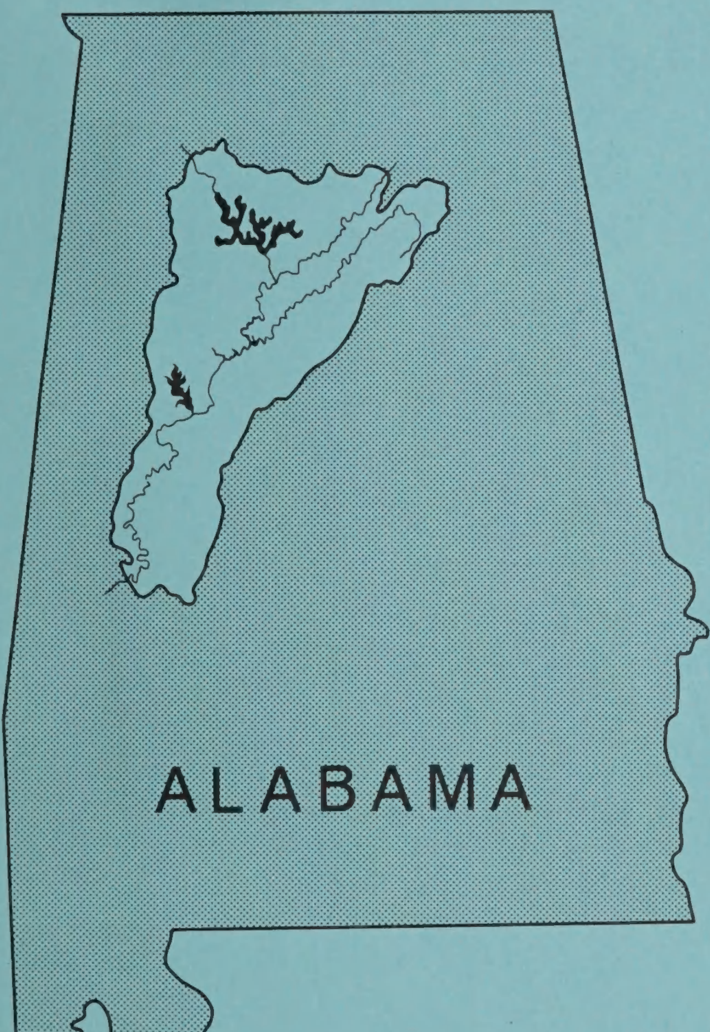
BLACK WARRIOR
RIVER BASIN COOPERATIVE STUDY



Prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Economics and Statistics Service
Forest Service

In cooperation with the

STATE OF ALABAMA,
OFFICE OF STATE PLANNING AND FEDERAL PROGRAMS

Auburn, Alabama

December 1980

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ALABAMA

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CHAPTER 1

SUMMARY

Objectives

The overall objective of this study was to inventory natural resources, analyze agricultural and economic development and potential, and provide basic data for orderly development of the water and related land resources of the area. The study provides inventories of existing water and related land resources and identifies problems and needs so that various programs of the United States Department of Agriculture can be effectively coordinated with programs of state, local, and other federal agencies.

Information presented in this report is user-oriented and will be useful to federal, state, and local governmental agencies concerned with resource management programs and development opportunities. Other organizations to benefit from this report include soil and water conservation districts, watershed associations, planning commissions, and other local groups. This report can be an aid in planning for the conservation and utilization of the land and water resources in the study area, developing budgets, and setting priorities for expenditures of funds in meeting the identified problems and needs. Supplemental information supporting this study can be found in the appendix to this report.

Authority

Participation in the cooperative river basin study by the United States Department of Agriculture was under authority of Section 6 of Public Law 83-566, as amended.

Description of the Area

The Black Warrior River is a principal tributary of the Tombigbee River, a branch of the Mobile River System. The basin is located primarily in Northwest Alabama and is bounded on the east by the Cahaba and Coosa River Basins, on the north by the Tennessee River Basin, and on the west by the Tombigbee River Basin.

The basin is roughly triangular and covers about 4,007,000 acres. It includes parts of 17 counties and has a maximum width of 60 miles and length of 150 miles. The Black Warrior River is formed by the juncture of the Locust and Mulberry Forks 20 miles west of Birmingham. The river flows generally southwesterly 118 miles to Eutaw, then southerly 55 miles to Demopolis where it enters the Tombigbee River. The principal tributaries of the Black Warrior River are the Locust, Mulberry, and Sipsey Forks. Birmingham, Alabama's largest city, is located on the eastern edge of the basin. Tuscaloosa is located in the southern third of the basin.

The land and water areas of the basin encompasses about 12 percent of the state. Approximately 67.2 percent of the basin, or 2,694,000 acres are forested. Other land uses include cropland, 13.1 percent; pasture, 8.5 percent; incorporated areas and transportation corridors, 6.6 percent; surface water, 1.9 percent; and all other land areas, 2.7 percent. Cropland in 1975 represents an increase of 10 percent over the 1967 total. Generally, the trend has been to fewer acres of pasture and forest over this period.

Problems and Needs

Study efforts were coordinated with cooperating agencies to define the nature, location, and extent of local resource problems. Problems identified include erosion, sedimentation, inadequate drainage, flooding, low income and insufficient water for irrigation, water supply, timber supply, and recreation. Attention was directed toward the problems identified in the Black Warrior River Basin Plan of Work and those of interest to the Office of State Planning and Federal Programs, State of Alabama.

Cropland, pastureland, and forest land needing sheet and rill erosion control amounts to 532,000 acres. In 1975, 80 percent of the cropland, 6 percent of the pastureland, and 3 percent of the forest land needed additional treatment measures to reduce soil loss to an acceptable level for sustained productivity.

The study revealed a flood problem on about 330,000 acres of flood plain. About 31,900 acres of cropland, 38,700 acres of pastureland, and 15,400 acres of land in other uses would benefit from flood damage reduction. Forty-six communities within the basin have been identified as having a flood problem.[1/]

Sediment is continuously filling stream and reservoirs and damaging water quality and fish habitat. Sediment reduction needs amount to about 9 million tons per year.

