	Wells - 2	.432	50.0			
	Holy Trinity	Holy Trinity Cinicle	100 2/			Wells					
	Hurtsboro	Water and Sewer Board Town of Hurtsboro	1020	.100	.200	2 Well Fields	.200	98.0	.14	.17	.23
	Opelika	Dixie School	273 4/			Wells					
	Phenix City	Russell County Utility Board	6000	.067	.320	2 Well Fields	.320	11.2			
		1119 Broad Street	28000	4.200	7.500	Chattahoochee River	5.080	150.0	7.23	9.51	14.06
	Pittsview	Pittsview Community Supply	400			Well Fields					
		Pittsview Junior High School	397 4/			Wells					
		Seale Community and Highway	160			Well Fields					
	Seale	Area Vocational School	2000 4/			Wells					
		Chavala High School	859 4/			Wells					
		Ft. Mitchell Mobile Homes	140 3/			Well Fields					
		Oliver Elementary School	540 4/			Wells					
		Seale Community	150			Well Fields					

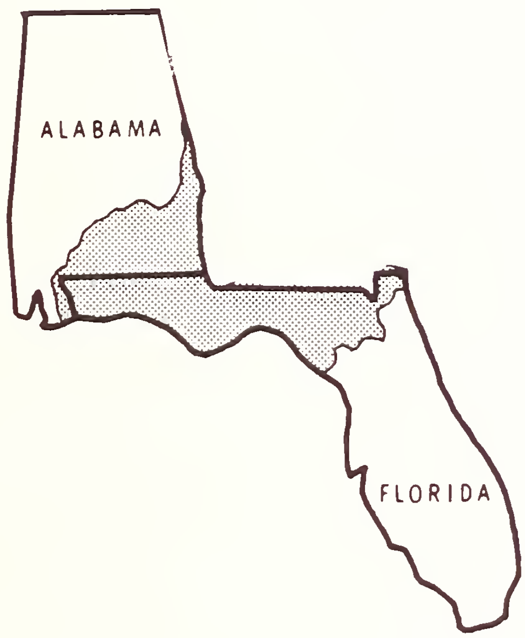
0/ Campground; 1/ Recreation; 2/ Restaurant; 3/ Mobile Home Park; 4/ School; 5/ Rest Area; 6/ Motel; 7/ Picnic Area; 8/ Institution.

VOLUME II

NORTHEAST GULF RIVER BASINS

FLORIDA AND ALABAMA

COOPERATIVE SURVEY



PREPARED BY

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE
ECONOMICS, STATISTICS, AND COOPERATIVES SERVICE
FOREST SERVICE

In Cooperation With

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

STATE OF ALABAMA
ALABAMA OFFICE OF STATE PLANNING AND FEDERAL PROGRAMS

AUGUST 1980

V O L U M E   I I

Northeast Gulf River Basins

Florida and Alabama

Cooperative Survey

Prepared By

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service
Economics, Statistics, and Cooperatives Service
Forest Service

In Cooperation With

STATE OF FLORIDA
Department of Environmental Regulation

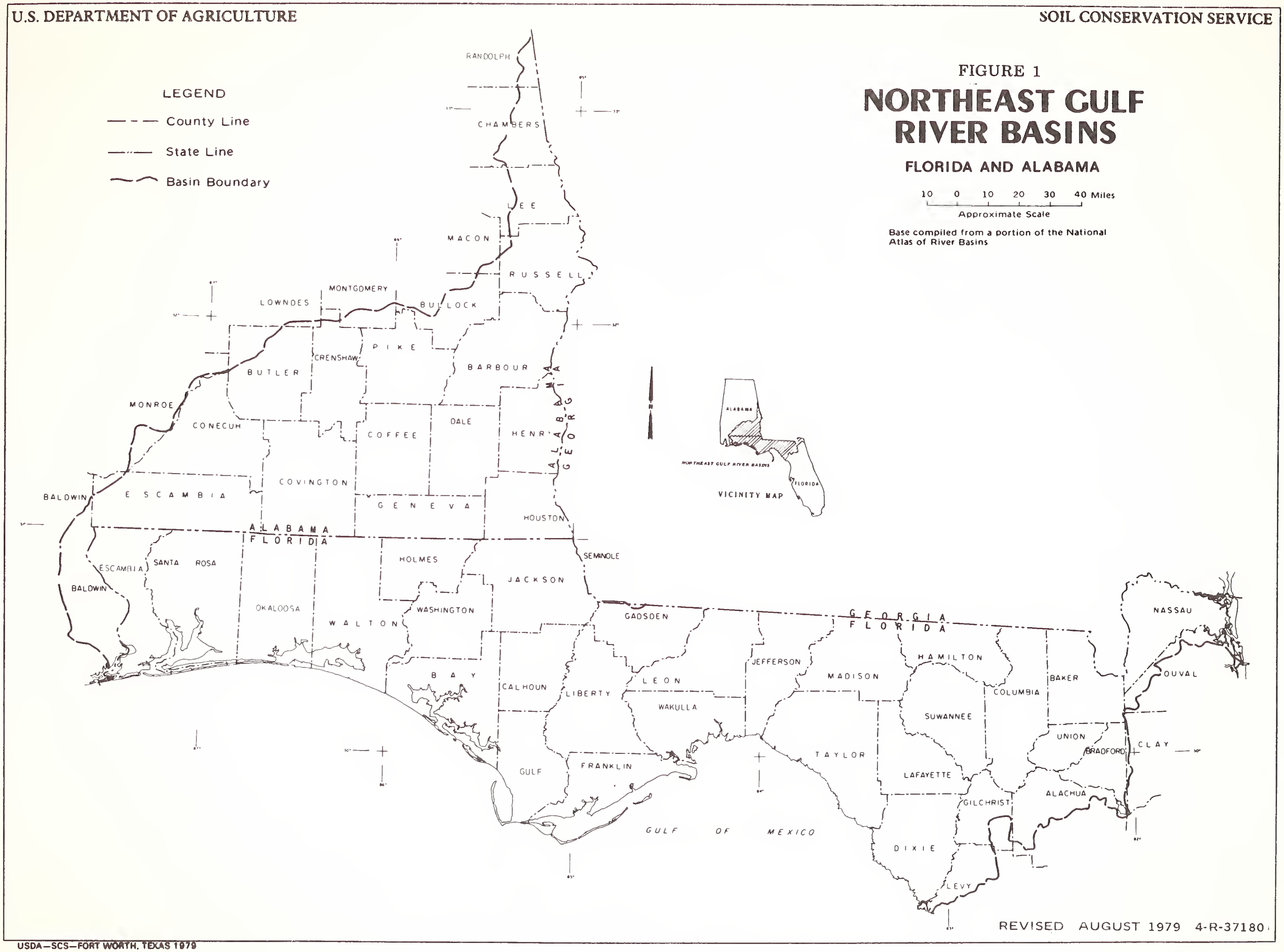
STATE OF ALABAMA
Alabama Office of State Planning and Federal Programs

August 1980

During the study, Alabama SCS personnel became more involved in development of agricultural land use and production projections than was originally anticipated. After these projections were made, the Alabama SCS assumed more responsibility for development of Alternative and Recommended Plan elements. Due to these and other commitments, it was determined that Alabama plan elements would be developed for 1990 only, in order to permit completion of the study within the time period reflected in the revised Plan of Work.

The study was directed by a USDA Field Advisory Committee (FAC), composed of the Florida State Conservationist, Soil Conservation Service (Chairman); Leader, Southern Resource Group, Economics, Statistics, and Cooperatives Service; and Field Representative, Southeastern Area, Forest Service. The Chairman provided coordination and liaison with the state sponsoring agencies and cooperating federal agencies.

The FAC gratefully acknowledges the assistance and cooperation of other federal, state, and local agencies, other groups, and individuals who supplied data and other services. Their efforts represent a substantial contribution to the success of this study.


U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FIGURE 1
NORTHEAST GULF RIVER BASINS
FLORIDA AND ALABAMA
10 0 10 20 30 40 Miles
Approximate Scale
Base compiled from a portion of the National Atlas of River Basins
LEGEND
County Line
State Line
Basin Boundary
VICINITY MAP
ALABAMA
FLORIDA
NORTHEAST GULF RIVER BASINS
RANDOLPH
CHAMBERS
LEE
MACON
RUSSELL
MONTGOMERY
LOWNDES
BULLOCK
BUTLER
CRENSHAW
PIKE
BARBOUR
MONROE
CONECUH
COFFEE
DALE
HENRY
COVINGTON
BALDWIN
ESCAMBIA
GENEVA
HOUSTON
ALABAMA
FLORIDA
GEORGIA
SEMINOLE
ESCAMBIA
SANTA ROSA
HOLMES
JACKSON
BALDWIN
OKALOOSA
WALTON
WASHINGTON
GADSDEN
BAY
CALHOUN
LIBERTY
LEON
WAKULLA
JEFFERSON
MADISON
HAMILTON
COLUMBIA
BAKER
NASSAU
DUVAL
SUWANNEE
TAYLOR
LAFAYETTE
UNION
BRADFORD
CLAY
ALACHUA
GILCHRIST
DIXIE
LEVY
GULF
FRANKLIN
GULF OF MEXICO
REVISED AUGUST 1979 4-R-37180
USDA—SCS—FORT WORTH, TEXAS 1979

SUMMARY

Volume II documents Phase II of the Northeast Gulf River Basins Study. It consists of five chapters, which are entitled: (I) Future Without Accelerated Development, (II) Needs, (III) Alternative Plans, (IV) Recommended Plan, and (V) Opportunities to Implement 1990 Portion of the Recommended Plan.

Prior to formulating a recommended plan, the situation and conditions expected to exist by the 1990 and 2020 time periods were estimated. Practices and trends of ongoing programs were taken into account. Crop and pasture yields are expected to increase about 30% by 1990 and 75% by 2020. Production of all crops except cotton and tobacco is expected to more than double by 2020. An increase in acreage, especially of corn and soybeans, will be necessary to realize the projected levels of production.

Of the total Basin area of 19,233,000 acres, 14,097,000 acres are in forest land. A gradual increase in wood fiber production is projected. In the Alabama Subarea, net annual growth is expected to be 65 cu.ft. per acre by 1990 and 75 cu.ft. per acre by 2020. The projections for the Florida Subarea are 45 and 55 cu.ft. per acre by 1990 and 2020 respectively. Forest land acreage is expected to decline 6% by 2020. The agricultural land base is expected to decline 1% by 1990 and 4% by 2020 based on expected non-agricultural land needs. The major part of this shift is expected in the Florida Subarea. Further reduction in the agricultural land base is expected due to the growth of large caving gullies. Failure to treat these gullies will cause a portion of the interdependent (upstream) areas of cropland to be converted to less productive uses. Economic conditions are expected to stimulate land use shifts including woodland clearing, to meet all production requirements for the next 50 years, except for wood products.

Soil erosion is expected to continue as a serious resource problem. Ongoing programs are expected to adequately protect 33% of the lands requiring erosion control practices by 1990 and 40% by 2020. Soil lost through erosion of cropland is estimated to exceed 9 tons per acre by 1990 and 11 tons by 2020. Erosion on 3.7 million acres of disturbed forest land in 1990 will average 14.6 tons per acre, and in 2020, erosion on 4.8 million acres will average 14.9 tons per acre. Natural erosion on forest land is negligible. Sediment yield is expected to increase at a rate relative to the rate of erosion.

Cropland subject to excess water hazard is expected to increase to 74,000 acres by 1990 and to 90,000 by 2020. Approximately 6 million acres subject to flooding by the 100-year flood will remain predominantly in woods.

Total water use for all purposes is expected to increase more than 3.5 times the present rate. Much of the water will be returned to groundwater or a stream system.

Fresh water fishing will continue to be one of the fastest growing recreational activities in the Basins. Hunting is expected to increase at a rate faster than population growth.

Approximately 120 plants and 65 animal species are expected to be on the "Endangered and Threatened Species" lists by 1990. Three rivers in the Florida Subarea are likely to be in the State Wild and Scenic Rivers System by 1990, and three additional systems by 2020. Wetlands will be adequately protected under state and federal authorities.

"Needs" as presented in Chapter II are those needs and desires of the public not expected to be satisfied in the future by ongoing programs and projects that are continued at their current rate of implementation (Tables 2-1 and 2-2). Generally, the needs were determined by estimating future requirements and desires, and then subtracting those quantities expected to be provided by ongoing public and private programs and projects. The present status of soil and water resources and public preferences were taken into account in estimating needs. Increasing demands placed on land resources will cause land use shifts to take place; this, in turn, will result in the increased use of marginal soils for agricultural production, which will, in turn, accelerate soil erosion. There is a continuing need to reduce soil erosion to improve the resource base and to improve water quality. According to data developed for the Basins, soil lost annually through erosion will increase 29 percent, or 17 million tons by the year 2020.

There are needs for enhancement and protection of wildlife habitat, wild and scenic rivers, threatened and endangered species, and wetlands and other critical habitat. Additional opportunities are also needed for fresh water fishing and water based recreation.

Two alternative plans were formulated on the basis of "NEEDS", as described in Chapter II. These alternatives are described in Chapter III. One alternative emphasizes economic development (ED), and the other emphasizes environmental quality (EQ). Plans were formulated to meet needs for each of the alternatives (Tables 3-5, -6, and -7). The beneficial and adverse effects of the elements of each alternative were evaluated and displayed and the effects are presented in monetary and/or descriptive terms by three accounts: Economic Development, Environmental Quality, and Social Well-Being. An element may accrue effects to more than one account.

The EQ objective is to enhance environmental quality by the conservation, preservation, and restoration of the quality of certain natural and cultural resources, and ecological systems. The EQ elements were selected on this basis. The objective of the ED alternative is to increase the value of the nation's output of goods and services to improve economic development, and to meet existing and projected demands for agricultural and forest products.

The Recommended Plan is set forth in Chapter IV. Selection of the elements was guided by what appears to be a reasonable and rational perception of priorities and preferences of people living in the study area, their representatives, and the USDA study team. Due consideration was given to the beneficial and adverse effects of elements.

The recommended actions whose implementation would currently be subject to the respective states' permitting processes on a site specific basis will continue to need the proper permits before any construction can begin.

For the Florida Subarea, the land treatment elements in the Recommended Plan are the same as in the EQ Alternative Plan. Eighty percent of the cropland on the five most highly erosive soil resource groups (SRG's) will be converted to less intensive uses such as pasture or trees by 1990 and 95 percent will be converted by 2020. Emphasis is placed on rotations, crop residue, and minimum tillage to reduce soil erosion to a tolerable level.

In the Alabama Subarea, approximately 75 percent of the row crop acreage on highly erosive soils, which cannot be effectively treated to reduce erosion to acceptable levels, will be removed and replaced with less intensive uses such as pasture and trees. Treatment on those acres remaining in row crops includes, as the first increment, terraces, contour crop residue, and cover crops. Additional treatment needs are met through rotations, minimum tillage, or other methods.

Additional elements of the Recommended Plan are listed in Tables 4-4 and 4-5. The amount planned, installation costs, and remaining needs are displayed by time frames for each subarea. Beneficial and adverse effects of each element are displayed in three accounts for each subarea (Tables 4-6 through 4-14).

Opportunities to implement the 1990 portion of the Recommended Plan are covered in Chapter V. Elements may be installed through a variety of federal, state, and local programs. Implementation of individual plan elements depend, to a great extent, on the interest, leadership, and financial ability of the local people. Preparation of detailed and site specific plans with detailed cost estimates will be necessary prior to implementation of project type elements. Some rearranging of USDA program priorities, funding and manpower, will be needed.

Portions of the erosion and sediment control element can be implemented under the following programs: Conservation Operations (CO), Rural Clean Water Program (RCWP), the Small Watershed Program (PL-566), and the Agricultural Conservation Program (ACP). The primary objective of the RCWP is to improve water quality; however, this objective will be achieved primarily by preventing soil erosion.

Reforestation programs can be carried out under existing USDA cooperative forestry programs directed by the state foresters of Alabama and Florida.

NORTHEAST GULF RIVER BASINS
VOLUME II

TABLE OF CONTENTS

TABLES (Cont.) Page

TABLES (Continued)

CHAPTER I. FUTURE CONDITIONS WITHOUT ACCELERATED DEVELOPMENT

Water and land resource use and environmental, economic, and social conditions continue to change with time. The expected future setting with ongoing natural resource development programs is established as a basis for determining needs, formulating plans and comparing alternatives. The future condition without accelerated development focuses on two future dates, 1990 and 2020, and is specifically defined as a continuation of the ongoing programs at current levels, plus any development presently funded and underway. New federally assisted or private group type projects and programs or acceleration of ongoing programs are not included in this projected setting. Ongoing programs are summarized in Chapter VI of Volume I.

Projections of ongoing programs are presented in Chapter V, Volume I. These projections are compatible with the OBERS[1/] Series C national projections framework and assumptions. Some significant changes have developed recently in population trends and agricultural production in the study area and in agricultural exports nationally. Agriculture is the only sector in which the changes are expected to have a significant impact upon resource development needs[2/]. To keep the report current, new agricultural projections were developed and are presented in this chapter. The projections for the Basin economy in general were not modified and the information in Volume I, except for agriculture, is a basis for developing alternative plans.

Assumptions

General - The projection of any future setting is a conditional forecast based upon general and specific assumptions. In general, past trends have been evaluated and extended into the future. No major wars, environmental disasters, or critical energy shortages are considered; however, adjustments to conserve energy and control pollution and environmental degradation are expected and will cause changes in the industrial mix of output. Further, is is assumed that reasonably full employment and technological progress will support continued economic growth in aggregate and per capita statistics.

1/ The OBERS Reports are a series of publications on historical and projected regional activity based upon alternate national population and agricultural export assumptions. They were prepared by the Office of Business Economics and the Economic Research Service for the Water Resources Council.

2/ Completion of the study in a timely manner precluded serious consideration of making a complete change to the Series E projections.

Agricultural Setting - Many of the present trends in agriculture are expected to continue for the next 15 to 20 years. Farm operations are expected to continue to grow in size and become more capital intensive. Cost reducing and yield increasing technologies are expected to continue to make an impact on agriculture, but at a declining rate. Some deterioration of the resource base will continue, but the overall negative impact on yields will not be sufficient to counteract the positive technological impact. A market economy is expected to continue to be the dominant force in price determination for agricultural input and output. As in the general economy, energy costs and environmental concerns will definitely have an impact on resource organization in the production process. Some additional assumptions are:

1. The amount of agricultural land will decrease due to an increase in non-agricultural uses.

2. Economic conditions will continue to be a primary force in determining production and land use.

3. Minor crops will continue to hold their present relative importance in terms of land use.

4. Minimum tillage and double cropping will be used on more acreage in the future.

5. Some cropland will be converted to pasture as gully erosion continues.

6. Additional woodland clearing will take place.

7. Beef production will continue to be a cow-calf operation.

8. Most commercial forest land now classed as non-stocked or poorly stocked and with a growth capacity of at least 65 cubic feet per acre per year will be reforested.

9. There will be major improvements in wood utilization and a reduction in timber mortality.

Agricultural Production

A linear programming model was used to define combinations of economically efficient land use patterns under alternative sets of assumptions about supply and demand for agricultural products. Future production practices, resource problems, land use shifts, yields, rate of adoption of new technology, and potential for farmers to adjust to changing conditions are all factors relating to the supply of agricultural products. Explicit or implicit assumptions about these factors are inherent in the analysis.

On the demand side, assumptions about domestic population, per capita use rates, comparative advantage, and export demand are incorporated into the analysis. The model is very useful as an aid in evaluating the impacts of resource development in a study area. Comparison of future conditions with and without accelerated resource developments can be accomplished by holding all factors not affected by the plan constant. Production potential with alternative levels of development can also be examined.

The projections reflect what is expected to take place with ongoing programs and are based upon specific assumptions. Among the more important assumptions are yields which are projected to increase approximately 30 percent by 1990 and 75 percent by 2020, primarily due to expected technological development and wider application of this technology. Efficiency gains through land use shifts are expected, but institutional factors, tradition, and other non-economic effects, implicity included in the model through acreage constraints, are assumed to limit these changes.

National and regional production are expected to respond to domestic needs for our growing population and to a gradual growth in agricultural exports. Several different production scenarios, including, but not limited to OBERS, were analyzed as aids in selecting the future without development situation. This was an interactive process with no specific number of alternatives being specified for consideration before a future without development situation was established. The two state subareas were examined independently and the number of scenarios examined was based on the needs of each independent evaluation.

In Alabama, the projected trends in OBERS are not as consistent with recent historical trends as in Florida. A state technical committee of SCS personnel defined an alternate set of state and subarea land use projections which they felt were more appropriate. Several alternative future conditions were projected ranging from OBERS "C" to production levels much more compatible with the technical committee's perspective of future land use. After examining all of the information developed, the technical committee's future land use projections were selected as representative of future conditions. Linear programming was used only as an accounting tool to simulate expected production, given these acreages at the state and subarea level, (Tables 1-1 and 1-2). The differences between the production level selected and OBERS E' are summarized in Table 1-3.

In Florida, a state model was not developed but several different future conditions at the subarea level were analyzed. The future selected for the Florida Subarea is very compatible with the OBERS state level projections.

Table 1-1. Agricultural and Timber Production Without Accelerated Development, Alabama and Florida (state totals) 1972 and Projected to 1990 and 2020.

Commodity	Units	State of Alabama			State of Florida		
		1972	1990	2020	1972	1990	2020
		1000					
Crop							
Corn	bu.	26160	49000	74000	14122	25000	36200
Cotton	bales	567	412	446	14	6	4
Soybeans	bu.	16000	38000	48000	4872	13200	22400
Peanuts	cwts.	3684	5362	8156	1377	1841	2697
Tobacco	cwts.	926	-	-	23424	340	450
Wheat	bu.	2200	4050	6650	630	2000	2800
Vegetables	cwts.	1978	-	-	47244	4630	55600
Hay	tons	814	1300	1900	311	452	688
Livestock							
Beef & Veal	lbs.	616585	1072000	1588000	473580	800000	1000000
Pork	lbs.	330715	307036	353320	91310	78875	6789
Broilers	lbs.	1437386	2425206	3598721	209624	64300	42500
Eggs	doz.	237667	345938	491183	236667	315066	455892
Milk	lbs.	820000	456500	226000	1843000	2189850	2988300
Timber							
Sawlogs, Veneer, etc.	cu.ft.	335000	425000	560000	145000	185000	240000
Pulpwood	cu.ft.	383000	615000	1170000	247000	370000	710000

Source: Statistical Reporting Service, USDA (1972 Crop and Livestock data); U. S. Forest Service (Timber)

Table 1-2. Agricultural and Timber Production Without Accelerated Development by Subarea, 1972 and Projected to 1990 and 2020

Item	Units	1972	1990	2020
		---------------1000---------------		
Florida Subarea				
Corn	bu.	13350	25000	33700
Cotton	bales	13	6	4
Peanuts	cwt.	1202	1712	2509
Soybeans	bu.	4628	12700	22000
Wheat	bu.	820	2000	2800
Tobacco	cwt.	258	333	450
Vegetables	cwt.	1822	3240	3900
Hay	tons	97	140	213
Pasture	AUM's	2334	3017	3300
Forest Products	cu.ft.	173371	252450	393360
Alabama Subarea				
Corn	bu.	9501	23238	34106
Cotton	bales	35	12	15
Peanuts	cwt.	3296	5213	8408
Soybeans	bu.	3058	6244	7600
Wheat	bu.	721	1061	1531
Hay	tons	148	263	331
Pasture	AUM's	2713	3978	5491
Forest products	cu.ft.	138754	197654	296148

Table 1-3. Comparison of Agricultural Production Projections Without Accelerated Development and OBERS E' Projections, State of Alabama, 1990 and 2020.

Commodity	Unit	OBERS E'		W/O Development		Difference	
		1990	2020	1990	2020	1990	2020
		---------------1000-------------				Percent Change	
Corn	bu.	32763	50373	49000	74000	+50	+47
Cotton	bales	290	167	412	446	+42	+167
Soybeans	bu.	38462	61130	38000	48000	-1	-21
Peanuts	cwt.	5306	6460	5362	8156	+1	+26
Wheat	bu.	4406	6502	4050	6650	-8	+2
Hay	tons	769	868	1300	1900	+69	+119
Beef & Veal	lbs.	1051698	1539335	1072000	1588000	+2	+3

The major crops included in the linear programming models account for over 90 percent of the cropland harvested in 1972. Information required for the analysis included yields, current detailed land use, expected production, and present and future production costs. Commodity specialists at agricultural colleges and within USDA were consulted in developing the data.

In both subareas, production of all crops except cotton and tobacco are expected to more than double by 2020. Corn production in Alabama is expected to approximately triple the base year production and the Florida Subarea soybean production is projected to be four times the base year level. Yield increases are expected to account for a large part of this growth. However, additional acres, especially of corn and soybeans, will be necessary to reach the projected levels of production.

Production of beef, broilers, and eggs is expected to increase substantially in the Basins with minor changes realized in pork and milk. Beef and dairy enterprises require substantial acreages for grazing to support production of these commodities, and some increase in pasture, especially in the Alabama Subarea, is expected.

Agricultural production, yields, and land use for future time periods are basic factors in analyzing agricultural resource development needs. A related factor--cost of production--is used to define resource development potential from an efficiency standpoint. Given the basic identity that acres harvested times yields per acre equals gross production, then the amount of resource development to meet food and fiber requirements may have one of two components: first, the resources available without accelerated development may be inadequate to meet desired food and fiber production requirements in an absolute sense; second, the food and fiber requirements may be met but at a cost substantially above desired or potential levels, and erosion rates will be higher than at the present time.

In the Northeast Gulf, the cropland base is inadequate if no land use shifts from woodland to crops or pasture occur. It was assumed that the necessary clearing would take place and projected production of all crops except wood products would be met. The use of additional lands to meet this production level is expected, however, the related increase in erosion rates will deplete the land resource base and result in higher agricultural production costs.

Forest Production

Wood volume produced annually in the Basins is determined by three major factors: inherent growth capacity of forest land, amount (acres) of land in forest vegetation, and level of stocking of forest land. All volumes given in this and succeeding chapters are products of these factors. (Table 1-4).

Table 1-4. Capacity of Timber Resource to Meet Projected Demands for Wood Products - 1990 and 2020[1/] - Northeast Gulf River Basins

	1990	2020
	------(1000 cubic feet)-------	
Alabama Subarea		
Net Annual Growth	286,455	321,900
Volume Cut[2/]	214,841	321,900
Volume Converted to Products[3/]	197,654	296,148
OBERS Demand	211,920	325,864
Florida Subarea		
Net Annual Growth	420,750	491,700
Volume Cut[2/]	315,562	491,700
Volume Converted to Products[3/]	252,450	393,360
OBERS Demand	237,250	500,640

1/ Data from: Southern and Southeastern Forest Experiment Stations; OBERS Projections, Water Resources Council, Series E; and Area Planning, Southeastern Area, State & Private Forestry.

2/ Timber removed during logging and land clearing operations

3/ The difference between Volume Cut and Volume Converted is volume lost as logging residue, in cultural operations, and in land clearing.

Current net annual growth for the Alabama Subarea is 54 cubic feet per acre. With continued protection and management of these timber stands the growth rates can reach 65 cubic feet by 1990 and 75 cubic feet by 2020. In the Florida Subarea, the current net annual growth is 33 cubic feet; increases to 45 cubic feet in 1990 and 55 cubic feet in 2020 can be realized with similar protection and management.