There are about 90,000 acres of crops and pasture in the basin that need surface or internal drainage. These are usually lowlands or those having a constant or occasional high water table.

If present management trends continue, timber removals will begin to exceed growth shortly after the year 2000. By 2030 a deficit of over 30 million cubic feet will have resulted. Some of the causes for this expected shortage are: a dwindling forest acreage base, incomplete forest utilization, and understocked forest lands.

The demand for outdoor recreation in the basin is increasing faster than the population. There is a need for four land and water based recreation activities; including fishing, swimming, camping, and picnicking.

The study identified three water systems (Berry, Fayette, and Oneonta) needing additional supply of municipal and industrial water. Present and future needs may be supplied from impoundments, streams, wells, and purchase arrangements from other communities.

1/ Refer to the latest Federal Emergency Management Agency FIA listing of communities participating in the National Flood Insurance Program.

CHAPTER 2

INTRODUCTION

NATURE AND SCOPE OF THE STUDY

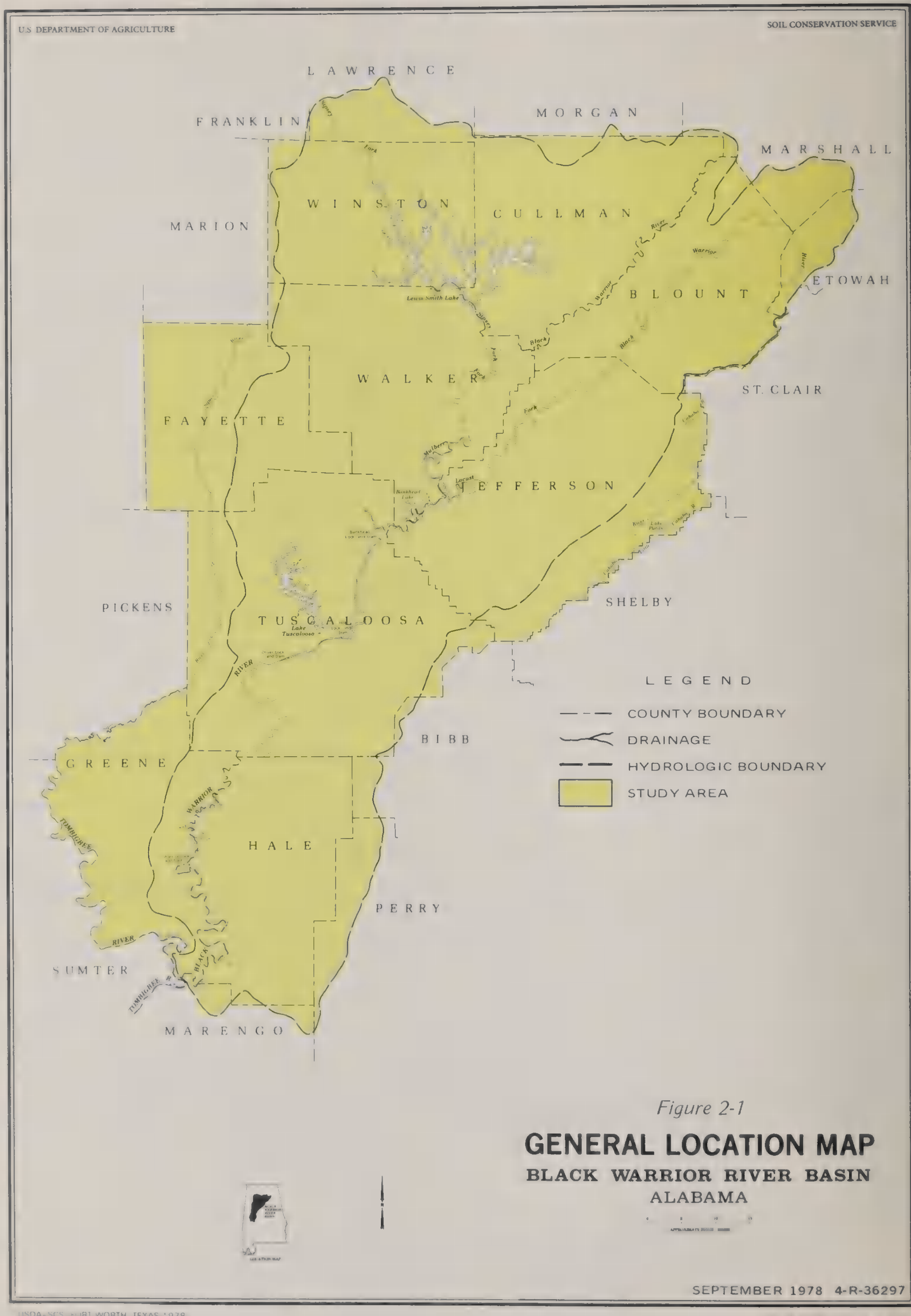
The State of Alabama requested the United States Department of Agriculture to participate in a cooperative study of the Black Warrior River Basin so that various programs of the United States Department of Agriculture can be effectively coordinated with programs of state, local, and other federal agencies. The overall objective of the study was to inventory natural resources, analyze economic development and potential, and provide basic data for orderly development of the water and related land resources of the area giving full consideration to the environmental, economic, and other related values involved. The study provides inventories of existing water and related land resources and identifies problems and needs as required to address the specific objectives. The basin encompasses the entire drainage area of the Black Warrior River (see figure 2-1).

This report contains the inventory of resources in the basin and the present and projected needs for the basin's water and related land resources. Opportunities for developing these resources will be identified in the ongoing Cooperative Statewide Study.

Participation in the cooperative river basin study by the United States Department of Agriculture was under authority of Section 6 of Public Law 83-566, as amended. The Soil Conservation Service (SCS), the Economics and Statistics Service (ESS), and the Forest Service (FS) are the United States Department of Agriculture participants in the study. The study was conducted under the supervision of a USDA Field Advisory Committee composed of representatives of the three USDA agencies participating in the study.

The Office of State Planning and Federal Programs (OSPFP) was the study sponsor and the coordinating agency for the State of Alabama. Other state and local governmental agencies and regional planning commissions and councils made significant contributions to the study. Their contributions are acknowledged throughout the report.

The multiple use of water and land for their related uses for wildlife, timber, recreation, and agriculture has created many complex inter-relationships and problems. These problems and needs were identified during meetings with local decisionmakers. The study procedures generally followed the conceptual basis embodied in the Principles and Standards for Planning Water and Related Land Resources published by the Water Resources Council September 10, 1973.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LAWRENCE
FRANKLIN
MORGAN
MARSHALL
WINSTON
CULLMAN
MARION
ETOWAH
BLOUNT
Lewis Smith Lake
WALKER
ST. CLAIR
FAYETTE
JEFFERSON
PICKENS
SHELBY
TUSCALOOSA
Lake Tuscaloosa
LEGEND
COUNTY BOUNDARY
DRAINAGE
HYDROLOGIC BOUNDARY
STUDY AREA
BIBB
GREENE
HALE
PERRY
SUMTER
MARENGO
WARRIOR
RIVER
BLACK
TOMBIGBEE
Figure 2-1
GENERAL LOCATION MAP
BLACK WARRIOR RIVER BASIN
ALABAMA
SEPTEMBER 1978 4-R-36297
USDA-SCS-FORT WORTH, TEXAS 1978
REVISED AUGUST 1978 BASE 4-R-35608

PURPOSE AND OBJECTIVES

The broad purposes of this study were (1) to inventory land and water resources, (2) to project future resource needs, (3) to provide basic data for planning and development, and (4) to identify problems and development opportunities for detailed study. To achieve these purposes, the study was conducted--

1. To provide input for the OSPFP planning process and to assist other state and local agencies engaged in resource planning;

2. To provide information to be considered in formulating sound conservation and development of land and water resources to meet current and foreseeable needs and economic growth and development, and to protect and enhance the natural environment;

3. To identify problems and needs requiring action which cannot be implemented under existing programs.1/

The study was concerned with the general problem of planning for the conservation, development and wise use of the areas limited natural resources among alternative uses so as to maximize net benefits to society.

The major objectives of this study are closely related to the state's goals for three functional areas of state government as presented in Goals for Alabama, 1975. A detailed discussion of the relationship between specific components of the basin study and state goals is presented in appendix 1.

USES OF THE REPORT

Information presented in this report is user-oriented, and, as such, should be very useful, especially to federal, state and local governmental agencies concerned with resource management programs and opportunities. Other organizations to benefit from this report includes soil and water conservation districts, watershed associations, planning commissions, municipal and county governing bodies, and other local groups. Data and projections presented herein establish a basis for selection and evaluation of alternative plans for natural resource use and development. Specifically, it can be an aid in planning land use; developing budgets and setting priorities for expenditures of funds; and early acquisition of needed improvements.

1/ The current statewide study will contain additional inventory data and evaluations of alternative solutions.

CHAPTER 3

NATURAL RESOURCES

DESCRIPTION OF THE AREA

The Black Warrior River is a principal tributary of the Tombigbee River, a branch of the Mobile River System. The basin is located primarily in Northwest Alabama and is bounded on the east by the Cahaba and Coosa River Basins, on the north by the Tennessee River Basin, and on the west by the Tombigbee River Basin. Hereafter, reference to "the basin" applies to the hydrologic boundary encompassing the drainage area of the river and its tributaries.

The basin (see figure 3-1) is roughly triangular and covers about 4,007,000 acres. The primary land uses are as follows: forest land 2,694,027 acres; pasture 338,013 acres; and cropland 526,597. It includes parts of 17 counties and has a maximum width of 60 miles and length of 150 miles. The Black Warrior River is formed by the juncture of the Locust and Mulberry Forks 20 miles west of Birmingham. The river flows generally southwesterly 118 miles to Eutaw, then southerly 55 miles to Demopolis where it enters the Tombigbee River. The principal tributaries of the Black Warrior River are the Locust, Mulberry, and Sipsey Forks. Birmingham, Alabama's largest city, is located on the eastern edge of the basin. Tuscaloosa is located in the southern third of the basin.

Climate

The climate is influenced by frontal systems moving from northwest to southeast and temperatures change rapidly from warm to cool due to inflow of northern air. The average annual temperature is 63 degrees Fahrenheit, ranging from 62 degrees in the north to 64 degrees in the southern portion of the basin (see figure 3-1). The average daily temperature varies from 80 degrees Fahrenheit in July to less than 45 degrees Fahrenheit in December.

Summer temperatures usually reach 90 degrees or higher about 70 days per year but temperatures above 100 degrees are relatively rare. Freezing temperatures are common but are usually of short duration. During the winter, extreme lows of 32 degrees or less occur about 65 times. The frost-free season varies from 210 days in the extreme north portion to about 240 days in the southern portion of the basin. Snowfall is rare and averages only about 2 inches per year in the northern portion.

Average annual rainfall is about 53 inches and varies from 52 inches in the southern portion to 58 inches in the northwest portion of the basin. The largest amount, approximately 5 inches per month, falls in winter and spring during the months of December through May. The more intense rains usually occur during the warmer months. The basin experiences the greatest total