Commercial forest land will gradually decline through 2020 (Table 1-5). This acreage loss in forest land will affect the Basin's capacity to expand its total wood fiber production. There are, however, other factors which will mitigate the effects of acreage decline.

The Basin's average net annual growth rate is expected to increase through 2020 principally because of continued reforestation efforts that improve stocking conditions within forest stands. Also, improvements in logging practices will be implemented to recover wood volume now lost as logging residues. The effects of these factors will spread out the eventual impact of restricted wood production capacity. Logging residues in the Alabama Subarea account for 5 percent of the total volume removed from growing stock volume in the subarea; residues in the Florida Subarea amount to 7 percent of total removals (Figures 1-1 and 1-2).

Land Use

Historically, the shift from agricultural use of land to non-agricultural use has paralleled population growth. Agricultural land availability was projected to continue declining based upon expected non-agricultural land needs. Population densities for the urban and built-up areas in the Basins presently range from four or more persons per acre in large growing metropolitan areas to less than one person per acre in small towns. Most of the population growth is expected to occur in the metropolitan areas, thereby increasing the density of urban population. More acreage will be needed especially for the expansion of the larger cities. Construction of reservoirs and dredge and fill operations can make minor modifications in the land base, but the land resource of the Basins is essentially finite. Strong competition from the non-agricultural sector will draw some of this resource away from agriculture as population continues to grow.

Land needed for recreation and environmentally important land such as marshes and swamps, place added demands on the land base. These recreational and environmental considerations carried out by state and federal agencies generally do not involve prime agricultural land, but do reduce land available for other uses.

The agricultural land base was reduced on the basis of projected growth of urban population to account for the above competing uses. The agricultural base was reduced by three quarters of an acre per capita increase in urban population. This amounts to a 1 percent decline in the Basin's agricultural land base by 1990 and a 4 percent decline by 2020. The major part of the shift is expected in the Florida Subarea.

The agricultural land base was further reduced by the expected loss of agricultural use in areas surrounding large gullies in the Alabama Subarea. Failure to treat these gullies will cause a portion of the nearby areas of cropland to be converted to less productive uses. This soil resource condition was considered in making projected estimates of land available for agricultural production. Cropland is expected to increase slightly, but all other major agricultural categories are projected to decline in the Northeast Gulf Basins (Table 1-5). The only deviation from that trend at the subarea level is for a slight increase in pasture acreage in the Alabama Subarea.

Much of the pasture acreage was under-utilized in 1972, but the substantial increase taking place in the beef industry is reducing this reserve. Additional pasture acreage is expected to be needed in the Alabama Subarea by 2020. There is opportunity to grow forages in the forests. However, tract size and fencing costs make this impractical for most landowners. In the Florida Subarea, pasture yields are projected to increase as livestock production needs increase. Minor changes in pasture acreage are expected. The aggregate acreage of cropland pasture plus permanent pasture, however, is expected to increase slightly in both subareas.

The number of acres needed to sustain the beef industry is very sensitive to the level of technology and management applied. If future wood product prices were to increase substantially relative to beef, some of the pasture acreage would be expected to shift to forest use. Such a shift is not anticipated, however, and limited conversion to forest acreage is expected.

During the next 50 years a gradual decline in forest acreage is anticipated. Forest land acreage for the past 30 years has fluctuated up and down, but the long-term trend is downward. Urban growth and agricultural needs are the major reasons for the downward trend. Between 1972 and 2020 forest land is expected to decline 6 percent.

Acreage currently in forest cover is adequate to meet present needs for wood fiber, forage, recreation, wildlife habitat, and watershed protection. However, if the price of wood products remains constant relative to the price of other goods and services, problems will be encountered in meeting future demands for wood fiber. The other forest resources, although not expected to be in short supply, will be available only under controlled use.

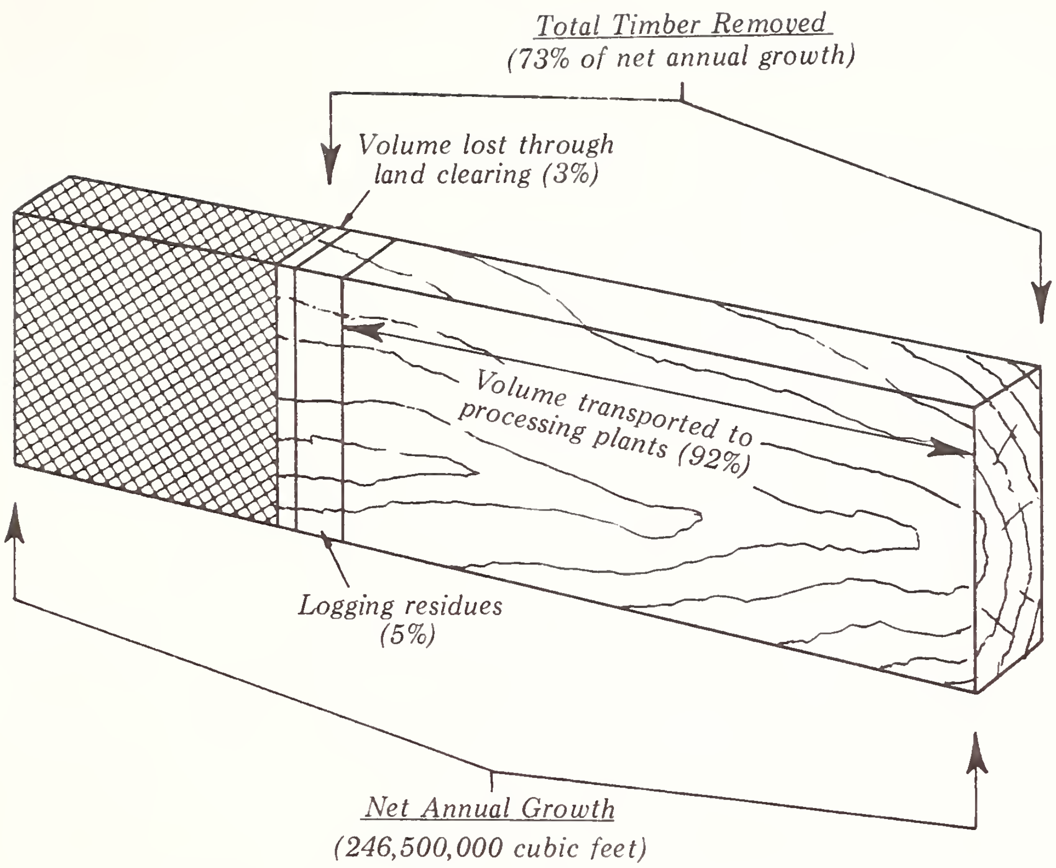


Figure 1-1. Wood Volume Utilized - Alabama Subarea, 1972

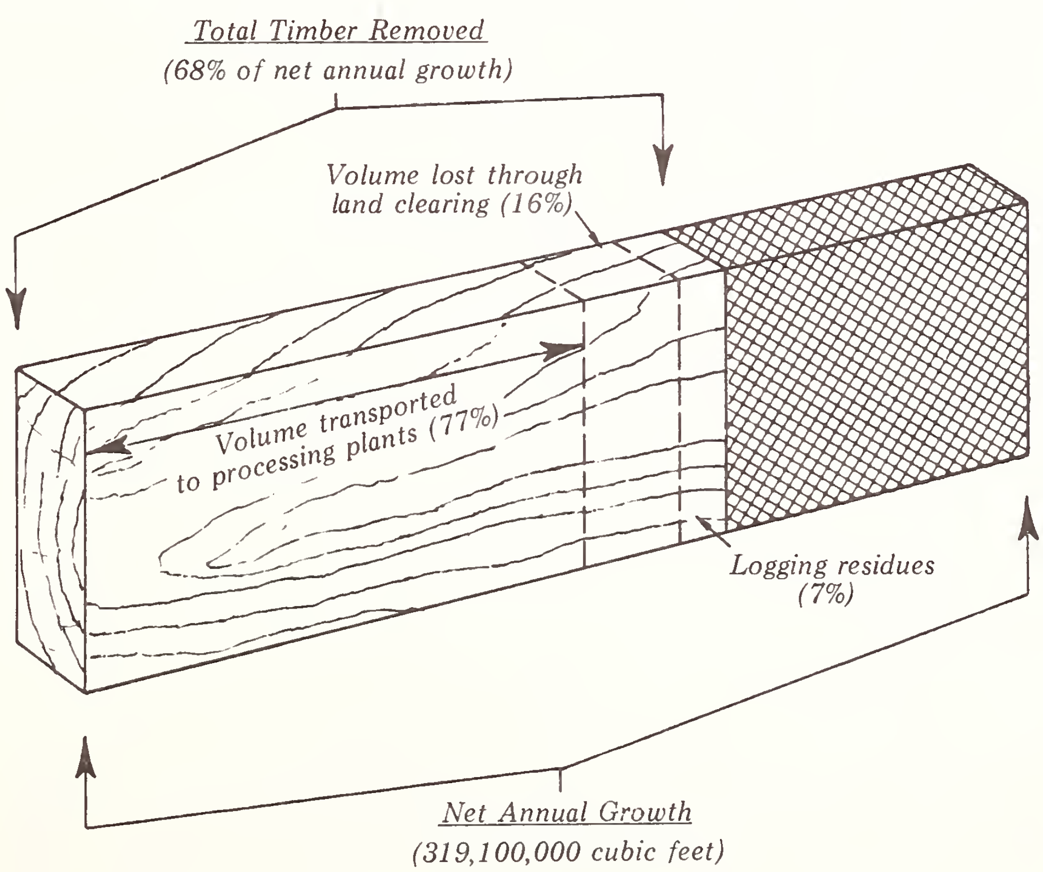


Figure 1-2. Wood Volume Utilized, Florida Subarea, 1970

Table 1-5. Land Use, Present and Future Without Accelerated Development, Northeast Gulf River Basins and State Subareas, 1972, 1990 and 2020.

Land Use	Alabama Subarea 1972	Alabama Subarea 1990	Alabama Subarea 2020	Florida Subarea 1972	Florida Subarea 1990	Florida Subarea 2020	Northeast Gulf River Basins 1972	Northeast Gulf River Basins 1990	Northeast Gulf River Basins 2020
	1000 acres								
Cropland 1/	1510	1654	1706	1379	1560	1660	2889	3214	3366
Corn	271	423	440	310	408	433	581	831	873
Cotton	37	14	12	11	5	3	48	19	15
Soybeans	146	299	317	241	534	727	387	833	1044
Peanuts	193	210	215	51	58	71	244	268	286
Wheat	29	34	41	32	58	82	61	92	123
Hay	70	113	108	47	49	71	117	162	179
Minor Crops	72	65	68	48	69	85	120	134	153
Pasture	408	390	403	372	330	320	780	720	723
Idle	300	157	162	280	148	118	580	305	280
Pasture	674	611	633	627	545	500	1301	1156	1133
Forest	4484	4407	4292	9613	9350	8940	14097	13757	13232
Miscellaneous	150	106	104	229	203	170	379	309	274
Agricultural Land	6818	6778	6735	11848	11658	11270	18666	18436	18005
Non-Agricultural Land	234	274	317	333	523	911	567	797	1228
Total Land Area	7052	7052	7052	12181	12181	12181	19233	19233	19233

1/ Crops do not sum up to total because of double cropping. Assumed 5 percent of tilled land double cropped in 1990 and 6 percent in 2020 in Alabama Subarea and 9 & 18 percent in Florida Subarea

The acreages of all major crops except cotton are projected to increase. The major increase in the Basins is for soybeans with the expected acreage increasing to over 2.5 times the 1972 level. Corn occupied the greatest acreage in 1972 and this acreage is expected to increase 50 percent by 2020. Acreages of both corn and soybeans are expected to increase in both subareas with growth in soybean acreage slightly favoring the Florida Subarea and corn the Alabama Subarea.

The distinction between pasture included in the cropland category and that included in the pasture category is somewhat arbitrary. Some, but not all, cropland pasture acreage is included in a rotation with other crops to minimize soil loss and maintain soil fertility. Approximately 775,000 acres of cropland were pastured in 1972. Without additional emphasis for pasture rotations on erosive soils, these acres are projected to decline to approximately 700,000. This figure would probably increase rather than decline if there were more pasture included in crop rotations.

The analysis of the Northeast Gulf River Basins' resources and desired future production levels suggests that at some time prior to 2020, some of the indicated needs for food and fiber will not be met. The deficits are expected to prevail primarily in the wood products area. Economic conditions will stimulate land use shifts (including woodland clearing) to meet the needs for crop and livestock production.

Additional land resources will be put into production by 1990 and per unit costs of production are expected to increase as more land resources are used. The immediate need related to food and fiber production is to improve efficiency to counteract the expected increases in costs per unit. Only in the more distant time frames does it appear that resource development can be based upon actual production deficits.

Emerging energy and environmental problems cast considerable uncertainty upon future input prices and uses. Fertilizers and chemicals may become relatively more expensive than they are now, and pollution abatement standards may become more stringent than has been assumed in this analysis. The capability of the resources to produce at the level projected and the economic efficiencies resulting from natural resource development are very much related to how these problems are resolved.

Soil Loss

Soil erosion is considered to be the most serious resource problem in the Basins. Most of the total soil loss is due to sheet and rill erosion originating on cropland. There are, however, many critical areas that are sources of extremely large amounts of soil losses over relatively small areas. These areas include gullies, roadsides, construction sites, and strip mines.

Total soil loss due to erosion in the Basins at the present time is estimated to be 59,464,000 tons annually; 41,290,000 tons of this being from sheet and rill, 11,074,000 tons from gullies, 3,400,000 from roadsides, and 3,700,000 from strip mines (Table 1-6).

Alabama SCS staff specialists compared the level of land treatment measures currently installed to that of the 1967 Conservation Needs Inventory. This comparison served as a basis for estimating the rate of application of these measures. From this analysis it was estimated that ongoing conservation programs are now adequately protecting 30 percent of the lands requiring erosion control practices and will be protecting 33 percent by 1990 and 40 percent by 2020. Erosion damage may be expressed in numbers of acres that are eroding at excessive rates or in tons of erosion. Either expression is based on the concept that each soil has a tolerance ("T") for a certain erosion level and erosion in excess of that tolerance will deplete the resource base. Areas that are eroding at rates of "T" or less can sustain crop yields and, conversely, areas that are eroding at rates in excess of "T" should be used differently or protected to reduce erosion and restore or maintain the resource base.

Erosion on cropland is estimated to average almost 9 tons per acre at the present time, increasing to over 9 tons in 1990 and to 11 tons by 2020. This change is due to the use or more erosive soils as cropland acres increase and as land use shifts take place. Pastureland erosion is expected to decrease slightly from the present rate of about one ton per acre as the percentage of improved pasture increases. Total sheet and rill erosion is expected to increase in both state subareas and in all subbasins (Tables 1-6, 1-7, and 1-8), under future conditions without accelerated treatment programs. Natural erosion on forest land is negligible. Disturbance during harvesting and planting practices are responsible for all forest land erosion shown in the tables.

Critical area erosion is occurring on approximately 119,000 acres in the Basins - 95,000 in the Alabama Subarea and 24,000 in the Florida Subarea, causing the annual soil loss of 15,358,000 and 2,816,000 tons, respectively. The majority of this erosion in Florida occurs in an area along the north portion of the subarea, just south of the state line. The problem area is rather widespread in the Alabama Subarea, and is especially severe in the Choctawhatchee and south half of the Chattahoochee sub-basins.

Critical areas include gullies, roadsides, and strip-mined areas which are eroded to the extent that they are producing excessive runoff and sediment which cause adverse offsite or downstream effects. The active gullies advance headward, developing side "fingers" as they progress. Large volumes of soil are lost due to caving as the gullies eat into soils which are underlain by unstable sands. Damaged in the process are fences, roads, buildings, and other fixed improvements, in addition to the voiding or depreciation of the land resource. There are additional areas upstream from, or in the watershed of, the gullies that are adversely affected and on which normal agricultural activities are hampered. This is due to the interference caused by gullies as they cut channels across the land. The farmer must decide whether he should reclaim the gully for use as a stable outlet for runoff water or reduce the intensity of land use from crops to pasture or woods.

Table 1-6. Erosion - Present and Future Without Accelerated Development, Northeast Gulf RB - Total Basin

		Present			1990			2020		
		Total	Protected	Not Protected	Total	Protected	Not Protected	Total	Protected	Not Protected
		(1000)								
SHEET & RILL										
Cropland	Ac.	2889	866	2023	3179	1053	2126	3330	1332	1998
	Tons	25381	3464	21917	29600	4208	25392	36770	5328	31442
Pasture	Ac.	1301	391	910	1208	400	808	1217	487	730
	Tons	1422	194	1228	1147	201	946	987	246	741
Forest land 1/	Ac.	14097	13710	387	13757	13501	256	13186	12859	327
	Tons	7542	501	7041	4772	1030	3742	5055	179	4876
Miscellaneous	Ac.	379	114	265	292	97	195	272	108	164
	Tons	2976	456	2520	2246	388	1858	2438	432	2006
Non-Agricultural	Ac.	567	172	395	797	263	534	1228	491	737
	Tons	3969	516	3453	4782	789	3993	6140	1473	4667
Subtotal	Ac.	19233	15253	3980	19233	15314	3919	19233	15277	3956
	Tons	41290	5131	36159	42547	6616	35931	51390	7658	43732
CRITICAL AREA										
Gully	Ac.	48		48	55		55	68		68
	Tons	11074		11074	13414		13414	18408		18408
Roadside	Ac.	34		34	34		34	34		34
	Tons	3400		3400	3400		3400	3400		3400
Stripmine	Ac.	37		37	37	5	32	37	5	32
	Tons	3700		3700	3225	25	3200	3225	25	3200
Subtotal	Ac.	119		119	126	5	121	139	5	134
	Tons	18174		18174	20039	25	20014	25033	25	25008
TOTAL	Tons	59464	5131	54333	62586	6641	55945	76423	7683	68740

1/ All forest land erosion is due to disturbance by forestry practices

Table 1-7. Erosion - Present and Future Without Accelerated Development, Northeast Gulf RB - Alabama Subarea

		Present			1990			2020		
		Total	Protected	Not Protected	Total	Protected	Not Protected	Total	Protected	Not Protected
		(1000)								
SHEET & RILL										
Cropland	Ac.	1510	453	1057	1619	538	1081	1670	668	1002
	Tons	14598	1812	12786	15496	2148	13348	15995	2672	13323
Pasture	Ac.	674	202	472	663	220	443	717	287	430
	Tons	512	100	412	442	110	332	411	145	266
Forest land 1/	Ac.	4484	4361	123	4407	4334	73	4246	4086	160
	Tons	3580	234	3346	2616	307	2309	3758	123	3635
Miscellaneous	Ac.	150	45	105	89	30	59	102	40	62
	Tons	1373	180	1193	825	120	705	908	160	748
Non-Agricultural	Ac.	234	71	163	274	91	183	317	127	190
	Tons	1638	213	1425	1644	273	1371	1585	381	1204
Subtotal	Ac.	7052	5132	1920	7052	5213	1839	7052	5208	1844
	Tons	21701	2539	19162	21023	2958	18065	22657	3481	19176
CRITICAL AREA										
Gully	Ac.	46		46	52		52	64		64
	Tons	10458		10458	12681		12681	17424		17424
Roadside	Ac.	32		32	32		32	32		32
	Tons	3200		3200	3200		3200	3200		3200
Stripmine	Ac.	17		17	17	3	14	17	3	14
	Tons	1700		1700	1415	15	1400	1415	15	1400
Subtotal	Ac.	95		95	101	3	98	113	3	110
	Tons	15358		15358	17296	15	17281	22039	15	22024
TOTAL	Tons	37059	2539	34520	38319	2973	35346	44696	3496	41200

1/ All forest land erosion is due to disturbance by forestry practices

Table 1-8. Erosion - Present and Future Without Accelerated Development, Northeast Gulf RB - Florida Subarea

		Present			1990			2020		
		Total	Protected	Not Protected	Total	Protected	Not Protected	Total	Protected	Not Protected
		(1000)								
SHEET & RILL										
Cropland	Ac.	1379	413	966	1560	515	1045	1660	664	996
	Tons	10783	1652	9131	14104	2060	12044	20775	2656	18119
Pasture	Ac.	627	189	438	545	180	365	500	200	300
	Tons	910	94	816	705	91	614	576	101	475
Forest land 1/	Ac.	9613	9349	264	9350	9167	183	8940	8773	167
	Tons	3962	267	3695	2156	723	1433	1297	56	1241
Miscellaneous	Ac.	229	69	160	203	67	136	170	68	102
	Tons	1603	276	1327	1421	268	1153	1530	272	1258
Non-Agricultural	Ac.	333	101	232	523	172	351	911	364	547
	Tons	2331	303	2028	3138	516	2622	4555	1092	3463
Subtotal	Ac.	12181	10121	2060	12181	10101	2080	12181	10069	2112
	Tons	19589	2592	16997	21524	3658	17866	28733	4177	24556
CRITICAL AREA										
Gully	Ac.	2		2	3		3	4		4
	Tons	616		616	733		733	984		984
Roadside	Ac.	2		2	2		2	2		2
	Tons	200		200	200		200	200		200
Stripmine	Ac.	20		20	20	2	18	20	2	18
	Tons	2000		2000	1810	10	1800	1810	10	1800
Subtotal	Ac.	24		24	25	2	23	26	2	24
	Tons	2816		2816	2743	10	2733	2994	10	2984
TOTAL	Tons	22405	2592	19813	24267	3668	20599	31727	4187	27540

1/ All forest land erosion is due to disturbance by forestry practices

These areas are considered as interdependent areas since their use for crops depends on the gully for a water disposal area. Land lost to the gullies and land use changes necessitated by gully encroachment cause economic losses to the farmers. Projections indicate that by 2020, the acreage voided by gullies will increase by 20,000 acres, not including interdependent areas. There is little optimism that ongoing programs, at current funding levels, will have measurable effects on the critical area erosion problems, especially on gullies. Many of the gullies have exceeded the size for which individual landowners have the technical or financial abilities to solve. In addition, the relatively small short-run economic benefit to be derived from reclaiming a gullied area, and the small area voided compared to the total farm acreage, place gully control in a low priority in the minds of many landowners. Cost-share funds available for gully control are not adequate to make significant progress in reclaiming these areas, and in many cases the landowner's share of costs, though proportionately small, exceeds his ability to pay.

Hydrologic studies (see Appendix for Volume I, Northeast Gulf River Basin, page 79), made in the Basins on effects of forestry practices, point to soil losses because of surface disturbances. Erosion attributable to these practices amounts to 7.5 million tons annually. Logging roads and mechanical site preparation are two major causes of forest land erosion. State foresters of Florida and Alabama are aware of these problems and, along with the forest industry, have initiated action to reduce erosion. Modification of site preparation techniques and higher standards in logging road construction will correct the erosion problem. Table 1-9 displays the amount of erosion expected from logging and reforestation operations, by subclasses.

Sediment

Sediment is the product of erosion and is proportional to the amount of erosion from a watershed. This sediment load in streams is less than total erosion and varies as the erosion varies. Sediment yield to downstream areas is reduced by erosion control measures and by sediment trapping features such as vegetative strips, ponds, and reservoirs.

Stream sediment comes from two generalized erosion sources - sheet and rill erosion, and channel type erosion which includes gully, streambank, and roadside erosion. Sheet and rill erosion occurs on almost the entire land surface but is more serious on bare disturbed areas such as intensively cropped land. Only a small percentage of the soil from sheet and rill erosion enters the stream system and becomes sediment, whereas, a much larger proportion of channel erosion becomes sediment.

Table 1-9. Present and Future Erosion Without Accelerated Development From Forestry Practices, Northeast Gulf River Basins

Area	1972	1990	2020
	--------------	1000 tons	----------
Alabama Subarea			
Chattahoochee Subbasin	821	732	1133
Chipola Subbasin	90	56	82
Choctawhatchee Subbasin	809	528	736
Perdido-Escambia Subbasin	1860	1300	1807
Subtotal - Alabama Subarea 1/	3580	2616	3758
Florida Subarea			
St. Johns River W.M.D.	78	7	4
Suwannee River W.M.D.	1198	255	206
Northwest Florida W.M.D.	2686	1894	1087
Subtotal - Florida Subarea	3962	2156	1297
TOTAL - Northeast Gulf River Basins	7542	4772	5055

1/ Improved forestry technology in planting and harvesting activities is expected to reduce erosion losses by 1990. By 2020, however, the increase in these activities is expected to offset the favorable effect of this improved technology, resulting in an increase in erosion.

A greater part of the total sediment enters the streams in the headwaters and becomes proportionally smaller as the size of the drainage area increases. This is due to the steeper gradients and narrower flood plains in the headwaters. As the streams become larger, or gradients flatten and flood plains broaden, much of the sediment being carried by streams is deposited on the flood plains.

Sediment yield is expected to increase in the future in most areas due to the shift of row crops onto steeper, more erodable lands. Cropland is the largest contributor of sediment.

In the Alabama Subarea, the major streams transport about 5,211,000 tons of sediment annually out of the Basins (Table 1-10). A large part of the sediment transported to the Chattahoochee River is trapped in reservoirs and is not carried downstream to Florida streams and the Gulf of Mexico. Conecuh River, in the Perdido-Escambia Basin, also has major dams with reservoir trapping effects. Table 1-10 is not a complete accounting of sediment yield from the subarea, as small independent streams that carry sediment to Florida streams have their sediment yield tallied with those streams. Sediment trapped in reservoirs within Alabama is also not accounted for in the table. Sediment can be a major detractor of water quality but was not identified in the Basin study as a major concern. Erosion, the producer of sediment, is a very serious problem and erosion control measures, if installed, will produce a satisfactory reduction in sedimentation.

Sediment yields in the Florida Subarea include sediment coming from Alabama and Georgia. The yields are shown by water management districts in Table 1-11, at the mouths of streams, but not for intervening coastal areas. Sediment for the St. Johns River Water Management District was considered to be negligible due to the flat terrain and good vegetative cover, and was therefore, not computed.

Impaired Drainage

Crops and pasture that are on soils having an excess water hazard will not reach potential yields without proper water management. Cropland with an excess water hazard is projected to increase from 57,000 acres in 1972 to 74,000 by 1990 and to 90,000 by 2020 (Table 1-12). Pasture acreage having this hazard is expected to increase from 127,000 acres in 1972 to 187,000 in 1990 and then decrease to 172,000 by 2020.

These acreages represent a small portion of the total area which will be in crops and pasture. Approximately 2 percent of the total cropland projected for 1990 will have excess water hazard - about the same proportion as currently exists. Excess water will be a problem on 15 percent of the total pasture in 1990 - 20 percent in the Florida Subarea and 12 percent in the Alabama Subarea.

Table 1-10. Annual Sediment Yield, Present and Projected, for Major Streams at the Florida State Line or at the Stream Outlet, Alabama Subarea, Northeast Gulf River Basins

River Basin/Subbasin	1972	1990	2020
	----------1000 tons sediment----		
Chattahoochee 1/	541	501	647
Chipola	165	174	203
Choctawhatchee	3020	3362	4325
Perdido-Escambia			
Yellow River	259	313	365
Conecuh River	808	979	1086
Escambia River	146	175	194
Perdido River	98	118	132
Styx River	104	126	135
Blackwater River	70	85	92
Subtotal Perdido-Escambia	1485	1796	2004
TOTAL - Alabama Subarea	5211	5833	7179

1/ Only the sediment yield from the Alabama Subarea downstream from Columbia Lock and Dam is indicated, sediment trapped by upstream dams was deleted from yield. No attempt was made to account for sediment from the Georgia portion of the Basin. The decrease in sediment in 1990 is due to a decreased erosion rate resulting from land use changes in Chattahoochee subbasin.

Table 1-11. Annual Sediment Yield, Present and Projected, by Water Management Districts, Florida Subarea

Water Management District	1972	1990	2020
	--------1000 tons sediment--------		
Northwest Florida 1/	532	569	766
Suwannee River	250	237	315
TOTAL - Florida Subarea	782	806	1081

1/ Does not include the Apalachicola River as the majority of the watershed is outside the study area and the total sediment yield could not be estimated.

Table 1-12. Impaired Drainage of Cropland and Pasture, Without Accelerated Development, Northeast Gulf River Basins and State Subareas - 1972, 1990, and 2020

	1972	1990	2020
Alabama Subarea			
Cropland (1000 Acres)	25	30	29
Percent of total cropland	2	2	2
Pasture (1000 Acres)	63	78	70
Percent of total pasture	9	12	10
Florida Subarea			
Cropland (1000 Acres)	32	44	61
Percent of total cropland	2	3	4
Pasture (1000 Acres)	64	109	102
Percent of total pasture	10	20	20
Basins Total			
Cropland (1000 Acres)	57	74	90
Percent of total cropland	2	2	3
Pasture (1000 Acres)	127	187	172
Percent of total pasture	10	15	14

Some forested sites in the Basin can benefit from removal of excess water. Water management practiced on selected sites would reduce stress on tree growth and result in accelerated growth. This additional growth would yield from 34 to 74 cubic feet per acre per year above present growth.

Water management also permits construction of roads and trails essential to movement of mechanical equipment for fire control and general management. There are 100,000 acres in the Alabama Subarea and 650,000 acres in the Florida Subarea on which water management would be justified in terms of protection, accelerated growth, and general management. Ongoing programs are expected to meet these needs.

Some alteration may occur in wildlife habitat conditions when water management is practiced on wet forested sites. Management objectives, both for timber and wildlife, will determine the extent water management will be carried out.

Water Use

Water use in both the Florida and Alabama Subareas without accelerated development is projected to increase in almost all categories for both 1990 and 2020 (Tables 1-13, -14, -15). Self supplied domestic water is the only use that is expected to remain at approximately the same level in the future as it is at present. Many counties are expected to install countywide water systems in the future or systems that serve several communities. Some rural homes are expected to connect with county systems.

Irrigation in the Basins is expected to be applied to about 120,000 acres of crops by 1990, and to 245,000 acres by 2020 (Table 1-13). Approximately one-fifth of this is in the Alabama Subarea. Principal crops to be irrigated are corn, peanuts, soybeans, tobacco, and vegetables. All of these crops are assumed to have about the same irrigation requirement of nine inches per acre per year - the equivalent of 670 gallons per acre per day.

Table 1-13. Acres Irrigated, by Subarea and Basin Total, 1990 and 2020

	1990	2020
	----------Acres----------	
Alabama Subarea	22000	45000
Florida Subarea	98000	200000
Total	120000	245000

Table 1-14. Water Use, by Sub-Basins, Alabama Subarea*

	Municipal	County Self-Supplied	Industry Self-Supplied	Irrigation	Livestock	Catfish Farming	Total
	Million Gallons Per Day						
1990							
Chattahoochee	13.9	5.9	43.4	3.0	2.4	0.8	69.4
Chipola	1.8	0.6	0.2	1.3	0.6	0.1	4.6
Choctawhatchee	20.4	6.2	1.8	7.0	4.6	0.8	40.8
Perdido-Escambia	13.0	8.8	56.8	3.7	4.7	0.9	87.9
Total - 1990	49.1	21.5	102.2	15.0	12.3	2.6	202.7
2020							
Chattahoochee	24.9	5.5	49.0	6.9	4.0	-	90.3
Chipola	5.8	0.5	0.5	2.4	1.0	-	10.2
Choctawhatchee	40.5	6.2	1.7	13.1	7.6	-	69.1
Perdido-Escambia	25.1	9.4	68.8	8.2	9.0	-	120.5
Total - 2020	96.3	21.6	120.0	30.6	21.6	-	290.1

*Excluding Thermoelectric

Table 1-15. Water Use, by Water Management Districts, Florida Subarea*

	Municipal	County Self-Supplied	Industry Self-Supplied	Irrigation	Livestock	Total
	--------	--------	Million Gallons Per Day	--------	--------	--------
1990						
St. Johns River	6.9	3.0	57.9	0.1	1.8	69.7
Suwannee River	18.1	9.6	117.0	24.1	4.4	173.2
Northwest Florida	135.8	20.2	195.3	41.4	6.2	398.9
Total - 1990	160.8	32.8	370.2	65.6	12.4	641.8
2020						
St. Johns River	23.5	2.5	88.2	0.4	2.7	117.3
Suwannee River	45.0	8.0	183.5	48.8	6.3	291.6
Northwest Florida	287.4	18.0	280.8	84.0	6.9	677.1
Total - 2020	355.9	28.5	552.5	133.2	15.9	1086.0

*Excluding Thermoelectric

Thermoelectric power generation is the largest user of fresh water at present and is expected to increase at a faster rate than other uses. The demand for electrical energy increases at a rate of about 7 or 8 percent per year, but those needs should be met to the year 2020 by ongoing programs and plans. It is expected that more thermoelectric plants will be located along coastal areas where saltwater can be used for cooling.

The 2020 total water use for the Alabama and Florida Subareas is expected to increase to more than 3.5 times the present rate. The projected total use amounts to 5.9 inches of runoff from the entire Basins, or approximately one-third of the total average annual runoff. Much of this water is not consumed but is returned to groundwater or to streams where it can be used again. Without an extensive system of reservoirs, less than one-third of the total runoff can be used because much of this water moves off rather quickly after a storm and is, therefore, lost from use. There are areas where present water supplies will not be adequate to meet future needs without further development.

Flood Damages

Agriculture - Of the total 19.23 million acres of land in the Northeast Gulf Basins, 5.87 million acres are subject to flooding from the 100-year flood. Almost five million acres of this flood-prone area is in the Florida Subarea, including 1.34 million acres classified as coastal, 0.49 million acres riverine, and 3.14 million acres tributary. The total flood-prone area in the Alabama Subarea is 0.90 million acres, of which 0.70 million is classified as tributary, 0.19 million riverine, and 0.01 million coastal. (Tables 1 through 7 of the Appendix to Volume I of this report).

Flood-prone areas are predominantly in forest. Only two percent or 136,000 acres involve pasture, cropland, and urban areas. No major increases in crop and pasture acreages in the flood plains are occurring, nor are they expected through the year 2020. There is, however, considerable urban development taking place and this trend is expected to continue.

Ongoing programs are not expected to reduce appreciably the agricultural areas subject to flooding. At the present time, potential benefits from reducing flooding of agricultural areas are relatively low, due in part to the limited use that is being made of the flood-prone areas. Typical flood reduction measures such as channels, dikes, and dams, are generally too expensive where low damageable values are involved.

Urban and Built-Up Areas - There are 103 towns and communities in the Basins that are subject to some degree of flooding. The flood insurance program of the Federal Insurance Administration (FIA) under the U. S. Department of Housing and Urban Development (HUD)1/ is expected to reduce the financial losses to property owners either through zoning or through subsidized insurance rates. If an insured home located in the 100-year flood plain is destroyed or damaged more than 50 percent of its value, due to any cause, another structure built at the same location cannot be insured at the subsidized rate.

Communities that have been approved for the regular program of FIA must require that all new construction and substantial improvements within the 100-year flood line be elevated or floodproofed to that elevation. Eventually, with new construction protected from the largest storm expected once in 100 years (1 percent chance per year), urban flood problems will be greatly reduced. With the program fully implemented, flood damages will remain basically the same as at present until the year 2000 and then gradually will reduce as the older homes in the 100-year flood plain are phased out due to obsolescence. The major existing losses to urban property owners can be reduced by the FIA program. Through the zoning requirement of the same program, new urban flood problems should be prevented. The regular FIA program will not cover all communities until well into the 1980s. Until that time there will continue to be a need for other programs such as the Flood Hazard Study (FHS) of the SCS and the Flood Plain Information (FPI) of the Corps of Engineers. Needs for new programs to solve urban flood problems are not anticipated.

Energy

The productivity being projected in this chapter is critically dependent on the timely availability of energy in the form needed to mesh with the biological processes involved in agriculture.

Investment of energy in agricultural production is beneficial to the U. S. population. The agricultural system of this country was able to feed the entire Nation in 1976 and also export agricultural products with a value that in effect paid for 68 percent of the total energy imports.

About one-third of the energy used for agricultural production is for fertilizer. Animal manures are a good substitute, if available where needed, but the total amount of collectable animal manure is only a small fraction of that needed on cropland.

1/ Effective April 1, 1979, the FIA was transferred from HUD to the Federal Emergency Management Agency (FEMA)

Comparisons of energy expenditures as input for various enterprises and methods as related to output are informative, however, the over-riding factors are the economic cost of the inputs and the economic value of the output. Man desires food which is acceptable both in value and in taste. Energy is traded to meet the taste and palatability factor involved in selecting the foods we eat.

The U. S. food system accounts for a relatively small portion of the total energy used in the industrial, commercial, residential, and transportation segments of the economy (Figure 1-3). Only three percent of the total energy consumed in the United States is used for agricultural production. Three times as much energy is used to process, package, refrigerate, and transport food from the farm to the home as is used for production. Energy used for food preparation in the home is 1.7 times as great as that needed for production of the food. The small percentage of the national energy use that is devoted to agricultural production should not belie the importance of energy to agriculture. The projected changes in cropland acres in the Basins between the years 1972 and 2020 do not consider a critical energy shortage. The total energy use (Table 1-16) is based on the projected acres of cropland and the per acre energy use. Fossil fuels, electricity, and the energy invested in fertilizers and pesticides comprise the energy vector. The data (Table 1-16) includes all energy used directly on the farm for production purposes such as field operations, irrigation, crop drying, space heating, and farm business auto use, and the invested energy required to manufacture fertilizers and pesticides, including carrier solution. Other invested energy and solar energy used by plants is not included in the tabulated values.

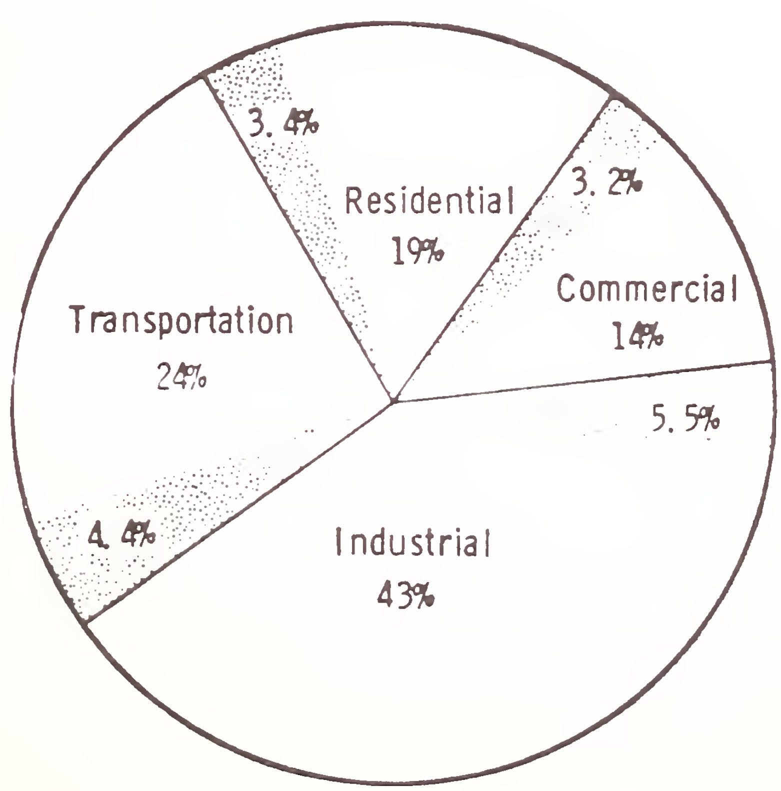


Figure 1-3 *Major categories of energy use in the United States. The shaded portion represents the energy consumption by the U.S. food system (Federal Energy Administration, 1975).*

Table 1-16. Present and Projected Energy Use by Crops, State Subareas

Subarea & Crop	Energy Use Per Acre 1/	Total Energy Use 1972	1990	2020
	--Million BTU--	----------Billion BTU-------		
Alabama				
Corn	5.355	1451	2271	2308
Cotton	10.355	383	135	124
Soybeans	2.894	422	868	897
Peanuts	7.242	1398	1521	1521
Wheat	4.001	116	132	160
Hay	3.040	213	340	322
Total		3983	5267	5332
Florida				
Corn	5.272	1634	2151	2283
Cotton	10.471	115	52	31
Peanuts	7.036	359	408	500
Soybeans	2.993	721	1598	2176
Wheat	3.798	122	220	311
Tobacco	62.467	812	875	1000
Vegetables	18.664	392	541	523
Hay	3.050	143	149	217
Total		4298	5994	7041

1/ Energy and U.S. Agriculture: 1974 Data Base, Volume 1, ERS, USDA

The use of energy is projected to increase between the years 1972 and 2020 by approximately 34 percent in the Alabama Subarea and 64 percent in the Florida Subarea based on energy uses relative to existing technology. Progress has been made in developing non-legumes with nitrogen fixing capabilities and, if successful, the energy used for producing nitrogen will be greatly reduced. Efforts are also being made to develop reduced tillage systems that are more profitable than conventional tillage when considering the soil, crops, pests, and weather involved.

These and other energy conserving technologies may be developed, but the limited supply of conventional energy sources and the interrelationship of all segments of our economy make it apparent that new energy sources are required.

Energy must be conserved and substitution must be made for increasingly scarce gas and oil. Gas and oil will have to be preserved for other uses for which no substitutes are available.

Solid Waste Management

The attention received by air and water pollution in recent years has given impetus to the abatement of land pollution. Public apathy in past years has resulted in a lack of planning and financing for adequate solid waste disposal practices. Solid waste includes garbage, rubbish, refuse, and other discarded solid or semi-solid materials resulting from domestic, industrial, commercial, agricultural, and governmental operations, but does not include solids or dissolved material in domestic sewage or other significant pollutants in water resources such as silt, dissolved, or suspended solids in industrial waste water effluent, dissolved materials in irrigation return flows, or other common water pollutants. Disposal sites for urban areas were not reserved in anticipation of growth. On the average, about 90 percent of the solid waste is disposed of on land and much of this is done in an unsatisfactory manner. Solid waste has been increasing with affluency and a growing population. Planning for solid waste must consider the permanent citizens as well as the visitors attracted to the area. The average rate at which solid waste is generated is expected to increase from approximately 5 pounds per person per day, experienced in 1970, to around 12 pounds per person per day by 1990. The actual rates may vary from place to place. A rural area that has little industry and light commercial activity may produce less than the average rates, or a city may have an urban development project that increases the demolition and miscellaneous waste. Composition of the solid waste will vary from one area to another as will the energy value per pound. The solid waste generated by today's society is only 10 to 15 percent actual garbage or putrescible material. The energy value is of particular consideration as the cost of fuel for stream generation continues to increase. Projections of solid waste based on past experiences are subject to change as economic pressures may affect the rate at which disposable products are produced and the value of solid waste for recovery.

Officials responsible for solid waste disposal have an increasingly difficult problem in purchasing or leasing new disposal sites. Land suitable for a disposal site quite often is being held for housing development and high costs are involved.

Public Law 94-580 "Resource Conservation and Recovery Act of 1976", was enacted to provide technical and financial assistance. Planning and implementation authorities to solve the waste management problem appear to be adequate.

Green and Open Space

The nature of green and open space precludes making an accurate inventory of quantity available or making an estimate of needs for a given population. Open space can have unlimited characteristics and serve many different purposes.

It is the judgement of the Basin study group that the Northeast Gulf River Basin has adequate amounts of green and open space and of the quality to meet acceptable standards set for society. Regional planning districts in northern Florida and southeastern Alabama should have no difficulty in planning for the needs of their constituencies and in locating areas to serve district needs.

Authority to plan for green and open space is already set up in current state and county laws. Funding is available, in limited amounts, to lease or purchase suitable areas. In some areas, federal lands, such as national forests and national wildlife refuges, already serve the needs of adjacent communities. No specific USDA program or project is recommended for either the Florida Subarea or the Alabama Subarea.

Water Based Recreation

Water based recreation usually consists of motor boating, canoeing, sailboating, water skiing, swimming, and fishing (Table 1-17). All of the activities except swimming require boat launching facilities. Florida has a surplus of boat ramps which will carry over beyond 2020. Alabama's boat ramp program is static. As new ramps are constructed, others go into a state of disrepair which will cause a shortage of ramps in the future.

Boating, which includes power boating, canoeing and sailing, requires large acreages of water; however, the demand is not so great that there will be a shortage in the near future. The Alabama portion of the basin is projected to have a surplus of boating waters through 2020, while Florida will develop a deficit by 2020. The supply in Alabama is primarily concentrated in two or three large reservoirs. This leaves localized shortages elsewhere. Water skiing also requires large areas of surface water for each occasion and usually appeals to the young. No shortages of fresh surface water will develop until after 1990. This shortage may be alleviated by some of the skiers utilizing the saltwater bays and the Gulf of Mexico.

Table 1-17. Recreation Supply, Future Without Accelerated Development, Northeast Gulf River Basins

Activity	Units	Florida 1974	Florida 1990	Florida 2020	Alabama 1974	Alabama 1990	Alabama 2020	TOTAL 1974	TOTAL 1990	TOTAL 2020
Fishing, Fresh-water	1000 Activity Occasions	10030	11015	11625	5400	6145	7640	15430	17160	19265
	Acres	167200	183585	193785	90000	102450	127350	257200	286035	321135
Swimming, Fresh-water	1000 Activity Occasions	4485	4485	4485	1530	1800	2700	6015	6285	7185
	Miles of Beach	2.1	2.1	2.1				2.1	2.1	2.1
	Acres Water & Beach				85	100	150	85	100	150
Picnicking	1000 Activity Occasions	5470	5585	5820	2075	2075	2075	7545	7660	7895
	Tables	3010	3010	3010	1920	1920	1920	4930	4930	4930
Camping	1000 Activity Occasions	9650	9650	9650	770	770	770	10420	10420	10420
	Campsites	9565	9565	9565	1710	1710	1710	11275	11275	11275
Boating, Fresh-water	1000 Activity Occasions	11520	11520	11520	4390	4390	4390	15910	15910	15910
	Acres	160000	160000	160000	61000	61000	61000	221000	221000	221000
Hunting	1000 Activity Occasions	5795	5795	5795	1165	1165	1165	6960	6960	6960
	Acres	2926000	2926000	2926000	980000	980000	980000	3906000	3906000	3906000
Skiing, Fresh-water	1000 Activity Occasions	5760	5760	5760	1160	1160	1160	6920	6920	6920
	Acres	128000	128000	128000	25770	25770	25770	153770	153770	153770

1/ Activity occasions are in terms of capacity of the facilities; Outdoor Recreation in Florida, and Alabama Statewide Comprehensive Outdoor Recreation Plan (SCORP)

Conversion Standards:

Fishing 60 AO/Ac.
Boating 72 AO/Ac.
Skiing 45 AO/Ac.

Alabama
Picnicking 1080 AO/Table
Swimming 18000 AO/Ac.
Hunting 1.1878 AO/Ac.
Camping 450 AO/Site

Florida
Picnicking 1800 AO/Table
Swimming 2 AO/ft. beach/day
Hunting 1.98 AO/Ac.
Camping 1000 AO/site

Fresh-water swimming, while not too important in Florida's coastal areas, is important to the inland residents of Alabama and Florida. This is an intensive use recreation activity with satisfaction derived from very small amounts of beach and water. Approximately 20,000 activity occasions can be accommodated by one acre of beach and water. Although shortages may develop for 1990 and 2020, this can be corrected very easily considering the shoreline and water surface available within the Northeast Gulf River Basins.

Because of the methods of gathering and working with the data available, it is very difficult to identify each area having a localized shortage of fresh water for recreational purposes. In determining local deficits, the distance the public is willing to travel to indulge in each sport should be considered. Whatever may be a feasible distance today may not be in the future if the costs of transportation rise to a level where the population is unwilling or unable to spend the money for recreational travel.

Fresh-Water Fishing - Fresh-water fishing is one of the fastest growing recreational activities in the Basins. Should this trend continue it will be difficult to accommodate the number of people desiring to fish. Large impoundments are not likely to be constructed in the future unless severe water or power shortages develop. Improved lake and river access will help many more fishermen but increased access alone will not compensate for the increased fishing demand. Approximately 500 farm ponds consisting of 1,200 acres are being built each year, and this appears to be the only way that fishing waters can be increased. There are about 30,000 acres of farm ponds in the Alabama Subarea and 7,200 acres in the Florida Subarea (1976). This ratio will remain about the same in the future. Using the standard of 60 fishing occasions per acre of water as developed in the Alabama Statewide Comprehensive Outdoor Recreation Plan, the farm ponds could provide approximately 2,170,000 fishing activities each year. At the present rate of construction, there will be about 54,000 acres of farm ponds in 1990 and 89,000 acres in 2020. This is equivalent to 5,340,000 fishing occasions per year in 2020. Farm ponds will become available to the public if enough incentives are offered to the landowners.

Biologists of the Florida Game and Fresh Water Fish Commission have determined that 2 to 3 pounds of fish per trip is a satisfactory catch for the average fisherman. Using this criterion, a well managed pond will provide 100 to 150 fishing occasions per acre per year. By applying fertilizer, controlling weeds, and adequately stocking, a pond can support 600 pounds of fish per acre, half of which will be harvestable. Increased interest and education will stimulate the landowners to practice better pond management.

It is also assumed that the lakes under control of the state fish agencies will be well managed by 2020. If there are no more lakes taken into the state's system, then the farm ponds and the 12,000 acres of fish management areas could provide up to 15,000,000 fishing activities per year. There are approximately 220,000 acres of natural streams and lakes with little or no management which can, in their natural state, provide 13,200,000 activity occasions per year.

At the stated levels of management, there will not be enough fishing opportunities by 1990 to satisfy everyone. Alabama will have a surplus of fishing waters except for local shortages, whereas Florida with a greater population of fishermen, will have a need for more managed fishing waters.

Access to Lakes and Streams - Public access to water areas in Florida has been provided by the Department of Natural Resources, the Department of Transportation, the Game and Fresh Water Fish Commission, and the Corps of Engineers. Many fish camp operators also provide access for a fee. The Florida Subarea has a surplus of boat ramps for present use levels and a sufficient number for 2020[1/]. However, the projections were based solely on population trends. Water activities, particularly fishing, are increasing at a rate greater than the population. It is possible, therefore, that what appears to be adequate access for many years to come may not be enough to satisfy everyone. As the costs of waterfront property skyrocketed and the installation of ramps began to meet the needs, several agencies deactivated their ramp-building crews. The crews will be activated if the number of ramps proves to be inadequate to meet the demand. It has been suggested that access be provided for each 5 miles of rivers and streams to make the resources more available to the public and to reduce the pressure on other water resources.[2/]

Alabama's survey determined that bank fishing was the most popular form of angling[3/]. It was recommended that landowner liability be reduced so that they could permit bank fishing along the streams and rivers of their land. Development of public fishing areas specifically for bank and pier fishing could increase use of the fisheries resource, reduce crowding on more popular waters, and disperse fishing pressure to underutilized impoundments. Public access to lakes and streams is considered to be adequate for future needs.

Hunting Resources

Hunting throughout the country is increasing at a rate less than the population as a whole; however, in the Northeast Gulf River Basins, it is growing faster than the population. This growth can most likely be attributed to rural origin of the inhabitants. The Florida Subarea has more land accessible to the public than any other area of the state.

1/ Outdoor Recreation in Florida, Department of Natural Resources, 1976
2/ Florida Game and Fresh Water Fish Commission (pers. com.)
3/ Alabama SCORP, Auburn University, 1973

This is due, in part, to large national forests, military reservations, and state forests. The Alabama Subarea has about 200,000 acres of wildlife management areas. Most of the hunting land is supplied by private or corporate landowners, made available through lease to hunt clubs and by permit or fee arrangements.

Land use changes, involving urbanization and clearing of timberland for crop production are gradually reducing hunting opportunities in the Basins. Leasing of large tracts of timber land by hunt clubs further reduces the areas available to the remaining hunters. This decrease in the resource places more hunter pressure on the remaining open land.

Added pressure on the hunting areas results in less satisfaction from the hunting experience; therefore, it is imperative that intensive management be carried out on the remaining areas. Management of the forests to produce more animals on less land will not reduce timber production significantly. The hunter of the future will spend considerably more time, money, and effort for his recreation than he is presently spending.

Protection of Threatened Plants and Animals

Presently there are 101 plants and 48 animals in the Basins which are on the state and national endangered and threatened species lists. Because they are protected by state and federal laws they will be protected where they occur on state and federal lands, or where state and federal agencies are involved with alteration of the environment. Protection of a species is not assured by local governing bodies nor by private interests.

By 1990, additional plants and animals will probably be placed on the threatened lists as new discoveries are made and life histories become better known. Approximately 120 plants and 65 animal species are expected to be on the lists.

In 2020, added knowledge of the species will determine that some will have proliferated under the protection afforded them and so will be deleted from the lists. Others, in spite of the protection, will become extinct. Therefore, it is expected that the numbers of plants and animals on the threatened lists will be approximately the same as the present, or about 100 plants and 50 animals.

Wild or Scenic Rivers

Three rivers in North Florida will most likely be in the State Wild and Scenic Rivers System by 1990. Most of the Blackwater River is in the Blackwater River State Forest while the Ichetucknee River is in the Ichetucknee Springs State Park. The Econfina River is in the watershed which provides water for Panama City and therefore needs protection.

With continued pressure from individuals and environmental groups, it is probable that the Suwannee River will be accepted into the National Wild and Scenic Rivers System. By 2020, the Wacissa, Crooked, and Chipola Rivers will probably be in the State's system.

Alabama, which has no state system, has studied and proposed the Perdido, Styx, and Conecuh Rivers for inclusion in the National Wild and Scenic Rivers System, but none have been selected for further study.

Public Law 90-542, the National Wild and Scenic River Act, was enacted to prevent the loss of some of the remaining free-flowing rivers. This law provides for financial and technical assistance from federal agencies for land acquisition and recreational development, however, all operational and maintenance costs are to be borne by the states. In the Northeast Gulf Basins the Suwannee River is the only stream which has been studied for inclusion in this program. Local opposition and limited financial support from the federal government has kept the Suwannee River from being accepted into the system although most of the river meets the requirements of the Act.

The Florida Department of Natural Resources established a state Scenic and Wild Rivers System in 1972 which has aims similar to Public Law 90-542. Feasibility studies have been made on several of the rivers that have been proposed for inclusion in the state system; however, as with the federal program, local opposition has stopped attempts to acquire easements.

Wild rivers and scenic rivers differ in the amount of visible disturbance permitted. Wild rivers are primarily natural and pristine, have no crossings, no impoundments, and a bare minimum evidence of human impact. The rivers must provide real wilderness experiences. Scenic rivers may have some development along their shores although the reason for the scenic designation is primarily for their aesthetic quality. They should be free-flowing, unpolluted and have a preponderance of native vegetation on their banks. Occasional bridge crossings, some agricultural activities, and scattered houses would be compatible with the scenic rivers concept.