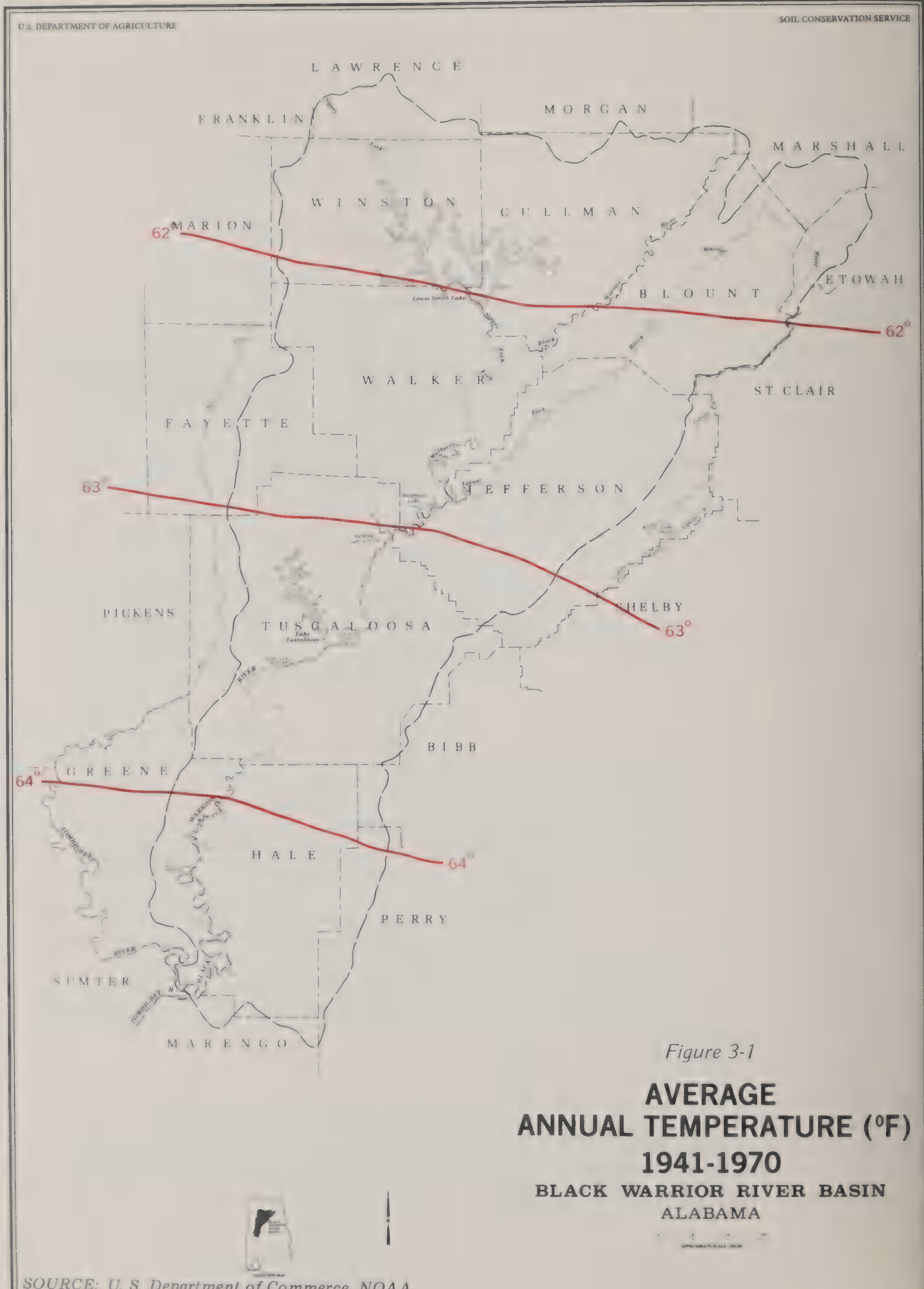

Figure 3-1

AVERAGE ANNUAL TEMPERATURE (°F) 1941-1970

BLACK WARRIOR RIVER BASIN ALABAMA

SOURCE: *U. S. Department of Commerce, NOAA, Environmental Data Service.*

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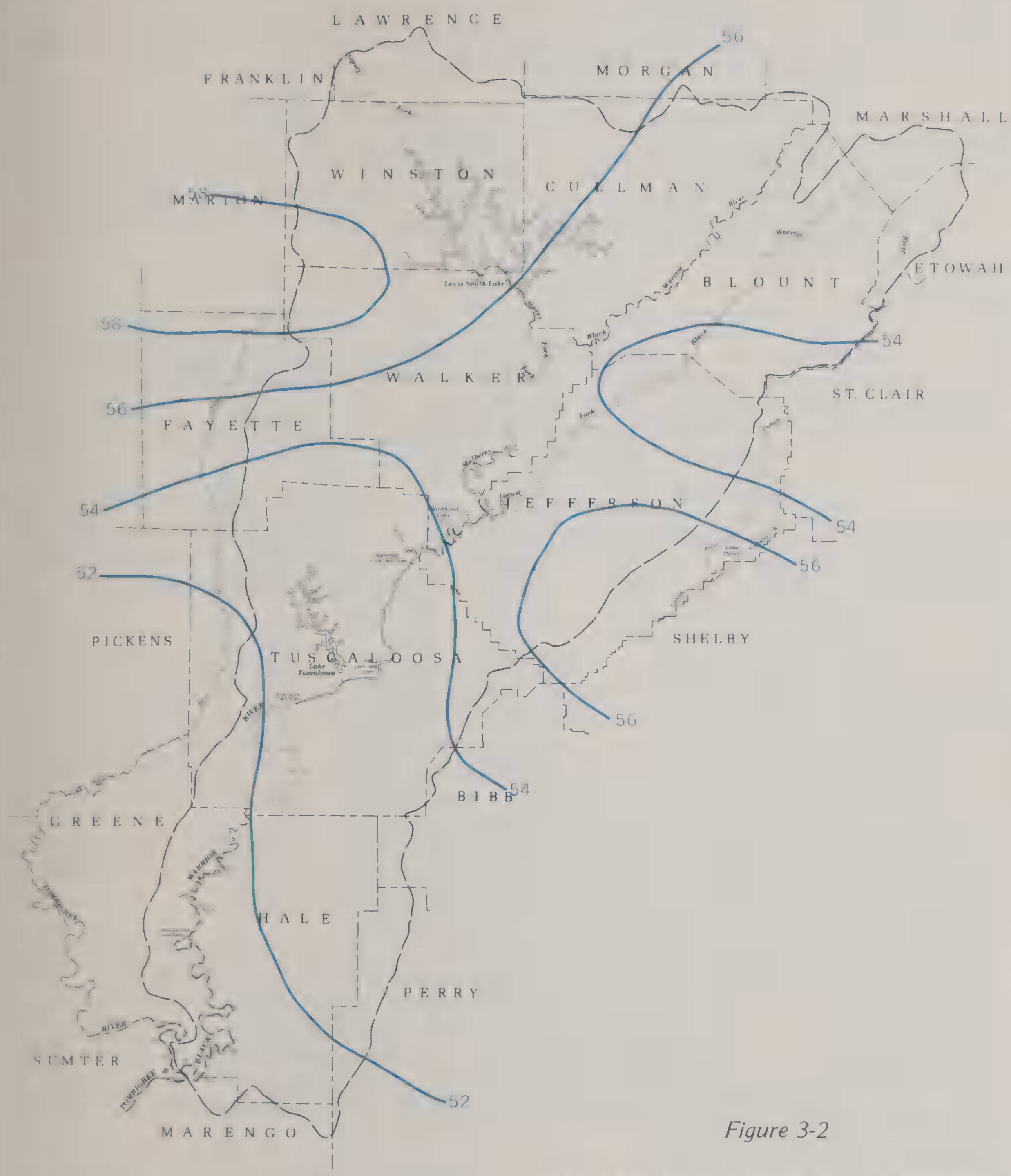