Priorities for establishing wild or scenic rivers depend on several factors. The ownership of the shoreline should be favorable to the designation of the river - public property such as state or national parks or forests, or corporate woodlands where land rights or easements in the flood plain can be obtained at minimum costs or by grants. Rights to high quality rivers which are threatened by developmental pressures should be obtained promptly before the costs become prohibitive and the resource is lost. Local support is necessary in order to carry through with the rivers concept. Often the residents of the area recognize only the immediate profit generated by a development. Unless the long range benefits of leaving rivers in their natural condition can be effectively expressed by the proponents, it is most probable that beautiful streams will be irreversibly altered.

A scenic or wild river, once established, will have its management directed toward preservation and protection. Pollution, construction, and change in land use will be strictly regulated. Access and facilities will be limited and rather primitive. The secondary purposes of the rivers will be nature study and appreciation, canoeing, photography, picnicking, and camping.

Preservation/Conservation of Prime Farmland

Land that is ideal for agricultural uses is, in most cases, also easily adapted to many other uses. With increased population, however, the demand for land for the production of food and fiber will be greater. Increased population has placed this land requirement for food and fiber production in direct competition with other uses such as homes, schools, hospitals, churches, shopping centers, factories, and highways. Therefore, there is a need to identify and preserve or conserve land best suited for agricultural production.

Prime farmlands are available areas which have the best combination of physical and chemical characteristics for producing agricultural crops (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban and built-up or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods.

The Soil Conservation Service has the authority and responsibility to identify and locate areas that meet the criteria for prime farmland. This program is being carried out at the state level by SCS. Maps that delineate prime farmland are being developed for each county. These maps are wholly dependent on the published soil survey for the county. At present, 10 of the 22 counties in the Alabama Subarea have completed surveys. It has been estimated that about 50 percent of the Alabama Subarea should qualify as prime farmland. Although over 97 percent of the prime farmlands in Florida occurs in the Florida Subarea, these lands comprise only 10% of the available lands in the Subarea.

Preservation/Conservation of Wetlands, Wilderness and Other Critical Habitats

Wetland areas have long been the primary targets of developers and preservationists. Waterfront lots on lakes, rivers or oceans have commanded premium prices for house sites. Preservationists would purchase the land and leave it inviolate, prohibiting all activities. Between those extremes should be a satisfactory compromise in the use of wetlands which would not result in destruction of these most productive of ecosystems. The wetlands systems filter nutrients and sediment and so provide a natural buffer protecting the streams and bays.

Wetlands in the Florida Subarea are protected under Florida Statutes, the Administrative Code, and Public Law 92-500. The Department of Environmental Regulation, the Department of Natural Resources, and the Corps of Engineers, provide the guidance and enforcement for wetland protection. In the Alabama Subarea, some protection to wetlands, estuaries, and wilderness areas is afforded by the State Water Pollution Control Act of 1965, the Coastal Zone Management Program, and the Wilderness Act.

Florida's Endangered Lands Plan has led to the purchase of 26,800 acres in the Apalachicola River Swamp, thereby ensuring the perpetuation of this critical habitat and providing some protection for the famous Apalachicola estuary. Part of St. George Island has also been purchased by the State to preserve a segment of the barrier islands with their dunes and beautiful beaches.

Within the Apalachicola National Forest, Bradwell Bay has been established as a National Wilderness Area. This 22,000 acre tract is an almost impenetrable titi swamp and provides refuge for the Florida black bear and the red-cockaded woodpecker among other endangered species.

The Federal Land and Water Conservation Fund provides the states, on a matching basis, money to purchase outstanding recreational areas. As of 1975, Florida had purchased 56,500 acres of land and had developed 2,500 acres to provide recreational opportunities. Alabama is more oriented to urban or county parks and playgrounds and has spent most of its share of the fund for these types of developments.

Florida has taken legislative action to preserve its wetlands and wild areas. With adequate funding, Florida will purchase or otherwise attempt to control the more critical areas which are facing immediate development. Alabama, on the other hand, seems to favor developing and improving state and district parks.

Protection or Preservation of Geologic Points of Interest

The Northeast Gulf Basins are in the Coastal Plain Physiographic Province with the exception of a very small area in the northern part of the Alabama Subarea which is in the Piedmont Province. As the name implies, the Coastal Plain is an area of subdued topography with no spectacular evidences of crustal movement.

The rocks of the Piedmont are intensely folded and distorted. Most of the area is covered with a mantle of weathered rock that covers hard rock so that the folding and faulting are evident primarily in road cuts or other excavations. Preservation of these sites is best accomplished by leaving them as they are.

To a trained geologist, any place where the processes that have shaped and are shaping, the earth is a geologic point of interest. In the public sense, the site must have scenic or unique attributes to be interesting. For example, most of the large springs of Florida have been commercially developed, and they are dramatic expressions of the solution of carbonate rocks and the development of underground drainage in carbonate terrains, but their appeal to the public is mostly scenic. A sinkhole is not dramatic or unique when surrounded by thousands of other sinkholes. A few of the larger sinks should be preserved, such as the Devil's Millhopper near Gainesville. Most of the springs are already developed, either commercially or by government entities.

There is no inventory of geologic points of interest at the present and no agency is designating geologic sites for preservation. These sites cannot be preserved without an agency being assigned the responsibility for identifying and inventorying them.

Protection and Restoration of Archeological and Historical Resources

Historic and archeological sites provide evidence of the lives and activities of people who lived in the past. Historic sites are places where significant events of the more recent past occurred and some record is available, either in written history or in local lore. Archeological sites are usually more ancient and little of the history is known. The history of archeological sites and the lives and activities of the people that were associated with the sites are deduced from artifacts at the location by people trained in the science of archeology.

Whereas historical sites are known before discovery, archeological sites are very often found incidental to other activities. Recently the Historical and Archeological Preservation Act has required an archeological evaluation of all major construction projects. This has led to the discovery of many sites not previously known.

Due to the fact that many people have an urge to collect artifacts and will destroy sites and remove valuable objects, professional archeologists are reluctant to reveal the locations of these sites. This reluctance and the need for secrecy make it very difficult to obtain an inventory of known archeological sites. The projection of additional sites of historical and archeological interest is complicated by the lack of an inventory of present known sites, and new sites continue to be located.

Professional archeologists, historians, and historical societies would prefer that all significant sites be protected or restored. State and Federal governments, however, must be selective and must set priorities, as the available resources will not permit satisfying all needs at the optimum level. Present levels of funding will not provide for the protection and restoration of all the sites and much of our historical and archeological resources will be lost through abuse and neglect. Enumerating the sites needed or determining the funding necessary for preservation is very difficult and has not been accomplished.

Air Quality

The Clean Air Act amendment of 1977 (Public Law 95-95), administered by the U. S. Environmental Protection Agency, describes responsibility of states for air quality in their respective territories. Standards and maintenance procedures for air quality have been established by the states of Alabama and Florida. State programs are capable of handling all air pollution problems.

Current air quality standards for the Alabama and Florida Subareas do not require modification of USDA programs. If states change air quality standards that affect agricultural and forestry activities, USDA research programs are capable of responding to revised standards. Forest fire control research activities in USDA Forest Service is an example of the Department of Agriculture's continuing efforts to meet problems in air quality.

Technology and Education

Technological change has impacted heavily upon agriculture during the last 50 years. Mechanization, hybrid seeds, fertilizer, and chemical herbicides and pesticides have drastically changed the agricultural production process. Innovators quickly apply new techniques and an extensive educational effort has made substantial accomplishments. Educational support is very necessary to help the agricultural community make sound investment decisions in a rapidly changing environment. Both the research and development of new ideas and the extension of these ideas to producers has played an important role in the change. A continuation of yield increasing and cost reducing technological developments is expected in the future.

The emphasis on increased efficiency, however, will probably not be the primary force impacting on agriculture during the next few years. Present energy and environmental concerns suggest dramatic changes in uses of energy and environmentally sound production practices for the future.

Minimum tillage and multicropping are very appealing in that energy use and erosion are reduced. Pest management problems and the geographical concentration of production, however, may intensify the chemical pollution potential of these practices. The long range feasibility of the practices still bears some uncertainty but they are expected to become more prevalent unless serious pest management problems persist.

CHAPTER II. NEEDS

This chapter concerns the unsatisfied needs and desires of the public and those that are not expected to be satisfied in the future by ongoing programs and projects at current rates of implementation. Satisfying these needs will enhance economic development, environmental quality, and the social well-being of the people within the Basins. Needs also serve as a basis for formulation of alternative plans to improve the use and management efficiencies of water and related land resources.

Generally, needs were determined by estimating future requirements and desires, and then subtracting those quantities expected to be provided by ongoing public and private programs and projects. The present status of soil and water resources and public preferences were taken into account in estimating needs.

Land Use and Production

The levels of agricultural production, yields, and land use for future time periods are basic factors in analyzing agricultural resource development needs. The cost of production is also used to define the potential for resource development from an efficiency standpoint. Given the basic identity that acres harvested times yield per acre equal gross production, then resource development needs to meet food and fiber requirements may have one of two components: first, the resources available without accelerated development may be inadequate to meet desired food and fiber production requirements in an absolute sense at some expected level of technology; second, the food and fiber requirements may be met but at a cost substantially above desired or potential levels, and erosion rates may be higher than at the present time.

The increasing demands placed on land resources of the Basins by urbanization, recreation, highway construction, mining, and agriculture, impact on land use and productive capacity. Projected agricultural production levels cannot be met with the expected level of technology unless additional woodland is cleared. Woodland clearing is expected to continue, however, at a rate necessary to meet projected requirements for all food and fiber production except wood products during the next 50 years. The addition of marginal, erosive soils to the cropland base and more intensive use of present cropland will cause erosion to increase, further depleting the land base. Such conditions will result in higher production costs for agricultural products. Even more seriously, such a trend reflects a loss of the land base and would reduce the capability of the Basins to produce food for future generations.

In order the meet the major objectives of the study, two needs must be satisfied - increased agricultural income and reduced soil erosion. These two specific objectives are not necessarily compatible. Emphasis on improving agricultural income may dictate that additional crop acres be located on erosive soils, causing adverse environmental effects.

If the specific objective of reducing soil erosion is met, the use of erosive soils for production should be discouraged, or management systems installed which will reduce erosion to acceptable rates. The economically efficient approach is land use conversion to less intense uses for some soils. This, however, will adversely affect the Basins' ability to maintain or increase its agricultural base and increase income to the rural community. The erosive soils removed from crop production, however, could be used for less intensive purposes such as pasture, forest, or recreation.

Soils with less severe problems could be utilized more intensively, and corrective measures should be taken on problem soils to meet the need for increased agricultural income. Prime farmland that is now being used for forests and pasture could be converted to cropland, droughty soils could be irrigated, and wet soils could be drained to the extent that they support gains in net agricultural income. More detailed analysis would be required for specific site recommendations.

Forest Production

The Basin's available supply of forest products for 1990 is projected at 450 million cubic feet. This is sufficient to meet the projected demand of 449 million cubic feet for that period. A deficit will occur by 2020 when the projected supply will lack 137 million cubic feet of meeting the projected demand of 826.5 million cubic feet. (Table 2-1). A deficit of 14.3 million cubic feet occurs in the Alabama Subarea for 1990. This deficit, however, will be offset by the surplus volume in the Florida Subarea.

Timber growing is a long-term investment, requiring 20 to 40 years for various crop rotations. This dictates the immediate initiation of planning programs if an adequate supply of wood fiber is to be available by 2020. Also, the increasing demands for other uses of forest land, such as recreation and wildlife habitat, will limit the capacity of the land to supply pulpwood and sawtimber unless reforestation efforts are initiated early.

Erosion Control

The greatest natural resource need in the Basins is for soil erosion control (Table 2-1). This need is particularly evident in the northwest portion of the Florida Subarea and in about 11 Alabama counties which make up the majority of the land in this subarea.

Sheet and rill erosion - Land treatment needs are based on the assumption that 33 percent of the land (excluding forest land) will be adequately protected by ongoing programs by 1990, and 40 percent by 2020. Even though some areas are considered to be adequately protected, the erosion on these lands is significant and should be lowered even further where practical. Adequate treatment and protective measures on cropland are annual concerns and must be continually dealt with and maintained in order to keep erosion losses in check and maintain production.

Total cropland acreage is expected to increase slightly in future years but the acres needing erosion control show a decline because of the increase in acres protected by ongoing programs. Offsetting this decrease in acres needing erosion control, however, is an increase in the erosion rate per acre. This is due to cropland expanding to more erodable soils as land use changes take place without acceleration of conservation programs.

Critical area - Ongoing programs are not making significant progress in critical area erosion reduction. The relatively small area involved in a gully, for example, compared with the high cost and marginal short-run benefit of corrective action have not been conducive to solving this problem. Consequently, the need for critical area erosion control continues to grow in order to improve the resource base and water quality. Soil erosion from gullies will increase by about 37 percent from 1990 to 2020, and will involve approximately 134,000 acres.

Interdependent areas - Interdependent areas are those lands which comprise the drainage areas upstream from gullies. These areas are dependent on the gully for disposal of surface run-off. So long as the gully is unstable, the interdependent area does not have a stable outlet. These areas can be expected to become severely depreciated or voided in the future as a part of the gully system. In a shorter time period; the assumption is that agricultural productivity of an interdependent area depends on stabilization of the gully before application of needed conservation treatment measures. Unstable outlets for waterways prevent the installation of terrace, surface drainage, or tile drainage systems. Without these and other land treatment systems, land use will be less intensive and net returns will decrease. In the Florida Subarea, approximately 19,700 acres are classified as interdependent areas. In the Alabama Subarea, the figure is about 503,000 acres.

Sediment Reduction

Sediment reduction is needed to improve water quality, aesthetics, fish habitat, and to reduce the silting of streams and reservoirs. Sediment reduction objectives were not stated by study sponsors, but the effect of erosion control upon the streams was determined. A 75 percent reduction in sediment will put most waters of the Basins within the range of sediment concentrations wherein a good fishery can be developed.

Alabama Subarea waters, at their outlets, now average 225 milligrams per litre (mg/l) suspended sediment, which is expected to increase to about 310 mg/l by 2020. Sediment reduction needs are estimated at 10.4 million tons by 1990 and 13.5 million tons by 2020 (Table 2-1).

Flood Damage Reduction

The flood-prone area of the Florida Subarea includes 39,000 acres of pasture and 22,000 acres of cropland; in the Alabama Subarea there are about 26,000 and 12,000 acres, respectively. The total pasture and cropland in the flood-prone area comprises less than two percent of the total flood-prone area. Occasionally, severe flood damages occur to agricultural crops, but, due to the infrequent occurrence and relatively high flood-free yields on many of the flood-plain soils, farming operations continue. No additional needs for accelerated programs are anticipated for agricultural flooding.

Urban flooding is a problem in many locations, and until all areas are covered by the regular FIA program, a need exists for additional flood hazard studies to guide local communities in permitting and zoning requirements. Future urban flooding damages can be greatly reduced by denying building permits below the 100-year flood elevation. As the study area is covered by the regular FIA program, the need for flood hazard studies in urban areas will be minimized or eliminated.

Irrigation

Projected irrigation water requirements in the Florida Subarea are not expected to be met by existing programs, so additional sources of water must be developed. There are no net irrigation water needs in the Alabama Subarea.

Municipal and Industrial Water Supply

Municipal and industrial water needs for 1990 and 2020 are more than existing water systems can supply or than can be met by increasing present pumping capacity (Table 2-1). Opelika is the only town in the Alabama Subarea not able to meet its future water needs. This city will need 13.2 million gallons per day of additional water to meet its projected 2020 needs. Use of the Chattahoochee River as a source of water is being investigated. Consideration is also being given toward development of a potential reservoir site in the Tallapoosa River Basin.

Two locations in the Florida Subarea - Ft. Walton Beach and Quincy - are expected to require other sources of water to meet future needs. Fort Walton Beach and the surrounding area will need approximately 18.6 million g.p.d. of additional water by the year 2020. This area currently gets its fresh water from the Floridan Aquifer but the piezometric pressure head has been lowered considerably below sea level and if this should continue, salt water intrusion will likely develop. Quincy, which will require other sources of water to meet its additional needs of 3.1 million g.p.d. by 2020, presently uses water out of Quincy Creek with a standby well tapping the Floridan Aquifer. The creek is not dependable during certain times of the year; the aquifer has a low yield and has a high salt content especially at deeper levels.

Several other areas in the Florida Subarea will need to enlarge their present systems in order to meet future demands for good quality fresh water. One of these is Fernandina Beach which is experiencing salt water intrusion. This problem will worsen unless the well field is expanded to an area large enough to adequately meet future needs.

Agricultural Drainage

Drainage will be needed on about 260,000 acres of farmland for either of the projected time frames (Table 2-1). These drainage needs will have to be met if the agricultural potential and desired efficiency of production are realized. Provisions for adequate drainage must be made before other needed conservation practices can be successfully applied on excessively wet soils.

Wildlife Habitat Enhancement/Protection

Public lands available for hunters, bird watchers, and other nature lovers are insufficient for the present population. This deficit will increase as the population expands, placing more demands upon a decreasing resource. The Florida Subarea has more public lands - approximately 2,700,000 acres - open to hunting than any other section of the state and they are still overutilized. About 60 percent of the hunting occurs on private land by permission or by payment of small fees.1/ Hunt clubs are leasing large tracts of land, thereby further reducing land available to the public. No privately owned land was included in the supply data thus causing some over-statement of needs.

There are two categories of wildlife management areas in Florida, Type I and Type II. Hunting in Type I areas is under control of the Game and Fresh Water Fish Commission whether the land is privately or publicly owned. Type II management areas require special permits from the landowners and have special considerations concerning the use of their land. There are 728,414 acres of Type II management land within the Florida Subarea. The western part of the subarea has 102,565 acres located primarily along the Choctawhatchee and Apalachicola Rivers. The remaining Type II management areas are in the eastern portion of the Florida Subarea. Type II areas may increase in the future because of the income generated for management practices, and creation of public goodwill.

1/ The Natural Systems and Hunting and Fishing Resources of Northwest Florida 1977. Florida Game and Fresh Water Fish Commission

Table 2-1. Needs - Northeast Gulf River Basins

Component Needs	Units	Alabama Subarea 1990	Alabama Subarea 2020	Florida Subarea 1990	Florida Subarea 2020	Total Basins 1990	Total Basins 2020
		---1000---					
Erosion Control							
Sheet and Rill							
Cropland	Acres	1081	1002	1045	996	2126	1998
	Tons	13348	13323	12044	18119	25392	31442
Pasture	Acres	443	430	365	300	808	730
	Tons	332	266	614	475	946	741
Forestland	Acres	73	160	183	167	256	327
	Tons	2309	3635	1433	1241	3742	4876
Miscellaneous	Acres	59	62	136	102	195	164
	Tons	705	748	1153	1258	1858	2006
Non-Agricultural	Acres	183	190	351	547	534	737
	Tons	1371	1204	2622	3463	3993	4667
Total Sheet & Rill	Acres	1839	1844	2080	2112	3919	3956
	Tons	18065	19176	17866	24566	35931	43732
Critical Area							
Gully	Acres	52	64	3	4	55	68
	Tons	12681	17424	733	984	13414	18408

1/ The term "needs" includes those requirements that are not expected to be satisfied by ongoing programs at current rates of implementation

CONTINUED

Table 2-1. continued

Component Needs	Units	Alabama Subarea		Florida Subarea		Total Basins	
		1990	2020	1990	2020	1990	2020
		------------------------1000------------------------					
Critical Area							
Roadside	Acres	32	32	2	2	34	34
	Tons	3200	3200	200	200	3400	3400
Stripmine	Acres	14	14	18	18	32	32
	Tons	1400	1400	1800	1800	3200	3200
Total Critical Area	Acres	98	110	23	24	121	134
	Tons	17281	22028	2733	2984	20014	25008
Sediment Reduction	Tons	4332	5384	6047	8105	10366	13489
Irrigation							
Land	Acres	0	0	9.8	29.7	9.8	29.7
Water	Acre/feet	0	0	7.3	22.3	7.3	22.3
Municipal & Industrial Water Supply	Gal/day	2600	13200	0	21700	2600	34900
Agricultural Drainage							
Cropland	Acres	30	29	44	61	74	90
Pasture	Acres	73	70	109	102	187	172
Forest Products	Cubic Feet	14266	29716	0	107280	0*	136996
Forest Land (reforestation)	Acres	135	0	720	0	855	0

*Although Alabama has a deficit, the surplus in Florida Subarea will balance off this volume

The Alabama Subarea also has a shortage of public wildlife areas even when Fort Rucker, Conecuh National Forest, and the Eufaula National Wildlife Refuge are included. At the present time, there are no plans for lease or acquisition of additional areas under any existing state or federal programs. However, it is the opinion of state authorities that two management areas consisting of a total of 55,000 acres strategically located, would be a desirable, practical addition to the present wildlife management system.

Improved habitat management and hunter control on public lands will be necessary to provide for the expected increase of hunters. Hunter-landowner relationships need to be improved so more areas could be open to hunters, thereby relieving the crowded conditions on public lands. Other users of state and federal lands such as hikers, bird watchers, and campers, should be permitted to pay for their recreational activities, providing funds for improved management of the resources.

Wild and Scenic Rivers

Attempts to implement Florida's Scenic and Wild Rivers Program have been unsuccessful because all landowners of the river corridor must be agreeable to terms of the Scenic and Wild Rivers Act. Waterfront property is much in demand for residential development and therefore many landowners will not willingly give up their land rights. Control of the river corridors is essential to maintain the integrity of the river systems. The State is not permitted by law to use the power of eminent domain to obtain land rights for recreation. Until this leverage is provided to the State by legislation, it appears that only limited progress will be made toward creating a State system of Wild and Scenic Rivers.

Alabama has yet to enact legislation establishing a State Wild and Scenic River System so that selected rivers may be studied for inclusion in such a system. However, the Alabama Legislature, by Act No. 465 (1969) designated a portion of Little River in Northeast Alabama as a State Wild and Scenic River. Most river banks in the Alabama Subarea will be subject to extensive developments by 2020 unless legislation is enacted to protect the streams. The Rivers Styx, Perdido, and Conecuh were proposed for inclusion in the National Wild and Scenic Rivers System, but they were not selected. The Conecuh was eliminated because of pollution, dam construction, and shoreline disturbance1/. With projected pollution abatement, sections of the river could meet the criteria of the National program. The Styx and Perdido Rivers could meet the standards, but more State and local support is needed.

1/ Alabama's Statewide Comprehensive Outdoor Recreation Plan, Auburn, Alabama, 1971

Rivers being considered for inclusion in the Florida system are: Blackwater, Econfina, Chipola, Choctawhatchee, Crooked, Wacissa, Santa Fe, Suwannee, and the Ichetucknee. By 1990, the Blackwater, Ichetucknee, and Econfina will probably be in the State system and the Suwannee in the National System. By 2020, the remaining proposed streams, except the Choctawhatchee and the Santa Fe, will be in the system if legislation permitting the taking of land is enacted.

Water Based Recreation

General - There will be no shortage of water surface for water-based recreation related to reservoirs until about 2020 when a deficit will occur in the Florida Subarea. Numerous reservoir sites have been investigated which could help provide some of the water needed for canoeing, sailing, swimming, and skiing. It is anticipated that several of these sites will be utilized to meet the municipal, industrial, and recreation demands while other sites could be developed and managed primarily for recreation. Power boating and skiing require so much surface water they will have to be regulated on these rather small reservoirs (690 ac. avg.), and will have to be compatible with any M&I water use. Picnicking, camping, and other outdoor activities are associated with water sports and could be included in plans for these sites. Weed growth is a serious problem associated with impounded water. Features to provide for lowering the water surface must be provided to aid in weed control. There is a growing demand and concern for recreational activities related to free-flowing streams. Obviously, this resource is in limited supply, so net needs could develop quickly.

Fresh water fishing - In order to meet the projected needs of the fishing public in the future, more intensive management of our waters will be necessary. To meet its sport fishing demands in 1990, the Florida Subarea will have to manage 119,200 acres of water intensively so that each acre will support 150 fishing occasions, and remaining waters must support about 60 fishing occasions per acre per year. Judged by present technology, these production requirements seem economically unattainable. If pond fertilizer costs continue to increase, projected harvestable yield for the 1990 period, expressed in fishing occasions, may not exceed an average of 60 occasions per acre.

By 2020, the waters of the Florida Subarea will not be able to meet the needs of all the fishermen even if all the waters were intensively managed. The demand of 35 million fishing occasions will require approximately 235,000 acres of water under intensive levels of management (150 activity occasions/acre).

Work at universities and research stations has changed the outlook of fishing in the south. Hybrid fish, which may lead to simpler pond management, and exotic fish which can produce more pounds per acre, will provide greater commercial and sports fishery harvests. If these fish practices become more widespread, the whole complexion of sports fishing may change and the need for additional water may not occur.

The cost of intensive management of fishing waters will be borne by the fishermen, in the form of increased licenses and fees, to the states or the property owners. Unless he is given a fair return on his investment, the owner could not be expected to provide recreation for the general public. More funds are needed for research and development of management techniques so that the waters can become more productive, thereby satisfying more of the fishing public. Local shortages of open water may continue to be a problem for some of the residents and may become more severe if travel is limited because of gasoline prices or shortages. (See Table 2-2).

Protection of Threatened and Endangered Species

All efforts directed toward protection and maintenance of threatened and endangered flora and faunal species will need appropriate management plans when the species are identified and located. Management of forest habitat may require some modifications of prevailing forestry practices. In some instances, especially for animals that require large areas, timber harvesting may have to be excluded or greatly reduced.

Recovery teams are organized by the U. S. Fish and Wildlife Service to combine talents and skills found in various conservation programs. These teams direct a single, efficient effort to restore and protect designated species. Each team, consisting of federal, state, academic, and industrial biologists, is assigned a specific species. Teams meet annually to review accomplishments of the various agencies in carrying out the recovery plan and to coordinate continuing efforts. The objective of each recovery plan is removal of subject species from the threatened and endangered list. Florida's Land Conservation Act of 1972 provides authority for purchase of such lands necessary for the protection of unique, or otherwise scarce, fauna, flora, and geologic sites characteristic of the original domain of Florida.

State and federal programs designed to protect threatened and endangered species are adequate for the present. However, funds currently allocated for these programs are inadequate. Additional funding is recommended for acceleration of field work to identify, locate, and map critical habitat for leasing or purchasing adequate habitat sites, and for research.

Protection of Wetlands, Wilderness, and Other Critical Habitat

The most important critical areas in the Basins to be protected or preserved are the wetlands. These include swamps, marshes, and estuaries. It is difficult to establish priorities for protection of wetlands so those most endangered by development are considered first. The Apalachicola River System is under the most public pressure for alteration. Dams are proposed which will permit larger barges to be used. Commercial and transportation interests are working to increase the barge traffic on the river as it is the least expensive method of transportation.

Table 2-2. Recreation Needs - Northeast Gulf River Basins 1/

Component Needs	Units	Florida 1990	Florida 2020	Alabama 1990	Alabama 2020	Total Needs 1990	Total Needs 2020
Fishing, fresh water	1000 Activity Occasions	10730	23610	915 2/	750	9815	24360
	Acres	178850	393500	15250 2/	12500	163600	406000
Swimming, fresh water	1000 Activity Occasions	11165	20845	180	310	11345	21155
	Miles of Beach	5.2	9.7			5.2	9.7
	Acres Water & Beach			10	20	10	20
Picnicking	1000 Activity Occasions	7045	14775	755	1830	7800	16605
	Tables	3990	8435	700	1695	4690	10130
Camping	1000 Activity Occasions	225 2/	5185	150	710	75 2/	5895
	Campsites	165 2/	5235	335	1580	170	6815
Boating, fresh water	1000 Activity Occasions	2490 2/	3135	2885 2/	1875 2/	5375 2/	1260
	Acres	34585 2/	43555	35925 2/	19085 2/	70510 2/	24470
Hunting	1000 Activity Occasions	2495	7500	1380	2140	3875	9640
	Acres	1254000	3784000	1164000	1802000	2418000	5586000
Skiing, fresh water	1000 Activity Occasions	915	4885	740 2/	440 2/	175	4445
	Acres	20000	108000	16435 2/	9770 2/	3565	98230

1/ Activity occasions are in terms of capacity of the facilities. Source: Outdoor Recreation in Florida, and SCORP, Alabama

2/ Denotes over-supply

Estuarine areas are continually being altered for real estate and industrial developments and therefore, should have high priority for protection. Justification for preservation lies not only on their aesthetic qualities but on their high productivity. They serve as nursery, spawning, and feeding grounds for shrimp, crabs, oysters, fish, and other species important to man. Many birds and other animals spend all or part of their lives in estuaries.

Recent studies of forestry practices adjacent to Apalachicola Bay have measured the effects of drainage, logging, and site preparation on the estuary. Changes were noted in turbidity, color, salinity, and pH levels with possible adverse effects on the estuarine biota. The extent of other estuaries in the Basin (St. Andrews Bay, Apalachee Bay, and Choctawhatchee Bay) justifies further investigation of the effects of forestry operations on these sensitive aquatic regions. Conclusions from the studies suggest changes in forestry operations which could influence forest production.1/

In Florida, flood plains contain about 350,000 wetland acres of significant concern to the State. The estuaries include approximately 150,000 acres of salt marsh.

The Perdido Bay estuary in Alabama occupies about 17,000 acres, 7,000 of which are marshlands. It is felt that 17,600 acres of representative wetlands along the Styx, Perdido, Pea, and Conecuh Rivers should be preserved in addition to the 7,000 acres of saltmarsh.

Technology and Education

It is important that remedial actions be taken to reduce energy use and environmental degradation where possible. It is equally important that these actions be tested before recommendations are made. The role of research and education will be critical in the next 10-15 years to keep agricultural producers informed on energy and pollution practices.

It is not possible to quantify the number of technological improvements or education classes needed. Specific areas where new technologies are needed or expected and education support will be necessary include:

1. Energy conservation
2. Pollution control
3. Pest management
4. Resource conservation and efficient use
5. Food nutrition and waste
6. Localized weather forecasting
7. Minimum tillage, double cropping, and irrigation
8. Natural resource preservation

1/ Livingston, R.J., 1978. Effects of clearcutting and upland reforestation activities on water quality and the biota of the Apalachicola estuary

Energy conservation, pollution control, and environmental degradation will automatically be considered to some extent by producers as energy costs increase and impacts of alternative resource uses are defined. Knowledge of future trends and costs will be needed in order to make sound decisions concerning agricultural alternatives.

Research and testing of energy conserving practices, new pest control techniques, and new equipment should be intensified. Efficient, environmentally sound methods of recycling more agricultural and other wastes through land application need to be researched. The scale of farming has increased substantially through time but the average operator is still ill-equipped to develop or test new techniques. Increased emphasis in research and education is needed in this area to increase investment in proven technologies.

Emphasis should be placed upon better monitoring of pest populations, soil fertility and soil moisture prior to application of chemicals, fertilizers, and irrigation water. Techniques for application more in accordance with plant requirements are also necessary to reduce residual impacts. The build-up and persistence of some agricultural chemicals will continue to require restricted use and intensify the need for biological and other means of controlling pests. Chemical composition of selected streams is given in Table V-25 of Volume I, but additional water quality data are needed for small streams to aid in determining the non-point pollution problem. The SCS is cooperating with the Florida Department of Environmental Regulation and others in establishing water quality monitoring stations on streams that drain agricultural areas. Similar type activities are cooperatively carried out in Alabama between SCS and the Alabama Office of State Planning and Federal Programs.

The area of food nutrition and waste needs to be addressed. Any efficiency gains which can be made through waste reduction has important implications for energy conservation and pollution control. Mechanization has, to some degree, contributed to product damage and field loss, but the timing of harvest has been greatly improved. The availability of harvesting equipment to small operators is one area that needs to be addressed. Field loss of products can be reduced through livestock utilization in some cases, or by hand gathering. There will be some waste where the cost of collection exceeds the value. Improvement in harvesting methods is needed for maximum efficiency.

A change in the marketing structure to provide better economic incentives based upon quality as well as quantity may be needed to encourage producers.

Weather is a very important uncontrollable factor which drastically influences crop production. Early warning systems for heavy rains, drought, and extreme temperatures are needed to improve farm operations and efficiencies.

Irrigation can improve product quality and increase yields. Product prices are presently inadequate to support irrigation on many crop soils. Improved varieties, better product quality, and shifts toward double cropping are needed to support future increases in irrigated acres. Techniques and information concerning irrigation water conservation will become more important as additional acreage is irrigated.

An expanded program of on-farm technical assistance is necessary to promote and expand conservation tillage. Training is needed in residue management prior to planting, planting techniques, and in weed and pest control during the growing season.

CHAPTER III. ALTERNATIVE PLANS

Alternative plans were formulated on the basis of "NEEDS" as described and tabulated in the preceding chapter. A Recommended Plan (Chapter IV) was formulated by selecting the most desirable elements of the alternative plans. One of the alternative plans emphasizes economic development (ED), and the other emphasizes environmental quality (EQ). The economic alternative optimizes economic development, not without consideration for environmental features, but to the point that the growth rate of economic activity within the Basins exceeds its current rate. The other alternative gives major consideration to environmental enhancement.

Alternatives for meeting needs were formulated with participation by groups and individuals throughout the Basins. Personal contacts were made with county commissioners, soil and water conservation district supervisors, regional planning agencies, special interest groups, representatives of state government, water management officials, and individuals. Generally, all groups were interested in economic development and in the protection and enhancement of environmental values.

Projections of production demands, population changes, soil erosion, water quality, changes in life styles, and other factors were considered in formulating the alternative plans. The beneficial and adverse effects of each alternative were evaluated and displayed by three accounts: Economic Development, Environmental Quality, and Social Well-Being. The identification of effects of various elements of each alternative are presented in monetary and/or descriptive terms. An element or measure included in an alternative plan may accrue effects to more than one account. An analysis of the accounts indicates possible trade-offs among elements and resource allocation, (Tables 3-5, 3-6, and 3-7).

Environmental Quality Alternative

The environmental quality objective is to enhance environmental quality by the conservation, preservation, and restoration of the quality of certain natural and cultural resources and ecological systems. This objective reflects society's concern and emphasis for the natural environment and its maintenance and enhancement as a source of present enjoyment and a heritage for future generations.

The EQ alternative recognizes the desirability of diverting a portion of the Nation's resources from production of more conventional market-oriented goods and services in order to accomplish environmental objectives. As incomes and living standards increase, society appears less willing to accept environmental deterioration in exchange for additional goods and services. The following discussion identifies some specific actions for the EQ alternative.

Agricultural land use and production - Land treatment is one of the main elements included in the environmental quality plan which will influence land use and production. Land treatment will be intensified to increase the adequately treated cropland and pasture from 33 percent to 65 percent by 1990 and 85 percent by 2020. Soil resource groups with severe erosion problems were identified and corrective management practives and land use adjustments were established for these soils.

In the Florida Subarea, emphasis will be placed on crop rotations, crop residue management, and minimum tillage to reduce erosion to an acceptable level. Land use conversion from row crops to less intensive uses such as pasture, woodland, or small grains, is recommended for five soil resource groups with extremely high erosion potential. The land use conversion goal is 80 percent by 1990 and 95 percent by 2020.

In the Alabama Subarea, any land considered treated includes terracing or drainage as needed, contour plowing, and crop residue management or cover crops left on the land. These practices are considered as the first increments of treatment. Additional treatment needs will be met through conservation cropping systems, minimum tillage, or other treatment as needed to reduce erosion to an acceptable level.

Yields are expected to increase about 10 percent when adequate conservation practices are applied to the land. In the Alabama Subarea, a farm planning element is included to intensify production on the less erosive soils to compensate for the acreages removed from crop production and used for conservation practices. Yield increases above 10 percent will be due to such factors as improved technology or new plant varieties.

Thirty percent of the forest land on soils with potential for producing high yields of crops and pasture is considered for conversion to these uses. Production with the EQ alternative will remain at approximately the without development level and crop acreage will decline from this level slightly due to increased yields (Tables 3-1 and 3-2).

In the Florida Subarea the cropland intensification element is not included. Production and acreages of major row crops will be less than the projected future without development levels. Hay, wheat, and pasture acreages and production will increase because of lower erosion rates for these crops.

Net returns from major crops and pasture are expected to be approximately 10 percent higher in 1990 for the entire study area with the EQ alternative. The major part of the increase is in the Alabama Subarea, which is expected to have a 20 percent increase. Essentially, no change is expected in the Florida Subarea by 1990, but a negative impact is expected in the longer run.

Table 3-1. Land Use, Present and Projected, EQ Alternative, Northeast Gulf River Basin and Subareas, 1972, 1990, and 2020

Land Use	Florida Subarea			Alabama Subarea 2/		Northeast Gulf River Basins	
	1972	1990	2020	1972	1990	1972	1990
	1000 Acres						
Cropland 1/	1379	1350	1550	1510	1666	2889	3016
Corn	310	259	314	271	393	581	652
Cotton	11	4	2	37	14	48	18
Soybeans	241	400	530	146	287	387	687
Peanuts	51	57	66	193	202	244	259
Wheat	32	92	160	29	42	61	134
Hay	47	54	79	70	132	117	186
Minor Crops	48	55	85	72	64	120	119
Pasture	372	350	375	408	381	780	731
Idle	290	159	139	300	152	580	311
Pasture	627	648	550	674	548	1301	1196
Forest	9613	9450	8990	4484	4458	14097	13908
Miscellaneous	229	210	180	150	106	379	316
Agricultural Land	11848	11658	11270	6818	6778	18666	18436
Non-Agricultural Land	333	523	911	234	274	567	797
Total Land Area	12181	12181	12181	7052	7052	19233	19233

1/ Sum of cropland categories exceeds cropland total because of double cropping

2/ See Preface for note on absence of 2020 data for Alabama Subarea

Table 3-2. Production of Major Crops, Pasture and Forest Products With the EQ Alternative, by Subarea, 1972, 1990, and 2020

Item	Units	1972	1990	2020
		-------------	1000	-------------
Florida Subarea				
Corn	bu.	13350	16200	24700
Cotton	bales	13	5	3
Peanuts	cwt.	1202	1700	2400
Soybeans	bu.	5377	9800	15500
Wheat	bu.	820	3500	5600
Tobacco	cwt.	258	318	420
Vegetables	cwt.	1822	3600	3700
Hay	tons	97	160	238
Pasture	AUMs	2334	4600	5000
Forest Products	cu.ft.	173371	255150	435560
Alabama Subarea 1/				
Corn	bu.	9501	23355	
Cotton	bales	35	13	
Peanuts	cwts.	3296	5293	
Soybeans	bu.	3058	6366	
Wheat	bu.	721	1375	
Hay	tons	148	253	
Pasture	AUMs	2713	3949	
Forest Products	cu.ft.	138754	200600	309400

1/ See Preface for note on absence of 2020 data for Alabama Subarea

Table 4-10. Recommended Plan, Environmental Quality Account, Florida Subarea, 1990

Components	Measure of Beneficial and Adverse Effects
A. Areas of natural beauty	1. Create 5400 acres of surface water.
	2. Improve visual quality of landscape by treating 432,000 acres of cropland and restocking 1,166,100 acres of forest land.
	3. Preserve 96 miles of wild and scenic rivers.
	4. Preserve 357,800 acres of floodplain.
	5. Preserve 150,000 acres of saltwater marsh.
	6. Disruption of tranquility of rural area by 16,884,500 visitor days.
B. Quality considerations of air, land, and water resources	1. Improve surface water quality by reducing sediment by 3.4 million tons/yr.
	2. Reduce erosion on 432,000 acres of cropland and 7,000 acres of critical areas and gullies.
C. Biological resources	1. Enhance fish habitat by reducing sediment.
	2. Perpetuate wetland species on 507,800 acres.
	3. Protect habitat for threatened and endangered species.
	4. Protect river ecosystems along 96 miles of wild and scenic rivers.
	5. Improve 95,650 acres of freshwater fish habitat.
	6. Eliminate woodland wildlife habitat on 155,400 acres.
	7. Improve wildlife habitat on 547,000 acres (better management, lease, purchase).
D. Irreversible or irretrievable commitments	1. Convert 5400 acres of wetland to irrigation reservoir pool.

Table 4-9. Recommended Plan, Economic Development Account, Florida Subarea, 1990

Beneficial Effects		Adverse Effects	
Components	Measure of Effects ($1000) Average Annual	Components	Measure of Effects ($1000) Average Annual
Value to users of increased outputs of goods and services:		Value of resources required for a plan:1/	
1. Erosion Control, Irrigation, Drainage	13,967	1. Irrigation	635
		2. Drainage	1,358
2. Recreation			
Hunting	7,089		
Fishing	25,826		
Recreation Facilities	14,364	3. Recreation- Improved fish and wild-life management and recreation facilities	4,075
3. Utilization of unemployed labor resources	217	4. Critical area treatment	1,908
		5. Grade stabilization structures	460
4. Increased wood fiber production	4,291	6. O&M - irrigation & drainage	511
Total Beneficial Effects	65,754	7. O&M - recreation	427
		8. O&M - critical area treatment & grade stabilization structure	166
		9. Reforestation work	4,528
		Total Adverse Effects	14,068

1/ The cost of land treatment ($12,235,000) is a necessary cost for erosion reduction; however, the separate benefits accruing to land treatment measures were not evaluated.

Table 4-8. Recommended Plan, Social Well-Being Account, Alabama Subarea, 1990

Components	Measures of Beneficial and Adverse Effects
A. Real income distribution	1. Create 9200 temporary jobs during installation of erosion control and recreation facilities.
	2. Create 100 permanent jobs for maintenance of erosion control and recreation facilities.
	3. Create 100 temporary jobs during reforestation work.
B. Life, health, and safety	1. Create safer conditions along roadsides and other rural areas by installation of roadside and gully erosion control facilities.
C. Recreational opportunities	1. Provide atmosphere for more rewarding experiences for such activities as hiking, pleasure driving, bicycling.
	2. Create 972,100 activity occasions of recreational use.
	3. Enhance recreational use of streams due to improved water quality.
	4. Improve access for recreational use of 55,000 acres of forest land.

Table 4-7. Recommended Plan, Environmental Quality Account, Alabama Subarea, 1990

Components	Measure of Beneficial and Adverse Effects
A. Areas of natural beauty	1. Improve visual quality of landscape by treating 250,000 acres of cropland and restocking 450,000 acres of forest land.
	2. Disruption of tranquility of rural area by 972,100 activity occasions.
	3. Preserve 82 miles of wild and scenic rivers.
	4. Preserve 17,600 acres of floodplain.
	5. Preserve 7,000 acres of saltwater marsh.
B. Quality considerations of air, land, and water resources	1. Reduce sediment by 1.6 million tons annually.
	2. Reduce erosion on 250,000 acres of cropland and 50,500 acres of critical areas and gullies.
C. Biological resources	1. Enhance fish habitat by reducing sediment load.
	2. Maintain wetland species on 24,600 acres.
	3. Protect habitat for threatened and endangered species.
	4. Protect ecosystems along 82 miles of wild and scenic rivers.
	5. Improve woodland wildlife habitat on 55,000 acres.

Table 4-6 . Recommended Plan, Economic Development Account, Alabama Subarea, 1990

Beneficial Effects		Adverse Effects	
Components	Measure of Effects ($1000) (Average Annual)	Components	Measure of Effects ($1000) (Average Annual)
Value to users of increased outputs of goods & services:		Value of resources required for a plan: 1/	
1. Gully erosion damage reduction	1,245	1. Critical area treatment	8,276
2. Sheet & rill erosion damage reduction	17,712 2/	2. Grade stabilization structures	5,618
3. Recreation		3. Recreation	346
Hunting	438	4. O&M - Recreation	109
Recreation facilities	1,814	5. O&M - Critical area treatment and grade stabilization structures	1,584
4. Utilization of unemployed labor resources	820	6. Reforestation work	1,748
5. Increased wood fiber production	2,422		
Total Beneficial Effects	24,451	Total Adverse Effects	17,681

1/ The cost of land treatment ($17,148,000), pasture maintenance ($5,498,000), and water disposal system maintenance ($8,733,000) are necessary costs for erosion reduction; however, the separate benefits accruing to these measures were not evaluated.

2/ Difference between net returns of Recommended Plan and Future Without (Table 4-3)

Table 4-5. Recommended Plan Elements, Costs, and Remaining Needs, Florida Subarea

Component Needs	Plan Elements	1990 Unit	1990 Amount Planned	1990 Installation Costs-$ 1/	1990 Remaining Needs	2020 Unit	2020 Amount Planned	2020 Installation Costs-$ 1/	2020 Remaining Needs
Erosion Reduction									
Cropland	Cons.Cropping Sys.	Ac.	432000	10800000	472500	Ac.	697500	17437500	620000
	Minimum Tillage	Ac.	110500	1105000	531800	Ac.	301800	3018000	503000
	Contour Farming	Ac.	37200	186000	40700	Ac.	68300	341500	22800
Pastureland	Pasture Planting	Ac.	26400	1320000	6600	Ac.	31400	1570000	1700
Critical Areas									
Gully Class I	Critical Area Treat.	No.	33	131000	50	No.	46	182000	37
Gully Class II	Grade Stab. Str.	No.	24	395000	35	No.	32	527000	27
Gully Class III	Grade Stab. Str.	No.	17	753000	25	No.	23	1019000	19
Gully Class IV	Grade Stab. Str.	No.	117	5341000	175	No.	161	7349000	131
Roadbank	Stabilization	Ac.	800	3818000	1200	Ac.	1100	5250000	900
Stripmine	Critical Area Treat.	Ac.	7200	22824000	10800	Ac.	9900	31383000	8100
Irrigation	Water Supply	Ac.Ft.	24400	2608000	0	Ac.Ft.	39400	4200000	0
	Water Management	Ac.	32600	391200	0	Ac.	52500	630000	0
Drainage		Ac.	150000	19039000	153000	Ac.	150000	19039000	163000
Municipal & Industrial	Water Supply					MGD	25.8	2840000	0
Recreation									
Fishing Areas	Imp. fish mgt.	Ac.	95650	2870000/Yr	0	Ac.	201130	6034000/Yr	0
	Pond construction					Ac.	41130	41130000	
Hunting Areas	Lease & improve for public hunting	Ac.	547000	273500/Yr	707000	Ac.	1641000	820500/Yr	2140000
Facilities	Picnic Units	No.	1995	8548600	0	No.	2210	9470000	0
	Campsites					No.	5235	10470000	0
Water-based Rec.	Impoundments					Ac.	7825	30668000	0
Wetlands-Preserv.	Floodplains	Ac.	357800	Not evaluated	750000	Ac.	750000	Not evaluated	0
Wild & Scenic Rivers	Preservation	Mi.	96	Not evaluated		Mi.	195	Not evaluated	0
Forest Land	Reforestation	Ac.	38870/Yr	4528400	0				

1/ These are total costs. Annual equivalent values summarized on Tables 4-9 & 4-12

TABLE 4-4. Recommended Plan Elements, Costs, and Remaining Needs, Alabama Subarea

Component Needs	Plan Elements	Unit	1990 Amount Planned	1990 Installation Costs - $5/	1990 Remaining Needs 5/ 6/
Erosion Reduction					
Cropland	Residue Mgt. 1/	Ac.	152000	608000	357000
	Cover Crops 1/	Ac.	152000	5476000	357000
	Water Disposal Est. 4/	Ac.	250000	49905000	586000
	Water Disposal Maint. 1/	Ac.	250000	8733000	586000
	Rotation Crop W. Sod. 2/	Ac.	110000	6630000	260000
Pastureland	Planting 4/	Ac.	139000	23570000	327000
	Maintenance 1/	Ac.	139000	5498000	327000
	Water Disposal System 3/	Ac.	48000	330000	113000
Critical Areas					
Gully Class I	Critical Area Treatment	No.	9410	37282400	14115
Gully Class II	Grade Stabilization Structure	No.	2481	40872000	3722
Gully Class III	Grade Stabilization Structure	No.	660	29236700	990
Gully Class IV	Grade Stabilization Structure	No.	191	8718800	287
Roadbank	Stabilization	Ac.	12800	61094400	19200
Stripmine	Critical Area Treatment	Ac.	5600	17752000	8400
Recreation					
Hunting Areas	Land Lease	Ac.	55000	110000/yr	1109000
Facilities	Tables, Grills	No.	350	1500000	350
	Campsites	No.	335	670000	0
Wetlands	Preservation				
	Estuaries	Ac.	7000	Not evaluated	0
	River Swamps	Ac.	17600	Not evaluated	0
Wild & Scenic Rivers	Preservation	Miles	82	Not evaluated	0
Forest Land	Reforestation	Ac.	15000/yr	1747500	0

1/ Annual; 2/ 6 yr.; 3/ 10 yr.; 4/ 15 yr.; 5/ These are total costs. Annual equivalent values are summarized in Table 4-6; 6/ Units same as for "Amount Planned"

Table 3-2. Production of Major Crops, Pasture and Forest Products With the EQ Alternative, by Subarea, 1972, 1990, and 2020

Item	Units	1972	1990	2020
		---------------	1000	---------------
Florida Subarea				
Corn	bu.	13350	16200	24700
Cotton	bales	13	5	3
Peanuts	cwt.	1202	1700	2400
Soybeans	bu.	5377	9800	15500
Wheat	bu.	820	3500	5600
Tobacco	cwt.	258	318	420
Vegetables	cwt.	1822	3600	3700
Hay	tons	97	160	238
Pasture	AUMs	2334	4600	5000
Forest Products	cu.ft.	173371	255150	435560
Alabama Subarea 1/				
Corn	bu.	9501	23355	
Cotton	bales	35	13	
Peanuts	cwts.	3296	5293	
Soybeans	bu.	3058	6366	
Wheat	bu.	721	1375	
Hay	tons	148	253	
Pasture	AUMs	2713	3949	
Forest Products	cu.ft.	138754	200600	309400

1/ See Preface for note on absence of 2020 data for Alabama Subarea

Forest Land Use and Production - Environmental protection of forest lands in the Basins involves a wide range of forestry activities. Major problems include wildfires, insect and disease attacks, and site disturbances related to logging and reforestation operations. Current forestry programs in each of the state subareas are designed to solve these and other problems. Acceleration of current reforestation programs, however, is needed to achieve long-range goals for protecting soil and water resources.

Protection of the environment, especially water quality, can be achieved through reforestation of non-stocked and poorly stocked forest land. There are 1,536,000 acres in the Basins that are understocked. It is feasible to regenerate 56 percent of these acres under the Environmental Quality Plan. The accelerated planting program will reforest, over a 30-year period, 135,000 acres in the Alabama Subarea and 720,000 acres in the Florida Subarea, for a total of 855,000 acres.

It is essential that the reforestation program begin in 1990 in order to achieve the goal of 855,000 acres set for 2020. For the Alabama Subarea the task will involve an annual accelerated planting rate of 4,500 acres; for the Florida Subarea a rate of 24,000 acres annually must be achieved.

Preservation of Wetlands and Wild and Scenic Rivers - The environmental quality alternative includes acquisition, grants, leases, easements, zoning, and other land-use regulations to protect wetlands, both estuarine and riverine, and wild and scenic rivers. Financial and vocal assistance are needed from individuals, groups, and units of government. The priorities are those areas most likely to succumb to construction or development pressures. The floodplains are necessary for filtering or recycling nutrients, absorbing flood waters, and retaining silt and pesticides.

The population movement toward the coastlines puts the estuarine areas in a precarious position. The marshes produce untold numbers of fish, shrimp, and other salt water animals. The salt water sport and commercial fishermen rely on the marshes to provide for their welfare. These areas are to be protected by the same means as the wetlands.

The EQ Plan will supplement existing legislative protection of approximately 7000 acres of major estuary in the Perdido Bay. In addition, this plan will preserve approximately 17,600 acres of important wetlands along the Styx, Perdido, Pea, and Conecuh Rivers.

The EQ Plan provides for protection of 82 miles of scenic streams in the Alabama Subarea including portions of the Perdido, Styx, and Conecuh Rivers.

Threatened and Endangered Species - Although many threatened and endangered species of animals and plants have been identified, their required habitats have not been defined. Recovery teams have been established for each animal species so sightings can be verified and recommendations developed for protection and perpetuation of these species.

Economic Development Alternative

The objective of the economic development alternative is to increase the value of the nation's output of goods and services and to improve economic efficiency. Elements of the ED alternative were selected on the basis of their ability to promote economic development and to meet existing and projected demands for agricultural and forest products. The following discussion identifies some specific actions for the ED alternative.

Land Use and Production - Acreage and production of corn, soybeans, peanuts, wheat, and pasture are projected to expand beyond the future without development level to accomplish the basic goal of increased net income (Tables 3-3 and 3-4). In the Florida Subarea, this expansion is accomplished through several plan elements including land treatment, land use changes (woodland clearing), irrigation, and drainage. In the Alabama Subarea, the ED alternative includes land treatment and land use conversion (including woodland clearing) elements.

Land treatment will be intensified to accommodate an additional 7 percent of the land base for 1990 and 15 percent by 2020 in both subareas. This would increase the adequately treated area to 40 percent by 1990 and 55 percent by 2020. Soil resource groups with a severe erosion problem were identified in both subareas. As with the EQ alternative, the intensity of row crops on some soils will be reduced and rotations will be developed which would be effective in reducing erosion. The choice of which soils to treat, however, is based more on economic efficiency than on resource conservation criteria with the ED alternative.

In both subareas it is assumed that land treatment would have a favorable impact on yields. In the Florida Subarea, it is assumed that annual yields would be increased about 10 percent on soils receiving accelerated treatment. In the Alabama Subarea, yield increases are assumed to range from 5 to 25 percent. This is essentially the same impact as with the EQ alternative but will be realized on fewer acres. Yield increases, in addition to those stated above, will be due to other factors such as improved technology or new plant varieties.

Conservation planning assistance,with emphasis on land treatment, is assumed to bring about some favorable land use shifts. On erosive soils, row crop intensity is expected to decline, whereas, row crops will be increased on the better soils. In the Florida Subarea, the maximum shift is limited to plus or minus 20 percent of the future without development range. In the Alabama Subarea, land use conversion and crop distribution constraints vary by crop and by soil resource group to reflect the production capability and erosion hazard for each group.

Some additional woodland clearing is anticipated in both subareas with the ED alternative. In The Florida Subarea woodland clearing with the ED alternative is expected to be increased by 67,000 acres or double the future without development clearing. No additional clearing beyond the future without level is projected for 2020. In the Alabama Subarea, woodland clearing is expected to increase by 5 percent in 1990.