Figure 3-2

AVERAGE ANNUAL RAINFALL
(inches)
1941 - 1970
BLACK WARRIOR RIVER BASIN
ALABAMA

SOURCE: U. S. Department of Commerce, NOAA, Environmental Data Service.

SEPTEMBER 1978 4-R-36300

USDA-SCS-FORT WORTH TEXAS 1978

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average amount of precipitation (5.8 inches) in July. This rainfall usually occurs in the form of short duration, high intensity downpours. The driest period of the year, and most critical from a water supply standpoint, is normally from August to October. Climatic forces change with seasons but the direction and velocity of the winds do not vary greatly during the year.

The normal rainfall pattern is shown in figure 3-2. Flood-producing storms over the Black Warrior River Basin are usually of the frontal type. They usually occur in the winter and spring and last from 2 to 4 days. Normally 5 to 6 inches of intense or general rainfall will cause widespread flooding; but on many smaller streams, 3 to 4 inches of rainfall are sufficient to produce significant flooding.

General Geology

Rock units of shale, limestone, dolomite, sandstone, and siltstone of Cambrian, Ordovician, Silurian, Devonian, Mississippian, and Pennsylvanian ages and chalk, sand, clay, and gravel of Cretaceous and Quaternary ages are exposed in the Black Warrior River Basin. Table 3-1 summarizes the stratigraphic sequence of the units in the basin.

The basin is structurally a complex region and, based on topographic features, geologic units, and structural features, has been divided into several physiographic regions (figure 3-3). The following descriptions of physiography and stratigraphy are modified from reports by Sapp and Emplaincourt (1975) and Copeland (1968).

Physiography--The basin includes parts of two major physiographic divisions, the Appalachian Highlands and Atlantic Plains (table 3-2). The Appalachian Highlands Division contains parts of the Cumberland Plateau section of the Appalachian Plateaus province and parts of the Alabama Valley and Ridge section of the Valley and Ridge province. The Atlantic Plains Division contains parts of the East Gulf Coastal Plain section of the Coastal Plain province.

The Cumberland Plateau section consists of submaturely to maturely dissected plateau and valley districts. The plateaus are underlain primarily by sandstone and shale beds, and the valleys by limestone and shale.

Five districts of the Cumberland Plateau section occur in the Black Warrior River Basin. The Warrior Basin district is a plateau of moderate relief which was formed on a broad syncline that has a shallow plunge to the southwest. The Sand Mountain and Blount Mountain districts are narrow elongated plateaus of moderate relief which formed on shallow synclines that trend to the northeast. The Sequatchie Valley and Murphrees Valley districts are narrow elongated valleys that were formed by the erosion of southwest-plunging anticlinal structures.

The Alabama Valley and Ridge section contains parts of an alternating series of four northeast-striking parallel ridge- and valley- districts. This includes the Coosa Ridges, Cahaba Valley, Cahaba Ridges and Birmingham-Big Canoe Valley districts. The Coosa Ridges are a series of linear ridges formed by folded

Table 3-1 --Stratigraphic sequence of rock units exposed in the Black Warrior River Basin

NE SW

Era	System	Series	Group	Geologic unit		
Cenozoic	Quaternary	Holocene		Alluvium		
		Pleistocene		Terrace Deposits		
Mesozoic	Cretaceous	Upper	Selma	Demopolis Chalk		
				Arcola Limestone Member		
				Mooreville Chalk		
				Tombigbee Sand Member		
				Eutaw Formation		
			Tuscaloosa	Gordo Formation		
				Coker Formation		
Paleozoic	Pennsylvanian			Pottsville Formation		
	Mississippian	Upper		Parkwood Formation		
				Bangor Limestone		Floyd Shale
				Hartselle Sandstone		
				Monteagle Limestone	Pride Mountain Formation	
				Tuscumbia Limestone		
		Lower		Fort Payne Chert		
				Maury Formation		
	Devonian			Chattanooga Shale		
				Frog Mountain Sandstone		
	Silurian			Red Mountain Formation		
	Ordovician	Middle		Little Oak Limestone	Chickamauga Limestone	
				Lenoir Limestone	Attalla Chert Conglomerate Member	
		Lower		Odenville Limestone		
			Knox	Newala Limestone		
				Longview Limestone		
				Chepultepec Dolomite		
	Cambrian	Upper		Copper Ridge Dolomite		
		Middle		Ketona Dolomite		
				Conasauga Formation		
		Lower		Rome Formation		

Source: Geological Survey of Alabama.