Table 3-3. Land Use, Present and Projected with ED Alternative, Northeast Gulf River Basin and Subareas, 1972, 1990, and 2020

Land Use	Florida Subarea			Alabama Subarea 1/		Northeast Gulf River Basins	
	1972	1990	2020	1972	1990	1972	1990
	1000 acres						
Cropland 2/	1379	1700	1820	1510	1556	2889	3256
Corn	310	412	431	271	444	581	856
Cotton	11	5	3	37	7	48	12
Soybeans	241	660	840	146	345	387	1005
Peanuts	51	65	110	193	211	244	276
Wheat	32	95	91	29	18	61	113
Hay	47	61	83	70	74	117	135
Minor Crops	48	70	90	72	45	120	115
Pasture	372	325	320	408	412	780	737
Idle	290	105	100	300	50	590	155
Pasture	627	558	500	674	723	1301	1281
Forest	9613	9200	8800	4484	4393	14097	13593
Miscellaneous	229	200	150	150	106	379	306
Agricultural Land	11848	11658	11270	6818	6778	18666	18436
Non-Agricultural Land	333	523	911	234	274	567	797
Total Land Area	12181	12181	12181	7052	7052	19233	19233

1/ See Preface for note on absence of 2020 data for Alabama Subarea

2/ Sum of cropland categories exceeds cropland total because of double cropping.

Table 3-4. Production of Major Crops, Pasture and Forest Products With the ED Alternative, by Subarea, 1972, 1990, and 2020

Item	Units	1972	1990	2020
		-------------	1000	-----------
Florida Subarea				
Corn	bu.	13350	26800	34300
Cotton	bales	13	6	4
Peanuts	cwt.	1202	2000	4180
Soybeans	bu.	5377	16100	25700
Wheat	bu.	820	3500	3200
Tobacco	cwt.	258	333	460
Vegetables	cwt.	1822	4400	5600
Hay	tons	97	180	258
Pasture	AUMs	2334	3300	3600
Forest Products	cu.ft.	173371	248400	567679
Alabama Subarea 1/				
Corn	bu.	9501	26400	
Cotton	bales	35	13	
Peanuts	cwts.	3296	5469	
Soybeans	bu.	3058	7394	
Wheat	bu.	721	603	
Hay	tons	148	140	
Pasture	AUMs	2713	1955	
Forest Products	cu.ft.	138754	228519	330303

1/ See Preface for note on absence of 2020 data for Alabama Subarea

In the Florida Subarea irrigation and drainage elements were also included in the ED alternative. Approximately 22,800 acres of cropland will be irrigated. Drainage of approximately 150,000 acres of forest land on Class IIw, IIIw, and IVw soils and conversion of these acres to crop production is planned.

Net returns from major crops and pasture are expected to increase 25 percent in the study area by 1990 with the ED alternative. The increase for the Florida Subarea is 21 percent and for the Alabama Subarea, 30 percent.

Forest Land Use and Production

Economic development of the Basin's forest resources can be achieved through a higher net annual growth rate per acre than currently prevailing (page 1-9). The opportunity to increase productivity can be reached through reforestation of the more productive sites included in the category of non-stocked and poorly stocked stands. An accelerated reforestation program will create a permanent base for maintaining productive levels to meet the deficits projected for 2020 (Table 1-4). This accelerated reforestation program will involve an annual planting rate of 15,000 acres in the Alabama Subarea and 38,870 acres in the Florida Subarea. Volume growth on these acres, added to the volume growth on the remaining forested acres will yield an annual volume of 897,982,000 cubic feet of forest products by 2020 (Table 3-4).

Drainage - In order to help meet the goal for the Florida Subarea of increasing net returns by 20 percent, the ED alternative includes woodland clearing and draining of 150,000 acres of soils in capability classes IIW, IIIW, and IVW, and converting them to crop production for the 1990 and 2020 plans. Large amounts of these soils are located throughout the subarea in various sized tracts. Drainage of these soils is necessary for successful crop production.

Irrigation - In the Florida Subarea, about 9800 acres of cropland will be irrigated to meet ED requirements by 1990 and 29,700 acres by 2020. In order to meet the additional goal of a 20 percent increase in net returns, 22,800 acres of crops will be irrigated cropland. Therefore, the total cropland acreages irrigated in the ED plan will be 32,600 in 1990 and 52,500 in 2020.

Public Water Supply - The public water supply component of the ED alternative in the Florida Subarea is related to the future water needs which are estimated to exist by 2020. Adequate sources of supply exist through 1990. The two areas in the Florida Subarea which will have a need for additional water are Fort Walton Beach and Quincy. The additional water needed in each of these areas can be provided by construction of reservoirs near the area of demand. Fort Walton Beach area needs can be provided for by a site on Turtle Creek and the Quincy area can be furnished by a site on Rocky Comfort Creek.

The public water supply component in the Alabama Subarea consists of the water needs for the Opelika area which will amount to 2.6 MGD by 1990. This need can be satisfied by construction of a reservoir on Little Uchee Creek but would lack 13.2 mgd in meeting the need by 2020. Other sites outside the Basins are being considered.

Recreation - The recreation plan for 1990 in the Florida Subarea includes 1995 additional picnic units; each consists of two tables, one shelter, one grill, and restroom facilities. Each unit will cost about $4,285 for a total of approximately $8,549,000. Annual benefits that will accrue from public use of the picnic areas are expected to be $14,364,000 from 7,182,000 activity occasions per year. By 2020, the benefits are expected to be $15,912,000 from an additional 2210 picnic units costing $9,470,000. The Alabama Subarea will need 350 additional units by 1990 which will cost about $1,500,000. The benefits from 756,000 activity occasions will be approximately $1,512,000 per year.

Although Florida will have a surplus in 1990, Alabama will need 335 additional campsites at a cost of $670,000. These will accommodate 150,000 visitors with annual benefits of $750,000. In 2020, Florida will require 5235 more campsites to provide for 5,235,000 additional campers with benefits of approximately $26,175,000. Costs of the campsites will be about $10,470,000.

Additional impoundments are needed in the Florida Subarea for increased water-based recreation in 2020. Recreational waters generally have more intensive use than do other types of waters. Fourteen impoundments, 12 of which were investigated primarily for municipal and industrial water and 2 for recreation, can supply additional recreational opportunities such as camping, picnicking, sailing, and canoeing. Costs of all the impoundments are approximately $31,000,000. At the rate of 200 users per acre, 2,063,000 activity occasions could be provided amounting to about $6,500,000 in annual benefits.

Operating expenses and maintenance costs vary for each facility but would reduce the net benefits somewhat. Five percent of construction costs is a reasonable annual operation, maintenance, and replacement figure.

Fresh water fishing - To meet the needs in Florida in 1990, it will be necessary to improve the management on all the man-made impoundments and ponds as well as on some of the natural waters. Selective stocking and adequate fertilizer application will ensure that there will be enough fishing opportunities for everyone. By 2020, all ponds, both natural and man-made, should be under intensive management. Construction will have to be accelerated in order to satisfy everyone's fishing desires. These ponds will increase the aesthetic values of the landscape.

Wildlife Habitat Enhancement - Acquisition, lease, and habitat improvement of wildlife areas will alleviate the pressure on existing outdoor recreation facilities by hunters, photographers, birdwatchers, and other users. Habitat management will include selective cutting of timberlands, controlled burning, and planting desirable wildlife plants. Upland game and non-game species feed on such domestic crops as corn, wheat, oats, clover, soybeans, velvet beans, cowpeas, millet, sorghum, and peanuts. Perennials such as lespedeza provide food and shelter at lower costs than the agricultural crops. Burning, in addition to reducing fire hazard and insect damage, encourages the growth of palatable deer browse. Cutting opens the canopy encouraging new low-growing vegetation favored by most animals.

Tables 3-5, 3-6, and 3-7 summarize the plan elements included in the EQ and ED alternatives for the Alabama and Florida Subareas. Included are the numbers of units planned, estimated costs, and remaining needs, or needs not expected to be satisfied by the alternative plans. Costs indicated on these tables are total costs. Annual equivalent values are shown in summary form on Tables 4-18, 4-19, and 4-20.

Table 3-5. Alternative Plan Elements, Costs, and Remaining Needs - Alabama Subarea - 1990

Component Needs	Plan Elements	ED Alternative Unit	ED Amount Planned	ED Installation Costs-$6/	ED Remaining Needs7/	EQ Alternative Unit	EQ Amount Planned	EQ Installation Costs-$6/	EQ Remaining Needs7/
Erosion Reduction									
Cropland	Residue Management1/	Ac.	52498	209990	449985	Ac.	263791	1055164	281202
	Cover Crops1/	Ac.	52498	1889928	449985	Ac.	263791	9496476	281202
	Water Disposal Est.3/	Ac.	87430	17486000	749401	Ac.	423763	34752600	463491
	Water Disposal Main.1/	Ac.	87430	3060050	749401	Ac.	423763	14831705	463491
	Rotation of crops w/sod2/	Ac.	38482	2308920	329737	Ac.	436650	26199000	477586
Pastureland	Planting4/	Ac.	70746	10611900	606226	Ac.	182517	27377550	199743
	Maintenance1/	Ac.	70746	2476110	606226	Ac.	182517	6388095	199743
	Water Disposal Sys.3/	Ac.	23037	1151850	197457	Ac.	71388	3569400	78083
Critical Areas									
Gully Class I	Critical Area Treat.5/					No.	15291	60582900	8234
Gully Class II	Grade Stab. Structure5/					No.	4032	66423200	2171
Gully Class III	Grade Stab. Structure5/					No.	1072	47487500	578
Gully Class IV	Grade Stab. Structure5/					No.	311	14196500	167
Roadbank	Stabilization5/					Ac.	20800	99278400	11200
Stripmine	Critical Area Treat.5/					Ac.	9100	28847000	4900
Recreation									
Hunting Areas	Land Lease1/	Ac.	55000	110000	1109000				
Facilities	Picnic Units	No.	350	1500000					
	Campsites4/	No.	335	670000					
Wetlands	Preservation								
	Estuaries					Ac.	7000	Not Evaluated	
	River Swamps					Ac.	17600	Not Evaluated	
Forest Land	Reforestation1/	Ac.	15000	1747500	0	Ac.	4500	344250	0
Wild & Scenic Rivers	Preservation					Miles	82	Not Evaluated	58
M&I	Water Supply5/	MGD	3.8	1630000	0				

1/ Annual; 2/ 6 yr.; 3/ 10 yr;. 4/ 15 yr.; 5/ 50 yr.

6/ These are total costs. Annual equivalent values are summarized on Table 4-20.

7/ Units same as for "Amount Planned".

Table 3-6. Alternative Plan Elements, Costs, and Remaining Needs - Florida Subarea - 1990

Component Needs	Plan Elements	ED Alternative Unit	ED Amount Planned	ED Installation Costs-$5/	ED Remaining Needs6/	EQ Alternative Unit	EQ Amount Planned	EQ Installation Costs-$5/	EQ Remaining Needs6/
Erosion Control									
Cropland	Cons. Cropping Sys.1/	Ac.	119000	2975000	1020000	Ac.	432000	10800000	472500
	Minimum Tillage1/	Ac.	38500	385000	985600	Ac.	110500	1105000	531800
	Contour Farming1/	Ac.	15500	77400	144400	Ac.	37200	186000	40700
Pastureland	Pasture Planting2/					Ac.	26400	1320000	6600
Forest land	Reforestation1/	Ac.	38870	4528400	0	Ac.	24000	1836000	0
Critical Areas									
Gully Class I	Critical Area Treat.3/					No.	54	214000	29
Gully Class II	Grade Stab. Struct.3/					No.	38	626000	21
Gully Class III	Grade Stab. Struct.3/					No.	27	1196000	15
Gully Class IV	Grade Stab. Struct.3/					No.	190	8673000	102
Roadbank	Stabilization3/					Ac.	1300	6205000	700
Stripmine	Critical Area Treatment3/					Ac.	11700	37089000	6300
Irrigation	Water Supply4/	Ac.Ft.	24400	2608000					
	Water MAnagement1/	Ac.	32600	391200					
Drainage3/		Ac.	150000	19039000	153000				
Recreation									
Fishing Areas	Improved Fish Mgt.1/	Ac.	95650	2870000					
Hunting Areas	Lease & improve for public hunting1/	Ac.	547000	273500	707000				
Recreation Fac.	Picnic Units2/	No.	1995	8549000					
Wetlands	Preservation								
	a. River Floodplain					Ac.	357800	Not Evaluated	750000
	b. Estuaries					Ac.	150000	Not Evaluated	
Wild & Scenic Rivers						Miles	96	Not Evaluated	195

1/ Annual; 2/ 15 yrs. 3/ 50 yrs. 4/ 20 yrs.

5/ These are total costs. Annual equivalent values are summarized in Table 4-18

6/ Units same as for "Amount Planned"

Table 3-7. Alternative Plan Elements, Costs, and Remaining Needs - Florida Subarea - 2020

Component Needs	Plan Elements	ED Alternative				EQ Alternative			
		Unit	Amount Planned	Installation Costs-$[5/]	Remaining Needs[6/]	Unit	Amount Planned	Installation Costs-$[5/]	Remaining Needs[6/]
Erosion Control									
Cropland	Cons. Cropping Sys.[1/]	Ac.	268500	6712500	805500	Ac.	697500	17437500	620000
	Minimum Tillage[1/]	Ac.	132500	1325000	927500	Ac.	301800	3018000	503000
	Contour Farming[1/]	Ac.	36100	180500	108400	Ac.	68300	341500	22800
Pastureland	Pasture Planting[2/]	Ac.	13200	660000	19900	Ac.	31400	1570000	1700
Critical Areas									
Gully Class I	Critical Area Treat.[3/]					No.	71	281300	12
Gully Class II	Grade Stabil. Str.[3/]					No.	50	823700	9
Gully Class III	Grade Stabil. Str.[3/]					No.	36	1594700	6
Gully Class IV	Grade Stabil. Str.[3/]					No.	248	11320700	44
Roadbank	Stabilization[3/]					Ac.	1700	8114100	300
Stripmine	Critical Area Treat.[3/]					Ac.	15300	48501000	2700
Irrigation	Water Supply[4/]	Ac.Ft.	39400	4200000	0				
	Water Management[1/]	Ac.	52500	630000	0				
Drainage [3/]		Ac.	150000	19039000	163000				
Recreation									
Fishing Areas	Improved Fish Mgt.[1/]	Ac.	201130	6034000					
	Pond Construction[3/]	Ac.	41130	41130000					
Hunting Areas	Lease & improve for public hunting[1/]	Ac.	1641000	820500	2140000				
Recreation Fac.	Picnic Units[2/]	No.	2210	9470000	0				
	Campsites, water, elec. grills, etc.[2/]	Ac.	5235	10470000	0				
Water-based Recreation	Impoundments[3/]	Ac.	7825	30668000	0				
Municipal & Industrial	Water Supply[3/]	MGD	25.8	2840000	0				

Table 3-7 (Continued)

Component Needs	Plan Elements	ED Alternative				EQ Alternative			
		Unit	Amount Planned	Installation Costs- $5/	Remaining Needs6/	Unit	Amount Planned	Installation Costs- $5/	Remaining Needs6/
Wetlands	Preservation of fresh-water swamps and marshes					Ac.	750000	Not evaluated	0
Wild & Scenic Rivers	Preservation					Miles	195	Not evaluated	
M&I Water Supply		MGD	25.8	2840000	0				

1/ Annual; 2/ 15 yr.; 3/ 50 yr; 4/ 20 yr.

5/ These are total costs. Annual equivalent values are summarized in Table 4-20.

6/ Units same as for "Amount Planned"

CHAPTER IV. RECOMMENDED PLAN

The Recommended Plan is a combination of the most desirable elements taken from the alternative plans (Figure 4-1). Selection of the elements is governed by a reasonable and rational perception of priorities and preferences of people living in the study area, their representatives, and the USDA study team. Due consideration is given to the beneficial and adverse effects of elements. The recommended actions, whose implementation would currently be subject to the respective states' permitting processes on a site specific basis,will continue to need the proper permits before any construction can begin. The following discussion identifies the specific components of the Recommended Plan:

Land Use and Production - The Recommended Plan is developed by selecting the most desirable, compatible, and cost effective elements from the two alternative plans. The elements affecting land use and production are land treatment, woodland clearing, reforestation, irrigation, and drainage, (Tables 4-1 and 4-2).

Land treatment is included in the Recommended Plan at the same level as the EQ Plan in the Florida Subarea. An additional 32 percent of the cropland and pasture will be adequately treated by 1990 and 52 percent by 2020. Emphasis is placed on crop rotations, crop residue management, and minimum tillage to reduce erosion to an acceptable level. Minimum tillage appears to be an effective erosion control technique. Five soil resource groups with high erosion potential, when cultivated, are recommended for land use conversion from row crops to less intensive uses. The land use conversion goal was 80 percent of current acreage by 1990 and 95 percent by 2020.

In the Alabama Subarea, land treatment is intensified to treat an additional 20 percent of the cropland and pasture by 1990. The adequately treated portion will be 53 percent of the cropland and pasture with this plan. Adequate cropland treatment includes terracing or drainage as needed, contour plowing, and crop residue or cover crops left on the land. These practices are considered as the first increment of treatment to reduce erosion to an acceptable level. Additional treatment needs are met through rotations, minimum tillage, or other treatment as needed. Minimum tillage is expected to become a more important practice in the Alabama Subarea in the future.

Conservation land treatment is expected to produce an average yield increase of approximately 10 percent for all crops and pasture compared with untreated or partially treated conditions. In both subareas, a conservation planning element is included to promote efficient use of the better soil resources and to improve the agricultural income. In addition to conversion of the more erosive cropland to pasture and forest, up to 30 percent of the forest land with potential for growing higher value crops was considered for clearing. Land resources with negative returns from crops and pasture should revert to woodland. The additional clearing reflected in the selected plan in 1990 is 75,300 acres in the Florida Subarea and 72,200 in the Alabama Subarea.

Table 4-1. Land Use, Present and Projected with Recommended Plan, Northeast Gulf River Basin and Subareas, 1972, 1990, and 2020

Land Use	Florida Subarea			Alabama Subarea		Northeast Gulf River Basins	
	1972	1990	2020	1972	1990	1972	1990
	1000 Acres						
Cropland 1/	1379	1600	1756	1510	1564	2889	3164
Corn	310	323	393	271	443	581	766
Cotton	11	5	3	37	7	48	12
Soybeans	241	575	826	146	321	387	896
Peanuts	51	64	88	193	206	244	270
Wheat	32	143	103	29	21	61	164
Hay	47	70	74	70	82	117	152
Minor Crops	48	68	90	72	43	120	111
Pasture	372	340	330	408	391	780	731
Idle	290	142	110	300	100	590	242
Pasture	627	550	520	674	694	1301	1244
Forests	9613	9308	8840	4484	4414	14097	13722
Miscellaneous	229	200	154	150	106	379	306
Agricultural Land	11848	11658	11270	6818	6778	18666	18436
Non-Agricultural Land	333	523	911	234	274	567	797
Total Land Area	12181	12181	12181	7052	7052	19233	19233

1/ Sum of cropland categories exceeds cropland total because of double cropping.

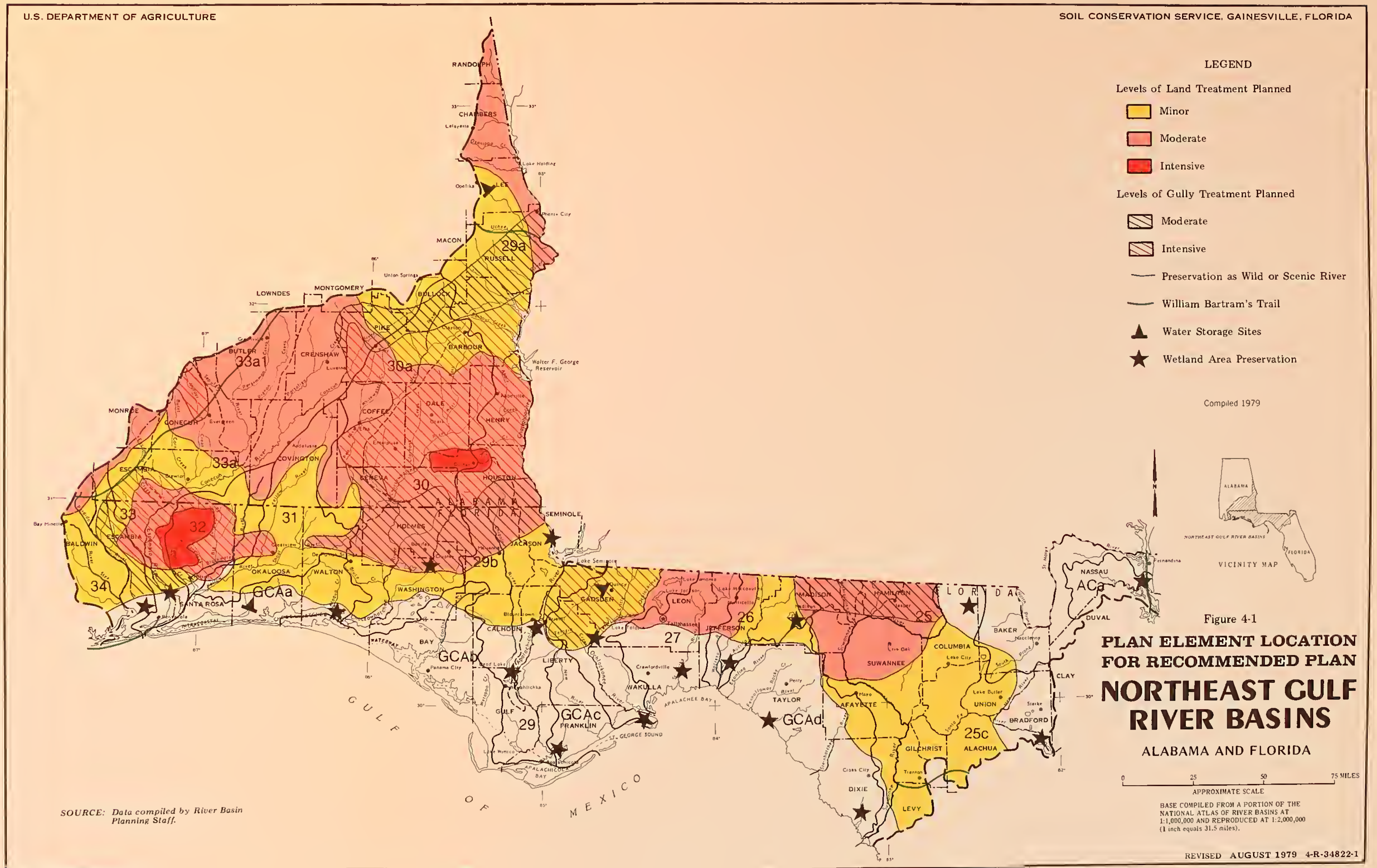


Figure 4-1

PLAN ELEMENT LOCATION FOR RECOMMENDED PLAN

NORTHEAST GULF RIVER BASINS

ALABAMA AND FLORIDA

USDA—SCS—FORT WORTH TEXAS 1979

REVISED JUNE 1974 4-R-31988-A

Table 4-2. Agricultural Production of Major Crops, Pasture and Woodland With the Recommended Plan by Subarea, 1972 and Projected to 1990 & 2020

Item	Units	1972	1990	2020
Florida Subarea				
Corn	bu.	13350	20300	34000
Cotton	bales	13	6	4
Peanuts	cwt.	1202	2100	3400
Soybeans	bu.	5377	14500	25700
Wheat	bu.	820	5300	3700
Tobacco	cwt.	258	333	450
Vegetables	cwt.	1822	3900	5000
Hay	tons	97	206	232
Pasture	AUM's	2334	3400	4400
Forest Products	cu.ft.	173371	248400	567679
Alabama Subarea				
Corn	bu.	9501	26300	
Cotton	bales	35	7	
Peanuts	cwts.	3296	5300	
Soybeans	bu.	3058	6900	
Wheat	bu.	721	700	
Hay	tons	148	152	
Pasture	AUM's	2713	4800	
Forest Products	cu.ft.	138754	228519	330303

In the Florida Subarea the irrigation and drainage elements included in the ED alternative are also included in the Recommended Plan. Approximately 28,500 acres of cropland and pasture with irrigation potentials are developed for irrigation and 150,000 acres of Class IIw, IIIw, and IVw woodland soils are drained and placed in crop production.

The study area is expected to realize a 20 percent increase in net returns from major crops and pasture with the Recommended Plan in 1990. Both subareas reflect increases - 27 percent in the Alabama Subarea, and 15 percent in the Florida Subarea (Table 4-3).

Forest Land Use and Production - Management of timber stands for high wood fiber production creates many of the conditions ideal for environmental enhancement, hence the emphasis on economic development in the Recommended Plan.

Increasing wood fiber production is to be achieved through restocking non-stocked forest land with growth capacity of at least 65 cubic feet per acre per year. Production increases will also occur where wildfire damage and insect and disease losses are reduced.

A major effort to improve utilization of harvested timber and to recover wood lost in land clearing will add a significant volume to the Basin's timber supply. The proposals in the Recommended Plan will not only satisfy the need for more timber for the future, but will also enhance the forest environment.

To achieve timber production goals for 2020, reforestation of non-stocked and poorly-stocked forest land should be accelerated annually by 15,000 acres in the Alabama Subarea and by 38,870 acres in the Florida Subarea, for 30 years, beginning in 1990. Planting can be accelerated by increased funding of existing programs.

Public Water Supply - The Florida Subarea has sources of public water which are estimated to be adequate through 1990. The Recommended Plan recognizes the additional needs which will exist by the year 2020 in the Ft. Walton Beach and Quincy areas of the Florida Subarea. The future need of the Ft. Walton Beach area can be provided by a reservoir on Turtle Creek, and the Quincy area need can be furnished by a reservoir on Rocky Comfort Creek.

The Alabama Subarea, with the exception of the area near Opelika, has sources of public water supply which are estimated to be adequate through 2020. A reservoir site on Little Uchee Creek could more than meet the need estimated by 1990 for the Opelika area, but will lack 13.2 mgd in meeting needs by 2020.

Table 4-3. Costs and Returns from Major Crops and Pasture, Without Plan, EQ Plan, ED Plan, and Selected Plan, Northeast Gulf River Basins, by Subarea, 1990

Item	Alabama Subarea				Florida Subarea				Northeast Gulf River Basins			
	Without Plan	EQ Plan	ED Plan	Recommended Plan	Without Plan	EQ Plan	ED Plan	Recommended Plan	Without Plan	EQ Plan	ED Plan	Recommended Plan
	thousand dollars											
Gross Returns	194174	196125	209242	204243	230343	223560	266637	252126	424517	419685	475879	456369
Cost of Production	128876	117454	124530	121233	140748	132490	158470	148647	269624	249944	283000	269880
Net Returns	65278	78671	84712	83010	89595	91070	108167	103479	154873	169741	192879	186489
Change From Without Plan (Percent)												
Gross Returns		1	8	5		-3	16	9		-1	12	8
Cost of Production		-9	-3	-6		-6	13	6		-7	5	0
Net Returns		21	30	27		2	21	15		10	25	20

Drainage - The drainage element for the Florida Subarea Recommended Plan is the same as for the ED Alternative - the clearing and draining of 150,000 acres of woodland soils in capability classes IIw, IIIw, and IVw, and the conversion of these acres to crop production. Removal of the water hazard from these soils makes them well suited for row crops. A minimum amount of conservation treatment for erosion control is needed because of the relatively level surface of these soils. Drainage can be accomplished on individual farms and as small group projects.

Irrigation - The irrigation element in the Recommended Plan for the Florida Subarea is identical to that of the ED Alternative. This includes a basic irrigation requirement to meed ED needs and an additional amount to help realize a 20 percent increase in net returns. Acreages irrigated as a result of the plan are estimated at 32,600 in 1990 and 52,500 in 2020. Irrigation is not included as a plan element in the Alabama Subarea.