Table 3-2 -- Physiographic regions of the Black Warrior River Basin, Alabama

Classification			
Major division	Province	Section	District
Appalachian Highlands	Appalachian Plateaus	Cumberland Plateau	Warrior Basin
			Sand Mountain
			Sequatchie Valley
			Blount Mountain
			Murphrees Valley
	Valley and Ridge	Alabama Valley and Ridge	Coosa Ridges
			Cahaba Valley
			Cahaba Ridges
			Birmingham-Big Canoe Valley
Atlantic Plain	Coastal Plain	East Gulf Coastal Plain	Fall Line Hills
			Black Prairie
			Alluvial Plain

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Geological Survey of Alabama
Thomas J. Joiner
State Geologist

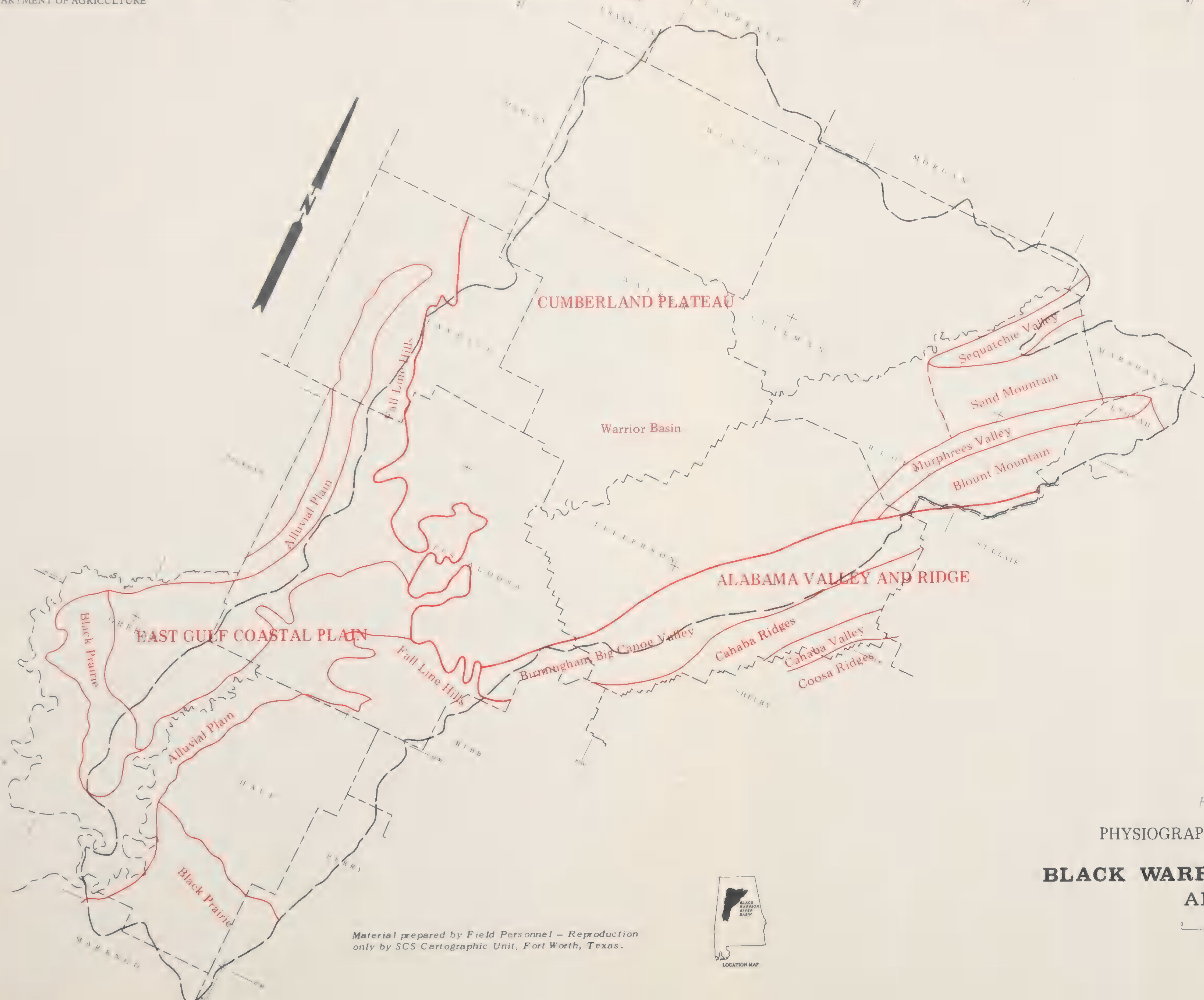

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Figure 3-1

PHYSIOGRAPHIC REGIONS OF THE

BLACK WARRIOR RIVER BASIN
ALABAMA

APPROXIMATE SCALE MILES

(from Sapp and Emplaincourt, 1975)

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and resistant sandstone. The Cahaba Valley district is a narrow valley developed on a faulted homocline. The Cahaba Ridges district consists of ridges formed by gently folded sandstone and conglomerate beds and intervening valleys underlain by shale. The Birmingham-Big Canoe Valley district is a narrow valley 4 to 8 miles wide formed by weathering of a faulted anticlinorium and is underlain primarily by limestone, dolomite, and lesser amounts of shale, sandstone and chert.

Sedimentary rocks of Mesozoic and Cenozoic ages are exposed in the East Gulf Coastal Plain section of the Coastal Plain province. In the Black Warrior River Basin of Alabama, this section is divided into the Fall Line Hills, Black Prairie Belt, and Alluvial Plain districts. The Fall Line Hills district is a dissected upland with a few broad, flat ridges separated by valleys ranging from 100 to 200 feet in depth. The Fall Line Hills are present in an area where streams descend from resistant Paleozoic sedimentary rocks to less resistant younger unconsolidated sand, clay, and gravel beds. This district has a maximum width of about 35 miles, and altitudes range from more than 700 feet above mean sea level in the northwestern part of the basin to about 250 feet above mean sea level along its southern edge.

The Black Prairie district lies to the south of the Fall Line Hills and is characteristically an undulating plain of low relief. This district is moderately dissected and has maximum elevations of about 250 feet above mean sea level.

The Alluvial Plains district consists of alluvium and terrace deposits adjacent to the Black Warrior, Tombigbee, and Sipsey Rivers. The district is a slightly undulating plain with relatively low relief and contains many swampy areas.

RESOURCE INVENTORIES

Inventory data have been developed from numerous published sources such as the 1967 Conservation Needs Inventory, the periodic Agricultural Census, and U. S. Census of Population reports. Information from many technical publications has also been used.

In addition to data from secondary sources, the river basin staff conducted an extensive field examination of the entire study area. This field examination was oriented toward the identification of existing and projected problems and the location of resources with development potential. Study efforts were coordinated with cooperating agencies to define the nature, location, and extent of local resource problems. Problems identified include erosion, sedimentation, drainage, flooding, irrigation, water supply, recreation, and low income. Attention was directed toward the problems identified in the Black Warrior River Basin Plan of Work and those encompassed by the specific components of the two planning objectives. The areas of interest expressed by the Office of State Planning and Federal Programs were also considered. District conservationists of the Soil Conservation Service participated in this field examination and furnished valuable information concerning problems within their district. After the field examination was completed, additional data were collected through SCS district conservationists, other federal and state agencies, university personnel, and regional planning commissions.

Black Warrior River Basin has a wide variety of natural resources including

forests,

pasture land

and cropland.

The basin has many . . .

scenic areas,

urban and built-up areas,

and wetlands.

Water Supply

Surface Water--In most areas of the basin an adequate supply of surface water exists, or could be impounded. Water supply sources of the basin are generally adequate at the present time except in local areas during extreme dry periods. In the future, additional supplies will be needed in the northern portion of the basin. A large part of the future needs can be supplied through development of surface reservoir storage. The average annual runoff ranges from 13 to 24 inches as shown on figure 3-4.

Surface Water Quantity: Water resource studies have been published in four counties by the U. S. Geological Survey/Geological Survey of Alabama. These reports contain quality and quantity information for wells, springs, and streams. The U. S. Geological Survey publishes annual reports for Alabama with streamflow measurements and water quality data at selected sites throughout the state (see figure 3-5). Rainfall (53-inch average) in the basin amounts to about 17.4 million acre-feet per year. Most of this rainfall is returned to the hydrologic cycle by evaporation and transpiration, a small amount infiltrates to ground water reservoirs, and the remainder becomes streamflow which is equivalent to an average 20-inch runoff from the basin. The geographic distribution of surface runoff at selected gaging stations is presented in appendix table 2A. Average annual runoff represents the normal surface water resource or the normal recoverable surface water supply. This totals about 6.7 million acre-feet per year or approximately 5.9 billion gallons per day.

An inventory of impoundments and water areas of streams, rivers, and natural lakes with perennial characteristics was made for the basin. Water areas inventoried cover from less than one acre to 21,000 acres. There are about 11,000 impoundments, including natural lakes, containing a combined surface area of about 73,000 acres. Natural lakes include beaver ponds, river oxbows, wet borrow pits, limestone sinks, and other similar water areas. The areas of rivers and perennial streams were estimated to be 4,775 acres. This gives a total water area of almost 78,000 acres for the basin.

There are 42 impoundments with surface areas larger than 40 acres and whose combined surface areas are 46,500 acres. This represents only 0.4 percent of the impoundments but 57.5 percent of the total water area. Lewis Smith Lake is the largest impoundment with a surface area of 21,200 acres. Statistics for impoundments in the basin are shown in table 3-3. This table shows the total surface acres of impoundments (a) larger than 500 acres, (b) between 40 and 500 acres, (c) between 5 and 40 acres, (d) less than 5 acres, and (e) natural lakes. Also included is the mileage of rivers and streams in the basin. Whole county data is shown in appendix table 2B. Only those streams with drainage areas sufficient to produce perennial flow were tabulated. In addition to serving as a vital commercial artery with impacts far beyond the basin area, the Black Warrior River and its tributary streams provide fishery resources, scenic, aesthetic, and other recreational needs.

Potential Reservoir Sites: An inventory of available reservoir sites in the Black Warrior River Basin has been made. Certain aspects of each site were examined. This inventory does not include every available site but shows only the better sites within an area.

Generally, these potential sites are fairly well distributed throughout the basin except for the Jefferson County sector. Soils, topography, geology, urban development, and extensive stripmining activities in Jefferson County and parts of Blount, Cullman, Tuscaloosa, and Walker Counties generally preclude the development of large reservoirs (Figure 3-6).

The major river in the basin, the Black Warrior, is largely developed and committed to navigation and hydroelectric power. Any additional development of the major tributaries--namely Locust Fork, Mulberry Fork, and Sipsey Fork--beyond that already existing or planned is limited. Consequently, the location and evaluation of potential reservoir sites focused on smaller tributaries and minor streams.

Drainage areas range in size from about 3 square miles to 43 square miles with an overall average of 11.5 square miles. Topographic quadrangle maps were the primary tool used to locate potential reservoir sites. Use was also made of published soil survey reports and county and local transportation maps. The type of sites evaluated are for on-stream reservoirs with ungated emergency spillways. These sites could serve for single- or multiple-purpose storage uses. These include storage for flood prevention, municipal and industrial water supply, recreation, irrigation, fish farming and livestock water, and for fish and wildlife.

Fixed improvements such as highways, local roads, utility rights-of-way, and houses are almost always involved in acquisition of property to install larger-type structures. Final location and total storage of these sites should be governed by the most practical approach to land use after considering both short-term and long-range benefits. No on-site investigations were made so there could exist some unknown features such as sinks, faults, roads, utility lines, and buildings within the reservoir area. The inventory will give planners a starting point in locating reservoir sites for water storage or flood detention needs. Site information such as location, size of drainage area, reservoir size, and approximate height of dam can be found in appendix 3.

Surface Water Quality: 1/ In general, most of the surface water of the basin is of good quality and requires limited treatment for most uses, however, some of Alabama's most severe water quality problems are located in the basin. The quality of basin streams is classified from a high category of "suitable public water supply" to a low category of "suitable for industrial and agriculture uses". A number of coal washing operations discharge their wastewaters within the area and inadequately treated effluents from industrial operations and municipal water treatment plants in the Birmingham area are also discharged into basin tributaries and the river. As a result, the Birmingham area presents the greatest pollution problem in the Black Warrior River Basin.