Recreation

The Recommended Plan includes all of the recreation items in the alternative plans - picnic tables, campgrounds, water impoundments, wildlife habitat enhancement, improved fish management, and accelerated pond construction. More leisure time and a growing population, particularly in the Northeast Gulf Basins, are certain to place greater demands on the resources than can be met by any ongoing program.

Preservation of Wetlands

In the Alabama Subarea, 7,000 acres of salt marsh in Perdido Bay and 17,600 acres of riverine wetlands along the Styx, Perdido, Pea, and Conecuh Rivers are recommended for protection.

Recommended for protection in the Florida Subarea by 1990 are 357,800 acres of floodplain wetlands and 150,000 acres of salt marsh. In 2020, 750,000 additional acres of floodplain wetlands are recommended for preservation.

Further development of the Apalachicola River system for transportation is an unresolved issue with the state governments of Alabama, Georgia, and Florida. The complexity of the issue is beyond the scope of this USDA study and therefore, the Recommended Plan contains no solution of the issue. The three states have recently prepared a Proposal to Study for submission to the Water Resources Council. The study will focus on an evaluation of competing uses of the Apalachicola, Flint, and Chattahoochee Rivers, in order to develop management strategies.

Wild and Scenic Rivers

Recommended for inclusion in the wild and scenic rivers in the Alabama Subarea are portions of the Perdido, Styx, and Conecuh Rivers for a total of 82 miles. Ninety-six miles of rivers in Florida- the Blackwater, Itchetucknee, and Escambia, are recommended for wild and scenic rivers by 1990 in addition to the Suwannee, which will probably be in the national system by that time. Recommended for 2020 inclusion in the Florida state system are the Wacissa, Crooked, and Chipola Rivers.

Summary Tables

Tables 4-4 and 4-5 contain all of the Recommended Plan elements, the total costs of installing these elements, and remaining needs not satisfied by the Recommended Plan for the Alabama and Florida Subareas. Annual equivalent costs and benefits are displayed to the three accounts- Economic Development, Environmental Quality, and Social Well-Being, in terms of beneficial and adverse effects (Tables 4-6 through 4-14). Non-monetary effects may or may not be annual values. For example, the creation of 1000 activity occasions of recreational use is an annual value, whereas the preservation of a given acreage of wetland habitat is a perpetual value.

A summary comparison of the estimated annual erosion by major sources is shown in Tables 4-15 and 4-16. Similar data for sediment are included in Table 4-17. These data indicate a decrease in sediment loads in the Basins of about 30 percent by 1990, with the Recommended Plan.

The remainder of the tables in Chapter IV (Tables 4-18, 4-19, and 4-20) displays beneficial and adverse effects of all of the plan elements of the E.D. and E.Q. alternatives and the Recommended Plan. The last two columns of these tables indicate the differences in effects between the Recommended Plan and each alternative plan.

TABLE 4-4. Recommended Plan Elements, Costs, and Remaining Needs, Alabama Subarea

Component Needs	Plan Elements	1990			
		Unit	Amount Planned	Installation Costs - $5/	Remaining Needs5/ 6/
Erosion Reduction					
Cropland	Residue Mgt.1/	Ac.	152000	608000	357000
	Cover Crops1/	Ac.	152000	5476000	357000
	Water Disposal Est.4/	Ac.	250000	49905000	586000
	Water Disposal Maint.1/	Ac.	250000	8733000	586000
	Rotation Crop W. Sod.2/	Ac.	110000	6630000	260000
Pastureland	Planting4/	Ac.	139000	23570000	327000
	Maintenance1/	Ac.	139000	5498000	327000
	Water Disposal System3/	Ac.	48000	330000	113000
Critical Areas					
Gully Class I	Critical Area Treatment	No.	9410	37282400	14115
Gully Class II	Grade Stabilization Structure	No.	2481	40872000	3722
Gully Class III	Grade Stabilization Structure	No.	660	29236700	990
Gully Class IV	Grade Stabilization Structure	No.	191	8718800	287
Roadbank	Stabilization	Ac.	12800	61094400	19200
Stripmine	Critical Area Treatment	Ac.	5600	17752000	8400
Recreation					
Hunting Areas	Land Lease	Ac.	55000	110000/yr	1109000
Facilities	Tables, Grills	No.	350	1500000	350
	Campsites	No.	335	670000	0
Wetlands	Preservation				
	Estuaries	Ac.	7000	Not evaluated	0
	River Swamps	Ac.	17600	Not evaluated	0
Wild & Scenic Rivers	Preservation	Miles	82	Not evaluated	0
Forest Land	Reforestation	Ac.	15000/yr	1747500	0

1/ Annual; 2/ 6 yr.; 3/ 10 yr.; 4/ 15 yr.; 5/ These are total costs. Annual equivalent values are summarized in Table 4-6; 6/ Units same as for "Amount Planned"

Table 4-5. Recommended Plan Elements, Costs, and Remaining Needs, Florida Subarea

Component Needs	Plan Elements	1990 Unit	1990 Amount Planned	1990 Installation Costs-$1/	1990 Remaining Needs	2020 Unit	2020 Amount Planned	2020 Installation Costs-$1/	2020 Remaining Needs
Erosion Reduction									
Cropland	Cons.Cropping Sys.	Ac.	432000	10800000	472500	Ac.	697500	17437500	620000
	Minimum Tillage	Ac.	110500	1105000	531800	Ac.	301800	3018000	503000
	Contour Farming	Ac.	37200	186000	40700	Ac.	68300	341500	22800
Pastureland	Pasture Planting	Ac.	26400	1320000	6600	Ac.	31400	1570000	1700
Critical Areas									
Gully Class I	Critical Area Treat.	No.	33	131000	50	No.	46	182000	37
Gully Class II	Grade Stab. Str.	No.	24	395000	35	No.	32	527000	27
Gully Class III	Grade Stab. Str.	No.	17	753000	25	No.	23	1019000	19
Gully Class IV	Grade Stab. Str.	No.	117	5341000	175	No.	161	7349000	131
Roadbank	Stabilization	Ac.	800	3818000	1200	Ac.	1100	5250000	900
Stripmine	Critical Area Treat.	Ac.	7200	22824000	10800	Ac.	9900	31383000	8100
Irrigation	Water Supply	Ac.Ft.	24400	2608000	0	Ac.Ft.	39400	4200000	0
	Water Management	Ac.	32600	391200	0	Ac.	52500	630000	0
Drainage		Ac.	150000	19039000	153000	Ac.	150000	19039000	163000
Municipal & Industrial	Water Supply					MGD	25.8	2840000	0
Recreation									
Fishing Areas	Imp. fish mgt.	Ac.	95650	2870000/Yr	0	Ac.	201130	6034000/Yr	0
	Pond construction					Ac.	41130	41130000	
Hunting Areas	Lease & improve for public hunting	Ac.	547000	273500/Yr	707000	Ac.	1641000	820500/Yr	2140000
Facilities	Picnic Units	No.	1995	8548600	0	No.	2210	9470000	0
	Campsites					No.	5235	10470000	0
Water-based Rec.	Impoundments					Ac.	7825	30668000	0
Wetlands-Preserv.	Floodplains	Ac.	357800	Not evaluated	750000	Ac.	750000	Not evaluated	0
Wild & Scenic Rivers	Preservation	Mi.	96	Not evaluated		Mi.	195	Not evaluated	0
Forest Land	Reforestation	Ac.	38870/Yr	4528400	0				

1/ These are total costs. Annual equivalent values summarized on Tables 4-9 & 4-12

Table 4-6 . Recommended Plan, Economic Development Account, Alabama Subarea, 1990

Beneficial Effects		Adverse Effects	
Components	Measure of Effects ($1000) (Average Annual)	Components	Measure of Effects ($1000) (Average Annual)
Value to users of increased outputs of goods & services:		Value of resources required for a plan: 1/	
1. Gully erosion damage reduction	1,245	1. Critical area treatment	8,276
2. Sheet & rill erosion damage reduction	17,712 2/	2. Grade stabilization structures	5,618
3. Recreation		3. Recreation	346
Hunting	438	4. O&M - Recreation	109
Recreation facilities	1,814	5. O&M - Critical area treatment and grade stabilization structures	1,584
4. Utilization of unemployed labor resources	820		
		6. Reforestation work	1,748
5. Increased wood fiber production	2,422		
Total Beneficial Effects	24,451	Total Adverse Effects	17,681

1/ The cost of land treatment ($17,148,000), pasture maintenance ($5,498,000), and water disposal system maintenance ($8,733,000) are necessary costs for erosion reduction; however, the separate benefits accruing to these measures were not evaluated.

2/ Difference between net returns of Recommended Plan and Future Without (Table 4-3)

Table 4-7. Recommended Plan, Environmental Quality Account, Alabama Subarea, 1990

Components	Measure of Beneficial and Adverse Effects
A. Areas of natural beauty	1. Improve visual quality of landscape by treating 250,000 acres of cropland and restocking 450,000 acres of forest land.
	2. Disruption of tranquility of rural area by 972,100 activity occasions.
	3. Preserve 82 miles of wild and scenic rivers.
	4. Preserve 17,600 acres of floodplain.
	5. Preserve 7,000 acres of saltwater marsh.
B. Quality considerations of air, land, and water resources	1. Reduce sediment by 1.6 million tons annually.
	2. Reduce erosion on 250,000 acres of cropland and 50,500 acres of critical areas and gullies.
C. Biological resources	1. Enhance fish habitat by reducing sediment load.
	2. Maintain wetland species on 24,600 acres.
	3. Protect habitat for threatened and endangered species.
	4. Protect ecosystems along 82 miles of wild and scenic rivers.
	5. Improve woodland wildlife habitat on 55,000 acres.

Table 4-8. Recommended Plan, Social Well-Being Account, Alabama Subarea, 1990

Components	Measures of Beneficial and Adverse Effects
A. Real income distribution	1. Create 9200 temporary jobs during installation of erosion control and recreation facilities.
	2. Create 100 permanent jobs for maintenance of erosion control and recreation facilities.
	3. Create 100 temporary jobs during reforestation work.
B. Life, health, and safety	1. Create safer conditions along roadsides and other rural areas by installation of roadside and gully erosion control facilities.
C. Recreational opportunities	1. Provide atmosphere for more rewarding experiences for such activities as hiking, pleasure driving, bicycling.
	2. Create 972,100 activity occasions of recreational use.
	3. Enhance recreational use of streams due to improved water quality.
	4. Improve access for recreational use of 55,000 acres of forest land.

Table 4-9. Recommended Plan, Economic Development Account, Florida Subarea, 1990

Beneficial Effects		Adverse Effects	
Components	Measure of Effects ($1000) Average Annual	Components	Measure of Effects ($1000) Average Annual
Value to users of increased outputs of goods and services:		Value of resources required for a plan:[1/]	
1. Erosion Control, Irrigation, Drainage	13,967	1. Irrigation	635
		2. Drainage	1,358
2. Recreation		3. Recreation- Improved fish and wildlife management and recreation facilities	4,075
Hunting	7,089		
Fishing	25,826		
Recreation Facilities	14,364		
3. Utilization of unemployed labor resources	217	4. Critical area treatment	1,908
		5. Grade stabilization structures	460
4. Increased wood fiber production	4,291	6. O&M - irrigation & drainage	511
Total Beneficial Effects	65,754	7. O&M - recreation	427
		8. O&M - critical area treatment & grade stabilization structure	166
		9. Reforestation work	4,528
		Total Adverse Effects	14,068

1/ The cost of land treatment ($12,235,000) is a necessary cost for erosion reduction; however, the separate benefits accruing to land treatment measures were not evaluated.

Table 4-10. Recommended Plan, Environmental Quality Account, Florida Subarea, 1990

Components	Measure of Beneficial and Adverse Effects
A. Areas of natural beauty	1. Create 5400 acres of surface water.
	2. Improve visual quality of landscape by treating 432,000 acres of cropland and restocking 1,166,100 acres of forest land.
	3. Preserve 96 miles of wild and scenic rivers.
	4. Preserve 357,800 acres of floodplain.
	5. Preserve 150,000 acres of saltwater marsh.
	6. Disruption of tranquility of rural area by 16,884,500 visitor days.
B. Quality considerations of air, land, and water resources	1. Improve surface water quality by reducing sediment by 3.4 million tons/yr.
	2. Reduce erosion on 432,000 acres of cropland and 7,000 acres of critical areas and gullies.
C. Biological resources	1. Enhance fish habitat by reducing sediment.
	2. Perpetuate wetland species on 507,800 acres.
	3. Protect habitat for threatened and endangered species.
	4. Protect river ecosystems along 96 miles of wild and scenic rivers.
	5. Improve 95,650 acres of freshwater fish habitat.
	6. Eliminate woodland wildlife habitat on 155,400 acres.
	7. Improve wildlife habitat on 547,000 acres (better management, lease, purchase).
D. Irreversible or irretrievable commitments	1. Convert 5400 acres of wetland to irrigation reservoir pool.

Table 4-11. Recommended Plan, Social Well-Being Account, Florida Subarea, 1990

Components	Measures of Beneficial and Adverse Effects
A. Real income distribution	1. Create 2350 temporary jobs during installation period.
	2. Create 120 permanent jobs for maintenance of erosion control, irrigation, drainage, recreation facilities.
	3. Create 260 temporary jobs for reforestation work.
B. Life, health, and safety	1. Create safer conditions along roadsides and other rural areas by installation of roadside and gully erosion control facilities.
C. Recreational opportunities	1. Provide atmosphere for more rewarding experiences for such activities as hiking, pleasure driving, bicycling.
	2. Enhance recreational use of streams due to improved water quality.
	3. Create 16,884,500 activity occasions of recreational activities.
	4. Improve access for recreational use of 547,000 acres of forest land.

Table 4-12. Recommended Plan, Economic Development Account, Florida Subarea, 2020

Beneficial Effects		Adverse Effects	
Components	Measure of Effects ($1000) Average Annual	Components	Measure of Effects ($1000) Average Annual
Value to users of increased outputs of goods and services:		Value of resources required for a plan:1/	
1. Erosion control, irrigation, drainage	5,951	1. Irrigation	1,023
2. Municipal & Industrial Water	210	2. Drainage	1,358
3. Recreation		3. Municipal & Industrial Water	202
Hunting	21,267	4. Recreation	14,147
Fishing	63,117	5. Critical area treatment	2,625
Recreation facilities	40,836	6. Grade stabilization structures	634
4. Utilization of unemployed labor resources	465	7. O&M - irrigation & drainage	591
		8. O&M - Recreation	1,068
		9. O&M - Critical area treatment & grade stabilization structure	229
Total Beneficial Effects	131,846	10. O&M - Municipal & Industrial Water	8
		Total Adverse Effects	21,885

1/ The cost of land treatment ($20,968) is a necessary cost for erosion reduction; however, the separate benefits accruing to land treatment measures were not evaluated.

Table 4-13. Recommended Plan, Environmental Quality Account, Florida Subarea, 2020

Components	Measure of Beneficial and Adverse Effects
A. Areas of natural beauty	1. Create 57,655 acres of surface water
	2. Improve visual quality of landscape by treating 697,500 acres of cropland
	3. Preserve 195 miles of wild and scenic rivers
	4. Preserve 750,000 acres of freshwater swamps and marshes
	5. Disruption of tranquility of rural area by 44,739,000 visitor days
B. Quality considerations of air, land, and water resources	1. Reduce erosion on 697,500 acres of cropland and 12,700 acres of critical areas and gullies
	2. Improve surface water quality by reducing sediment by 4.4 million tons annually
C. Biological resources	1. Improve fish habitat on 201,130 acres of flatwater
	2. Enhance fish habitat by reducing sediment
	3. Perpetuate wetland species on 750,000 acres
	4. Protect habitat for threatened and endangered species
	5. Protect river ecosystems along 195 miles of wild and scenic rivers
	6. Develop fish habitat on 57,655 acres
	7. Improve wildlife habitat on 1,641,000 acres by management, lease, purchase
	8. Eliminate woodland wildlife habitat on 207,655 acres
D. Irreversible or Irretrievable commitments	1. Inundate 57,655 acres of woodland and riparian vegetation

Table 4-14. Recommended Plan, Social Well-Being Account, Florida Subarea, 2020

Components	Measures of Beneficial and Adverse Effects
A. Real income distribution	1. Create 5300 temporary semi-skilled jobs during installation period.
	2. Create 150 full-time jobs for maintenance of erosion control, irrigation, drainage, recreation facilities
B. Life, health, and safety	1. Provide safer conditions along roadsides and other rural areas by installation of roadside and gully erosion control facilities
C. Recreational opportunities	1. Provide atmosphere for more rewarding experiences for such activities as hiking, pleasure driving, bicycling
	2. Enhance recreational use of streams due to improved water quality

Table 4-15. Summary Comparison of Erosion Without Plan, ED Plan, EQ Plan, and Recommended Plan, 1990-Alabama Subarea (1000 Tons)

Component Needs	Without Plan	ED Plan	EQ Plan	Recommended Plan
Erosion Control				
Sheet and Rill				
Cropland & Pasture	15938	11470	8554	10674
Forest Land	2616	2620	2600	2620
Miscellaneous	825	1150	1150	1150
Non-Agricultural	1644	1644	1644	1644
Total - Sheet and Rill	21023	16884	13948	16088
Critical Area				
Gully	12681	12681	5286	8066
Roadside	3200	3200	1307	1932
Stripmine	1415	1415	572	890
Total - Critical Area	17296	17296	7165	10888

Table 4-16. Summary Comparison of Erosion Without Plan, ED Plan, EQ Plan, and Recommended Plan, 1990 and 2020, Florida Subarea (1000 Tons)

	1 9 9 0				2 0 2 0			
Component Needs	Without Plan	ED Plan	EQ Plan	Recommended Plan	Without Plan	ED Plan	EQ Plan	Recommended Plan
Erosion Control								
Sheet and Rill								
Cropland & Pasture	14809	14000	7200	9200	21351	14600	8300	10700
Forest Land	2156	2220	2135	2200	1297	2016	2016	2016
Miscellaneous	1421	1400	1500	1400	1530	1400	1600	1400
Non-Agricultural	3138	3138	3138	3138	4555	4555	4555	4555
Total Sheet and Rill	21524	20758	13973	15938	28733	22571	16471	18671
Critical Area								
Gully	733	733	257	440	984	984	148	443
Roadside	200	200	70	120	200	200	30	90
Stripmine	1810	1810	633	1086	1810	1810	272	814
Total Critical Area	2743	2743	960	1646	2994	2994	450	1347

Table 4-17. Summary Comparison of Sediment Yield for Without Plan, ED Plan, EQ Plan, and Recommended Plan, 1990 and 2020, by Subareas (1000 Tons)

Subarea	1990 Without Plan	1990 ED Plan	1990 EQ Plan	1990 Recommended Plan	2020 Without Plan	2020 ED Plan	2020 EQ Plan	2020 Recommended Plan
Alabama	5834	5345	3274	4230	7179			
Florida	8100	7800	4700	5700	10800	8300	5300	6400
Total Basins	13934	13145	7974	9930				

Table 4-18. Summary Comparison Between the Recommended Plan and Other Alternative Plans, 1990, Florida Subarea

Account	ED Alternative	EQ Alternative	Recommended Plan	Difference (Rec. Plan minus Alt.) ED Alt.	Difference (Rec. Plan minus Alt.) EQ Alt.
Economic Development					
Beneficial effects ($1000)	70,221	4,474	65,754	-4,467	+61,280
Adverse effects ($1000)	11,534	5,957	14,068	+2,534	+ 8,111
Net Beneficial effects ($1000)	58,687	-1,483	51,686	-7,001	+53,169
Environmental Quality					
Beneficial and adverse effects					
A. Areas of Natural Beauty	Create 5400 acres of surface water		Create 5400 acres of surface water	0	+5400 acres of surface water
	Improve visual quality on 119,000 acres of cropland and 1,166,100 acres forest land	Improve visual quality on 432,000 acres of cropland and 720,000 acres forest land	Improve visual quality on 432,000 acres of cropland and 1,166,100 acres of forest land	+313,000 acres visual quality	+446,100 acres visual quality
	Disruption of rural tranquility by 16,884,500 visitor days	0	Disruption of rural tranquility by 16,884,500 visitor days	0	Increase disruption of rural tranquility by 16,884,500 visitor days
	0	Preserve 96 miles of wild and scenic rivers	Preserve 96 miles of wild and scenic rivers	+96 miles of wild and scenic rivers	0
	0	Preserve 357,800 acres of flood plain	Preserve 357,800 acres of flood plain	+357,800 acres of flood plain	0
	0	Preserve 150,000 acres of salt-water marsh	Preserve 150,000 acres of salt-water marsh	+150,000 acres of salt-water marsh	0

Table 4-18 (Cont.)

Account	ED Alternative	EQ Alternative	Recommended Plan	Difference (Rec. Plan minus Alt.) ED Alt.	Difference (Rec. Plan minus Alt.) EQ Alt.
B. Quality considerations of air, land, and water resources	Reduce erosion on 119,000 acres of cropland	Reduce erosion on 432,000 acres of cropland & 11,400 acres of critical areas & gullies	Reduce erosion on 432,000 acres of cropland and 7000 acres of critical areas & gullies	-313,000 acres cropland erosion & -7000 acres critical area and gully erosion	+4400 acres of critical area and gullies
	Reduce sediment by .3 million tons annually	Reduce sediment by 3.4 million tons annually	Reduce sediment by 3.4 million tons annually	-3.1 million tons sediment annually	0
C. Biological resources	Improve 95,650 acres of fresh-water fish habitat		Improve 95,650 ac. of fresh-water fish habitat	0	+95,650 acres improved fish habitat
	Eliminate woodland wildlife habitat on 155400 acres (Conversion to cropland and reservoir)	0	Eliminate woodland wildlife habitat on 155,400 acres (Conversion to cropland and reservoir)	0	-155,400 acres woodland wildlife habitat
	Improve fish habitat by reduction of .3 million tons sediment annually	0	Improve fish habitat by reduction of 3.4 million tons of sediment annually	Improved fish habitat	0
	Improve wildlife habitat on 547,000 acres	0	Improve wildlife habitat on 547,000 acres	0	+547,000 acres improved wildlife habitat
	0	Maintain wetland species on 507,800 acres	Maintain wetland species on 507,800 acres	+507,800 acres wetland species maintained	0
	0	Protect habitat for threatened and endangered species	Protect habitat for threatened and endangered species	Increase in habitat protection for threatened & endangered species	0

Table 4-18 (Cont)

Account	ED Alternative	EQ Alternative	Recommended Plan	Difference (Rec. Plan minus Alt.) ED Alt.	Difference (Rec. Plan minus Alt.) EQ Alt.
	0	Protect river ecosystems along 96 miles of wild and scenic rivers	Protect river ecosystems along 96 miles of wild and scenic rivers	+96 miles river ecosystem protection	0
D. Irreversible or Irretrievable Commitments	Convert 5400 acres of wetlands to irrigation reservoir	0	Convert 5400 acres of wetlands to irrigation reservoir	0	-5400 acres wetlands
Social Well-Being					
A. Increase in the number and types of jobs	260 temp. jobs for reforestation. Create 830 temporary jobs during installation period & 110 permanent jobs for maintenance of irrigation, drainage, recreation facilities	160 temp. jobs for reforestation. Create 2470 temp. jobs during installation period & 17 permanent jobs for maintenance of erosion control facilities	260 temp. jobs for reforestation. Create 2350 temporary jobs during installation period & 120 permanent jobs for maintenance of erosion control, irrigation, drainage recreation facilities	+1520 temporary jobs and +10 permanent jobs	-20 temporary jobs and +103 permanent jobs
B. Life, health, and safety	0	Create safer conditions along roadsides & other rural areas by installation of roadside & gully erosion control facilities	Create safer conditions along roadsides & other rural areas by installation of roadside & gully erosion control facilities	Safer conditions along roadsides & other rural areas	0

Table 4-18 (Cont.)

Account	ED Alternative	EQ Alternative	Recommended Plan	Difference (Rec. Plan minus Alt.) ED Alt.	Difference (Rec. Plan minus Alt.) EQ Alt.
C. Recreational opportunities	Create 16,884,500 visitor days of recreational activ- ities	0	Create 16,884,500 visitor days of recreational activ- ities	0	+16,884,500 visitor days
	Enhance recreational use of streams due to improved water quality	Enhance recreation- al use of streams due to improved water quality	Enhance recreational use of streams due to improved water quality	+Recreational use of streams due to improved water quality	-Recreational use of streams due to improved water quality
	Improve access for recreational use of 547,000 acres of forestland	0	Improve access for recreational use of 547,000 acres of forestland	0	+547,000 acres improved access for recreational use
		Provide atmosphere for more rewarding experiences for such activities as hiking, pleasure driving,bicycling	Provide atmosphere for more rewarding experiences for such activities as hiking, pleasure driving, bicycling	+More rewarding recreational experiences	0

Table 4-19. Summary Comparison Between the Recommended Plan and Other Alternative Plans - 2020, Florida Subarea

Account	ED Alternative	EQ Alternative	Recommended Plan	Difference (Rec. Plan minus Alt.) ED Alt.	Difference (Rec. Plan minus Alt.) EQ Alt.
Economic Development					
Beneficial Effects ($1000)	140,218	607	131,846	- 8,372	+131,239
Adverse Effects ($1000)	18,397	33,372	21,885	+ 3,488	- 11,487
Net Beneficial Effects ($1000)	121,821	- 32,765	109,961	-11,860	+142,726
Environmental Quality					
Beneficial and Adverse Effects					
A. Areas of Natural Beauty	Create 57,655 acres of surface water	0	Create 57,655 acres of surface water	0	+57,655 acres surface water
	Improve visual quality of landscape by treating 268,500 acres of cropland	Improve visual quality of landscape by treating 697,500 acres of cropland	Improve visual quality of landscape by treating 697,500 acres of cropland	+429,000 acres improved visual quality	0
	Disruption of tranquility of rural area by 44,739,000 visitor days	0	Disruption of tranquility of rural area by 44,739,000 visitor days	0	Decrease in rural tranquility
	0	Preserve 195 miles of wild and scenic rivers	Preserve 195 miles of wild and scenic rivers	+195 miles of wild and scenic rivers	0
	0	Preserve 750,000 acres of freshwater swamps and marshes	Preserve 750,000 acres of freshwater swamps and marshes	+750,000 acres of freshwater swamps and marshes	0

Table 4-19 (Cont.)

Account	ED Alternative	EQ Alternative	Recommended Plan	Difference (Rec. Plan minus Alt.) ED Alt.	Difference (Rec. Plan minus Alt.) EQ Alt.
B. Quality considerations of air, land, and water resources	Reduce erosion on 268,500 acres of cropland	Reduce erosion on 697,500 acres of cropland and 19,600 acres of critical areas and gullies	Reduce erosion on 697,500 acres of cropland and 12,700 acres of critical areas and gullies	-429,000 acres of cropland erosion and -12,700 acres of critical area and gully erosion	+6900 acres of critical area and gully erosion
	Reduce sediment by 2,500,000 tons annually	Reduce sediment by 5,500,000 tons annually	Reduce sediment by 4,400,000 tons annually	-1,900,000 tons sediment annually	+1,100,000 tons sediment annually
C. Biological resources	Develop fish habitat on 57,655 acres		Reduce fish habitat on 57,655 acres		+57,655 acres fish habitat
	Improve fish habitat on 201,130 acres of flatwater	0	Improve fish habitat on 201,130 acres of flatwater	0	+201,130 acres improved fish habitat
	Improve fish habitat by sediment reduction	Improve fish habitat by sediment reduction	Improve fish habitat by sediment reduction	+Improvement in fish habitat	-Improvement in fish habitat
	Improve wildlife habitat on 1,641,000 acres through better management, lease, purchase	0	Improve wildlife habitat on 1,641,000 acres through better management, lease, purchase	0	+1,641,000 acres improved wildlife habitat
	0	Maintain wetland species on 750,000 acres	Maintain wetland species on 750,000 acres	+750,000 acres wetland species maintained	0
	0	Protect habitat for threatened and endangered species	Protect habitat for threatened and endangered species	Increase in habitat protection for threatened and endangered species	0

Table 4-19 (Cont.)

Account	ED Alternative	EQ Alternative	Recommended Plan	Difference (Rec. Plan minus Alt.) ED Alt.	Difference (Rec. Plan minus Alt.) EQ Alt.
C. (Cont.)	0	Protect river ecosystems along 195 miles of wild and scenic rivers	Protect river ecosystems along 195 miles of wild and scenic rivers	+195 miles protected river ecosystems	0
	Eliminate woodland wildlife habitat on 207,655 acres	0	Eliminate woodland wildlife habitat on 207,655 acres	0	-207,655 acres woodland wildlife habitat
. Irreversible or irretrievable commitments	Inundate 57,655 acres of woodland and riparian vegetation	0	Inundate 57,655 acres of woodland and riparian vegetation	0	-57,655 acres of woodland and riparian vegetation
. Social Well-Being					
. Real income distribution	Provide 3210 temporary and 140 permanent jobs	Provide 3230 temporary and 22 permanent jobs	Create 5300 temporary and 150 permanent jobs	+2090 temporary and +10 permanent jobs	+2070 temporary and +128 permanent jobs
. Life, health, and safety	0	Create safer conditions along roadsides and other rural areas by installation of roadside and gully erosion control facilities	Create safer conditions along roadsides and other rural areas by installation of roadside and gully erosion control facilities	+Safer conditions along roadsides and other rural areas	0

Table 4-19 (Cont.)

Account	ED Alternative	EQ Alternative	Recommended Plan	Difference (Rec. Plan minus Alt.) ED Alt.	Difference (Rec. Plan minus Alt.) EQ Alt.
C. Recreational Opportunities	Create 44,739,000 visitor days of recreational activities	0	Create 44,739,000 visitor days of recreational activities	0	+44,739,000 visitor days of recreational activities
	Enhance recreational use of streams due to improved water quality	Enhance recreational use of streams due to improved water quality	Enhance recreational use of streams due to improved water quality	+Recreational use of streams due to improved water quality	-Recreational use of streams due to improved water quality
	0	Provide atmosphere for more rewarding experiences for such activities as hiking, pleasure driving, bicycling	Provide atmosphere for more rewarding experiences for such activities as hiking, pleasure driving,bicycling	+More rewarding recreational experiences	0

Table 4-20. Summary Comparison Between the Recommended Plan and Other Alternative Plans - 1990, Alabama Subarea

Account	ED Alternative	EQ Alternative	Recommended Plan	Difference (Rec. Plan minus Alt.) ED Alt.	Difference (Rec. Plan minus Alt.) EQ Alt.
1. Economic Development					
Beneficial effects ($1000)	24,215	17,436	24,451	+236	+7,015
Adverse effects ($1000)	2,324	24,520	17,681	+15,357	-6,839
Net Beneficial effects ($1000)	21,891	-7,084	6,770	-15,121	+13,854
2. Environmental Quality					
Beneficial and adverse effects					
A. Areas of Natural Beauty	Improve visual quality of landscape by treating 87,430 acres of cropland and restocking 450,000 acres of forest land	Improve visual quality of landscape by treating 436,650 acres of cropland and restocking 135,000 ac. of forest land	Improve visual quality of landscape by treating 250,000 acres of cropland and restocking 450,000 acres of forest land	+162,570 acres improved visual quality	+128,350 acres improved visual quality
	Disruption of tranquility of rural area by 972,100 activity occasions	0	Disruption of tranquility of rural area by 972,100 activity occasions	0	Decrease in rural tranquility due to 972,100 activity occasions
	0	Preserve 82 miles of wild & scenic rivers	Preserve 82 miles of wild & scenic rivers	+82 miles of wild and scenic rivers	0
	0	Preserve 17,600 acres of flood plain	Preserve 17,600 acres of flood plain	+17,600 acres of flood plain	0
	0	Preserve 7000 ac. of salt marsh	Preserve 7000 ac. of salt marsh	+7000 acres of salt marsh	0

Table 4-20 (Continued)

Account	ED Alternative	EQ Alternative	Recommended Plan	Difference (Rec. Plan Minus Alt.)	
				ED Alt.	EQ Alt.
B. Quality considerations of air, land, and water resources	Reduce erosion on 87,430 acres of cropland	Reduce erosion on 436,650 acres of cropland and 82,190 acres of critical areas and gullies	Reduce erosion on 250,000 acres of cropland and 50,500 acres of critical areas and gullies	-162,570 acres of cropland erosion and -50,500 acres of critical area and gully erosion	+186,650 acres of cropland erosion and +31,690 acres of critical area and gully erosion
	Reduce sediment by 489,000 tons annually	Reduce sediment by 2,560,000 tons annually	Reduce sediment by 1,600,000 tons annually	-1,111,000 tons sediment	+960,000 tons sediment
C. Biological resources	Improve woodland wildlife habitat on 55,000 acres	0	Improve woodland wildlife habitat on 55,000 acres	0	+55,000 acres improved woodland wildlife habitat
	Enhance stream fishery by reduction of sediment	Enhance stream fishery by reduction of sediment	Enhance stream fishery by reduction of sediment	+Improvement in fish habitat	-Improvement in fish habitat
	0	Maintain wetland species on 24,600 acres	Maintain wetland species on 24,600 acres	+24,600 acres wetland species	0
		Protect habitat for threatened and endangered species	Protect habitat for threatened and endangered species	+Protection of threatened and endangered species habitat	0
		Protect ecosystems along 82 miles of wild and scenic rivers	Protect ecosystems along 82 miles of wild and scenic rivers	+82 miles of protected wild and scenic rivers	0

Table 4-20. (Cont.)

Account	ED Alternative	EQ Alternative	Recommended Plan	Difference (Rec. Plan minus Alt.) ED Alt.	Difference (Rec. Plan minus Alt.) EQ Alt.
3. Social Well-Being A. Real income distribution	Provide 117 temporary jobs during installation of recreation facilities, 38 permanent jobs for maintenance, and 100 temporary jobs for reforestation	Provide 14,770 temporary jobs during installation of erosion control, 100 permanent jobs for maintenance and 30 jobs for reforestation	Provide 9,200 temporary jobs during installation of recreation and erosion control facilities, 100 permanent jobs for maintenance; 100 temp. jobs for reforestation	+9,083 temporary and 62 permanent jobs	-5,500 temporary jobs
B. Life, health, and safety	0	Create safer conditions along roadsides and other rural areas by installation of roadside and gully erosion control facilities	Create safer conditions along roadsides and other rural areas by installation of roadside and gully erosion control facilities	Safer conditions along roadside and other rural areas	0
C. Recreational opportunities	Create 972,100 activity occasions of recreational use	0	Create 972,100 activity occasions of recreational use	0	+972,100 activity occasions of recreational use
	Enhance recreational use of streams due to improved water quality	Enhance recreational use of streams due to improved water quality	Enhance recreational use of streams due to improved water quality	+Recreational use of streams due to improved water quality	-Recreational use of streams due to improved water quality
	Improve access for recreational use of 55,000 acres of forest land	0	Improve access for recreational use of 55,000 acres of forest land	0	+55,000 acres improved access for recreational use
	0	Provide atmosphere for more rewarding experiences for such activities as hiking, bicycling, pleasure driving	Provide atmosphere for more rewarding experiences for such activities as hiking, bicycling, pleasure driving	+More rewarding recreational experiences	0

CHAPTER V. OPPORTUNITIES TO IMPLEMENT 1990 PORTION OF THE RECOMMENDED PLAN

The Recommended Plan includes a combination of elements that emphasizes economic development and environmental quality. Opportunities for implementation of these measures exist through a variety of federal, state, and local programs. The priorities and schedule for implementation depend upon the interest and willingness of local units of government and organizations to initiate requests for assistance and to assume local leadership and other responsibilities as appropriate.

Technical and financial assistance for most plan elements is available through existing programs of local, state, and federal agencies. However, significant increases in levels of funding and some rearranging of priorities will be needed. Some plan elements may be implemented through a cooperative effort involving more than one program. The development of more detailed plans under various existing programs and authorities will be necessary to implement the elements of the Recommended Plan.

Additional information on opportunities to implement specific components of the Selected Plan is as follows:

Land Use and Production

Land treatment and land use adjustments can be accomplished through existing programs of USDA, provided adequate technical and financial assistance are available. Present levels of assistance are not adequate to attain the rate of implementation specified in the Recommended Plan.

Land use changes are primarily those required to minimize soil erosion, such as shifting crops from the more erodable soils and replacing them with pasture. Land treatment recommendations are also related to soil erosion control. Acceleration of technical assistance through the Conservation Operations Program of the Soil Conservation Service and cost-share assistance through the Agricultural Conservation Program of Agricultural Stabilization and Conservation Service could be used to implement the recommended level of conservation activities. Increased production to meet the goal of increased net income can also be attained through the above programs and through technology and education provided by agricultural research and extension programs.

Forest Land Use and Production

Currently, the state foresters of Alabama and Florida are directing USDA-cooperative programs designed to protect and develop forest resources in their respective states. These programs are adequate to meet organizational needs for implementing an accelerated plan.

Acceleration of reforestation projects, however, will require additional funding in the amount of 4.5 million dollars annually for 30 years in the Florida Subarea. The plan recommended for the Alabama Subarea will require an annual expenditure of 1.1 million dollars (1978 dollars) for 30 years.

Increased funding for cost-sharing programs will be required in order to insure response by forest landowners to their state's reforestation program.

Erosion and Sediment Control

The most alarming problem in the Northeast Gulf Basins is erosion of cropland and pastureland. This problem is most persistent in the Alabama Subarea and in the most westerly counties of the Florida Subarea. General location of erosion and sediment problems are illustrated by Figures V-1, V-2, and V-3 of Volume I, Northeast Gulf River Basins. More specific location is on file at the District Conservationist's office in each county.

The Conservation Operations (CO) program is administered by the Soil Conservation Service by authority of Public Law 74-46, 49 Statute 163 (16 USC 590 a-f,g). This program is designed to provide assistance to reduce soil erosion, solve soil, water, and agricultural waste management problems, bring about adjustments in land use, and reduce damage caused by excess water and sedimentation. Technical assistance is available through and in cooperation with conservation districts. These districts are formed under authority of state laws and are operated and controlled by local citizens. This assistance includes on-site planning assistance in making erosion control plans. The plans are based on a soil survey and interpretations for the intended uses and needed conservation treatment. On-site application assistance is also provided to help land users apply and maintain conservation practices.

There is no direct cost-share under the Conservation Operations program for the application of erosion control practices; however, cost-share is available under the Agricultural Conservation Program (ACP), administered by the Agricultural Stabilization and Conservation Service.

The effectiveness of the conservation programs is hampered by personnel ceilings and uncertainty of annual funding. To implement the erosion and sediment control practices contained in the 1990 part of the Recommended Plan, acceleration of the CO and ACP is needed. Soil and water conservation district supervisors could assume leadership in this. The quantified plan elements could serve as a basis for annual and long-range goals for acceleration of these programs at the district level.

The Rural Clean Water Program (RCWP) can have a substantial effect on erosion and sedimentation; although its primary objective is to improve water quality in rural areas. The RCWP is authorized by Section 208(j) of the Federal Water Pollution Control Act (P.L. 92-500), as amended).

This program is to be implemented on a project basis. To be eligible for financial and technical assistance, a proposed RCWP project area must be included in an approved agricultural portion of a 208 water quality management plan, and must have agricultural nonpoint source water quality problems. Only the highest priority RCWP project areas, where adequate participation of land owners or operators is assured, will receive consideration for funding. RCWP is only applicable to privately owned land. Any owner or operator whose land or activity is contributing to the area's agricultural nonpoint source water quality problems and who has an approved water quality plan is eligible to enter into a long-term (5 to 10 years) RCWP contract with the agency designated to administer the program in that project area. The RCWP contract will include best management practices to control agricultural nonpoint source pollution for improved water quality.

Where practicable, the SCS Administrator will enter into agreements with soil conservation districts, State soil and water conservation agencies, or State water quality agencies to administer all or part of the program for a project area. Where this is not practicable, USDA will administer the program for a project area, and the Administractor will enter into agreements with the Agricultural Stabilization and Conservation Service (ASCS) to administer part of the program in such project areas.

That portion of the erosion and sediment control element of the Recommended Plan having been identified as a high priority critical area by a 208 plan can be implemented under the RCWP. Soil and water conservation districts can assume leadership for implementation.

Another ongoing program under which the erosion and sediment control element of the Recommended Plan may be implemented is the Small Watershed Program. This program is authorized by the Watershed Protection and Flood Prevention Act (Public Law 83-566, as amended). This is a project type program, administered by the Soil Conservation Service with sponsorship by local organizations. Watershed plans which contain only land treatment are acceptable. Technical and cost-share assistance is available to install enduring practices to reduce erosion and sedimentation. Long-term agreements are to be used to install most accelerated land treatment. Local soil and water conservation districts can assume leadership for implementing the erosion and sediment control element of the Recommended Plan under the small watershed program.

The Agricultural Element of the 208 statewide water quality management plans identifies watersheds having known or potential nonpoint source pollution stemming from certain agricultural land uses and practices. Intense cultivation contributes to increased potential for nonpoint source pollution; the thrust of the Agricultural Element is to identify those activities contributing to water quality degradation and to develop beneficial management measures.

Agricultural Drainage

The drainage component of the Recommended Plan involves a relatively small percent of the total study area. This consists of scattered areas of soils having a water hazard severe enough to require drainage before successful crop production can be achieved. The drainage can be provided by installing surface and subsurface drainage and associated conservation treatment.

Implementation of the necessary drainage systems will, in many cases, be accomplished in total by individual landowners, however, technical assistance is available through, and in cooperation with, conservation districts. The Soil Conservation Service furnishes technical assistance according to the program needs and priorities established by the conservation districts which are state entities. The authority for this assistance is Public Law 74-46.

Irrigation

Technical assistance will be available from the Soil Conservation Service and the Cooperative Extension Service whenever there is a need for increased irrigation. Irrigation can increase production and may reduce some of the need for land use conversion from forest land or pasture to crops.

The combined use of both ground water and surface water should be adequate to meet all irrigation requirements through 2020 if properly managed. Good management of surface water will include the construction of additional reservoirs to store excess runoff until needed during drought periods. Ground water surveillance will be necessary to insure that the water table is not lowered to the point where salt water contamination becomes a problem.

Public Water Supply

The Recommended Plan includes three impoundment sites as the public water supply component. Each of the two sites in the Florida Subarea will be able to provide for the demand expected to exist in their respective service areas by the year 2020. The site located in the Alabama Subarea, near Opelika, will be able to provide for the need past the year 1990. Implementation will be accomplished by utilizing assistance programs such as the Consolidated Farm and Rural Development Act, PL 92-419.

Recreation

Government agencies such as U. S. Forest Service, National Park Service, Fish & Wildlife Service, State Park Service, Department of Transportation, and local governments, provide picnic tables and associated facilities. The demand for picnicking can be easily met if money is available because such sites, which are compatible with other land-using activities, require relatively small amounts of land.

Camping is a fast growing recreational activity whose demand can mostly be met by the public agencies. However, the private sector can provide more sophisticated facilities than the government. Private campgrounds generally are located on or near major highways while the public camps are more remote. In addition to the agencies above which install facilities on their lands, funds for outdoor recreation are also available from the Land & Water Conservation Fund, U. S. Department of Housing and Urban Development, Florida Outdoor Land Acquisition Program, Soil Conservation Service in Watershed and RC&D Projects, Farmers Home Administration, and other state and federal entities.

Multiple purpose impoundments can be used for recreation in addition to flood control, municipal and industrial water, and irrigation. The Soil Conservation Service, U.S. Army Corps of Engineers, Florida Game & Fresh Water Fish Commission, and Alabama Department of Conservation and Natural Resources are among the agencies which have been involved in constructing impoundments. Usually, those agencies work with local governments or quasi-governmental agencies who ordinarily initiate action for assistance.

Fresh Water Fishing

Intensive management and an increased rate of construction of ponds will be necessary to provide for the ever-growing number of fishermen. The Soil Conservation Service and the Agricultural Stabilization and Conservation Service collaborate in helping the landowners build ponds. SCS provides the technical expertise and ASCS assists financially. The U.S. Fish and Wildlife Service and State Hatcheries can provide fingerlings for stocking the ponds, usually through the local SCS or extension offices. The Florida Game and Fresh Water Fish Commission and the Alabama Department of Conservation and Natural Resources primarily work on public waters. These agencies get their funds from license fees, appropriations, and grants. Taxes on fishing equipment (Dingell-Johnson Act) also go toward research and fish habitat improvement. The agencies and SCS can help the pond owner with problems such as over or under stocking, weed control, fish balance, and fertilization.

Wildlife Habitat

The Florida Game and Fresh Water Fish Commission and the Alabama Department of Conservation and Natural Resources are the primary agencies concerned with wildlife. Their finances come from licenses, appropriations, and federal grants. The state wildlife agencies are custodians of all our wild animals and therefore enforce the laws, manage wildlife on state lands, educate the public, and encourage management on private lands.

Acquisition or lease of more lands and improved environmental manipulation will improve the opportunities for harvesting game. The game commissions will be able to obtain more land if the hunters are willing to pay more to enjoy their sport. License and management area fees are expected to rise. Additional funds will become available through taxes on firearms and ammunition (Pittman-Robertson Act). Landowners will lease their land to private clubs unless the state can provide more benefits such as more money and increased monitoring to prevent fires, vandalism, game violations, and other harmful acts. Small landowners can obtain management help from SCS, county foresters, and county extension agents. ASCS can provide financial assistance for planting food plots. Access to private lands will help alleviate pressures on public hunting areas.

Flood Damage Reduction

Local governments should provide leadership necessary to protect and preserve important natural areas and initiate regulations to prevent flood damage and promote orderly development. Flood insurance provided through the U. S. Department of Housing and Urban Development requires such regulation. Flood hazard information may be furnished by USGS, USDA, and the Corps of Engineers.

Protection of Wetlands

The states must identify and determine the most important wetlands for preservation. Regulations in the form of zoning, outright purchase, or long-term lease should be implemented. The Coastal Zone Management Act will provide funds to states for assistance once they have enacted their own management plans. Protection of inland wetlands can be provided through the Land and Water Conservation Act, the Clean Air Act, the Water Pollution Control Act, and the Flood Insurance Act.

Threatened and Endangered Species

Environmental organizations such as the Audubon Society, the Sierra Club, the Wildlife Federation, and the Nature Conservancy are active in protecting threatened and endangered species and their habitat as are the state and federal agencies. The Endangered Species Act prevents the agencies and states from destroying species or their habitats with actions funded by the government. The act was also intended to supply funds to state governments for species and habitat protection but the money has not yet been appropriated. The agencies most involved are the Florida Game and Fresh Water Fish Commission, the Alabama Department of Conservation and Natural Resources, and U. S. Fish and Wildlife Service.

Wild and Scenic Rivers

Recreational and aesthetic potentials of unspoiled, natural rivers and streams are practically unlimited. Because rivers are so important in their natural state, the National Wild and Scenic River Act was enacted. In the Basins, only the Suwannee River has been extensively studied. Although the study was favorable, there was not enough local support nor was there enough financial help available from the Federal Government. Florida has its own Scenic and Wild Rivers Program but has encountered the same problems that beset the National program.

The Heritage Conservation and Recreation Service of the Department of Interior and the Division of Recreation and Parks are responsible for the National and Florida's Scenic and Wild Rivers program respectively. As of the present, Alabama has no statewide wild & scenic rivers program.

Resource Utilization Potential

Expanded utilization of the basic agricultural resources - land, labor, and capital - is possible in the study area. Increased use of the resources will be encouraged by available labor and improved mechanization. Some labor problems during harvest time may occur for some specialty crops, however. Capital has been a problem in the past, especially for small operators. With expected expansion of average farm size and improvements in agricultural credit facilities, capital should not present a major obstacle to growth. The main restriction to agricultural expansion is the expected level of technology and the availability of land. With conventional crop rotations and expected management, the land resource is projected to be approaching full utilization by 1990 and to be over-taxed by 2020. With application of new technologies and continued application of successful practices, the land resource could be utilized much more intensively in a manner compatible with environmental goals.

Irrigation, drainage, increased row cropping intensity combined with erosion control techniques, land use shifts including woodland clearing and reforestation, and multiple cropping are ways of more fully utilizing the land resource. The multicropping of vegetables and small grains followed by corn or soybeans reflects the limited acreage of double cropping presently practiced. Early corn and soybean varieties being developed and the long growing season in the study area suggests that with the right economic incentive, almost all major crops could be grown in some type of multiple cropping system.

Expansion of agriculture through cultivation of more acres is very limited, however, from a physical view the potential for more intensively utilizing the available land resource is substantial in the Basins. Utilization of some of that potential is expected or included in the various plans.

Reforestation

Rehabilitation of non-stocked and poorly stocked forest lands will increase wood production and help protect water quality. Public law 92-500 (Clean Water Act) provides for financial assistance in carrying out provisions of this act. The decision to provide funds under this public law will add impetus to state reforestation programs.

Legislation

Federal Programs

Federal Aid in Sport Fish Restoration (Dingell-Johnson Act); 64 Stat. 430, as amended (16 U.S.C. 777-777k); Cost-sharing for fish restoration and management; USDI (FWS).

Federal Aid in Wildlife Restoration (Pittman-Robertson Act); 50 Stat. 917, as amended (16 U.S.C. 669-669i); Cost-sharing for land acquisition, development, research, and coordination; USDI (FWS).

Endangered Species Act; PL 93-205 (16 U.S.C. 1531-43); Animal and habitat surveys, research, management, land acquisition, protection, and public education; USDI (FWS)

Coastal Zone Management Act; PL 92-583 as amended (PL 94-370); preserve, protect, maintain, and enhance resources of the coastal zone; Department of Commerce (NOAA) and USDA (SCS).

Land and Water Conservation Fund; PL 88-578 as amended; Acquisition and development of picnic areas, city parks, outdoor swimming pools, campgrounds, tennis courts, launching ramps, roads, and water supplies associated with outdoor recreation; USDI (HCRS)

National Historic Preservation Act; PL 89-665 as amended; matching funds for acquisition and development of historic properties; USDI (HCRS)

Watershed and Flood Prevention Act (Small Watershed Program); PL 83-566; Technical and financial assistance to protect, develop, and utilize land and water resources in small watersheds; USDA (SCS, FmHA)

Soil Conservation and Domestic Allotment Act; PL-74-46; National soil and water conservation program; USDA (SCS, ASCS).

Clean Water Act; PL 92-500; amended by Rural Clean Water Act 95-217; assist States in establishing and maintaining measures to prevent and control water pollution; EPA, USDA, HEW

Agriculture and Consumer Protection Act; PL 93-86; Cost-sharing for soil and water conservation, pollution abatement, timber production (FIP) etc. USDA (SCS, ASCS, FS)

Federal Programs (Cont.)

Wild and Scenic Rivers Act; PL 90-542; Rivers with certain attributes will be preserved and protected to maintain free-flowing state; USDI (HCRS), USDA (USFS)

National Wilderness Act; PL 88-577; Preservation and protection of natural areas on Federal lands; Management by jurisdictional agency

National Flood Insurance Act; PL 90-448; guide development away from flood-prone areas; HUD

National Environmental Policy Act; PL 91-190; determined policy to prevent or eliminate environmental damage; CEQ

Air Quality Act; PL 90-148; Cooperative action to protect and enhance the quality of air resources; EPA

Migratory Bird Conservation Act; 16 USC 715-715r; Acquisition, development, and management of suitable areas for use as migratory bird reservations or preserves; USDI (FWS)

Open Space Lands; 42 USC 1300-1500d-i; Grants to states and local public bodies to provide open space, preserve areas of historical or architectural value, and prevent uncontrolled growth in urban areas; HUD

Sikes Act; PL 93-452; Fish and Wildlife conservation on military bases; DOD, USDI

Migratory Bird Hunting Stamp Act (Duck Stamp Act); 16 USC 718; Funds, derived from sale of stamps required to hunt migratory bird species, are used to acquire refuges and waterfowl production areas; USDI (FWS)

Fish and Wildlife Coordination Act; PL 85-624 (16 USC 661-666c); Gives equal consideration to wildlife with other features of water-resource development programs; USDI (FWS)

Water Bank Act; PL 91-559; to conserve surface waters, preserve and improve migratory waterfowl habitat and wildlife resources, and secure other environmental benefits and agricultural production limitations; USDA (ASCS, SCS)

Food and Agriculture Act; PL 87-703; Provides loans to local agencies for enacting RC&D plans; USDA (SCS, FmHA)

Consolidated Farm and Rural Development Act; PL 92-419; Loans, grants, matching funds and other assistance for water and waste systems to political subdivisions; loans and other assistance to farmers for normal farming practices; USDA (FmHA, SCS), EPA, HEW

Rural Abandoned Mine Program; PL 95-87; Reclamation of inadequately reclaimed surface mines; USDA (SCS, FmHA)

Alabama Statutes

Coastal Area Act (Title 9-7-1); Implements Federal Coastal Zone Management Act. Coastal Area Board

General Provisions (Title 9-2-1); Creates Department of Conservation and Natural Resources

Comprehensive Land Management and Use Program in Flood-Prone Areas Act of 1972 (No. 119); provides counties power to enact zoning, building codes, and health regulations to minimize damages caused by floods

Environmental Improvement Authorities Act of 1969 (Title 9-6-2); Provides authority to assist public and private corporations in the control, abatement, or prevention of water, air, or environmental pollution (Department of Conservation & Natural Resources)

Surface Mining Act of 1969 (No. 399); regulation of surface mining of clay, sand, gravel, ores, limestone marble, dolomite, etc. (not coal); Department of Industrial Relations

Water Pollution Control Act of 1971 (No. 1260); Established Water Improvement Commission; prevents, controls, abates present or new water pollution; (AWIC)

Florida Statutes

FS 161; Beach and Shore Preservation Act; Establishes coastal setback lines and regulates beach structures; DNR

FS 258.17-33; Wilderness System Act; Lands set aside for their biological, aesthetic, or scientific values; supplements National Wilderness Act; DNR

FS 258-36; State-owned submerged lands with exceptional biological or aesthetic values to be declared aquatic preserves or sanctuaries; DER

FS 259; Land Conservation Act; purchase of environmentally sensitive areas; DNR

FS 372; Game & Fresh Water Fish Commission Statute; Commission protects and conserves wildlife and fresh water aquatic life; with DNR controls noxious aquatic plants

FS 373; Water Resources Act; Management, conservation, development, and utilization of state waters and related resources; DER

FS 375; Outdoor Recreation and Conservation Act; Acquisition and management of land and related resources for recreation or conservation; DNR

FS 380; Environmental Land & Water Management Act; Establish land and water management policies to guide growth and development; DOA

FS 403; Air and Water Pollution Control Act; provides for program of air and water pollution prevention, abatement, and control; DER