The chemical quality of surface water varies through the year as a result of natural variations in climatic conditions, diversions and impoundments, inflow from other sources, and pollution from waste materials. As an example, high water and floods generally decrease the concentrations of dissolved minerals in streams and reservoirs but have the opposite effect on sediment loads and concentrations. Conversely, low streamflows usually result in higher mineral

1/ Source: Water Quality Management Plan prepared by Alabama Water Improvement Commission for the Black Warrior River Basin.

Table 3-3 - Acres of Surface Water by Counties - Black Warrior River Basin, 1978

County	Impoundments						Rivers &	Streams	Total
	Larger Than 500 Ac.	40-500	5-40	Less Than 5 Ac.	Natural	Subtotal			
	Acres						Miles	Acres	
Bibb	-	-	-	-	-	0	3	4	4
Blount	2,400	890	357	2,000	193	5,840	150	920	6,760
Cullman	8,640	404	275	3,940	276	13,535	138.5	557	14,092
Etowah	-	258	126	405	133	922	26	77	999
Fayette	-	81	51	115	1,293	1,540	54.5	160	1,700
Greene	1,960	240	242	192	626	3,260	22	30	3,290
Hale	1,811	345	1,800	514	4,000	8,470	202	274	8,744
Jefferson	1,535	92	558	427	90	2,702	280	763	3,465
Lawrence	-	-	7	26	-	33	21	41	74
Marengo	-	133	-	6	5	144	7	12	156
Marshall	-	-	30	500	12	542	22	41	583
Perry	-	125	64	25	220	434	22	14	448
Tuscaloosa	11,138	1,213	812	1,063	5,266	19,492	159.5	597	20,089
Walker	2,800	163	125	1,000	540	4,628	167	983	5,611
Winston	10,400	42	97	538	251	11,328	136	302	11,630
TOTAL	40,684	3,986	4,544	10,751	12,905	72,870	1410.5	4,774	77,645

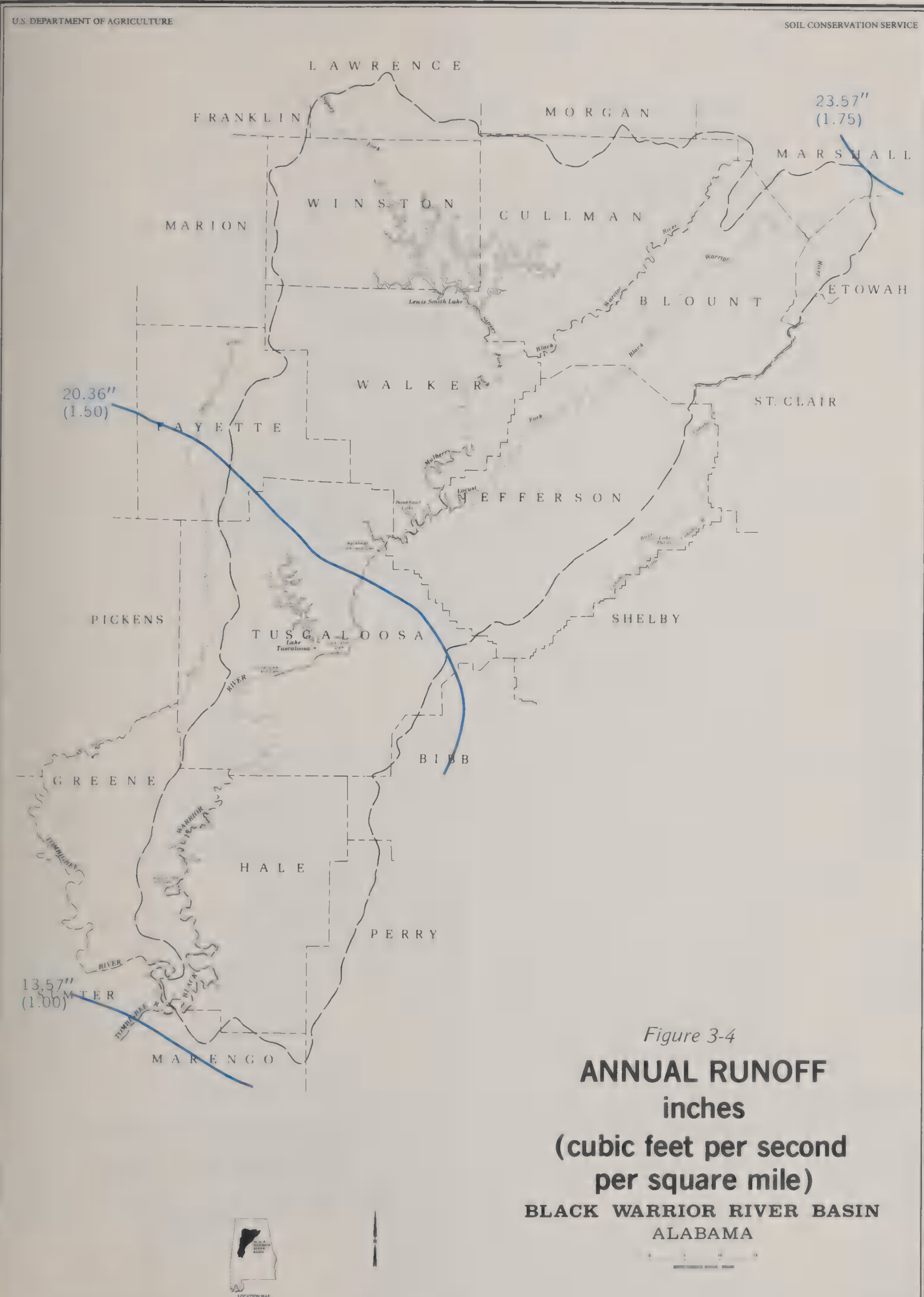

Figure 3-4

ANNUAL RUNOFF
inches
(cubic feet per second per square mile)

BLACK WARRIOR RIVER BASIN
ALABAMA

SOURCE: Geological Survey Water - Supply Papers, 1965.

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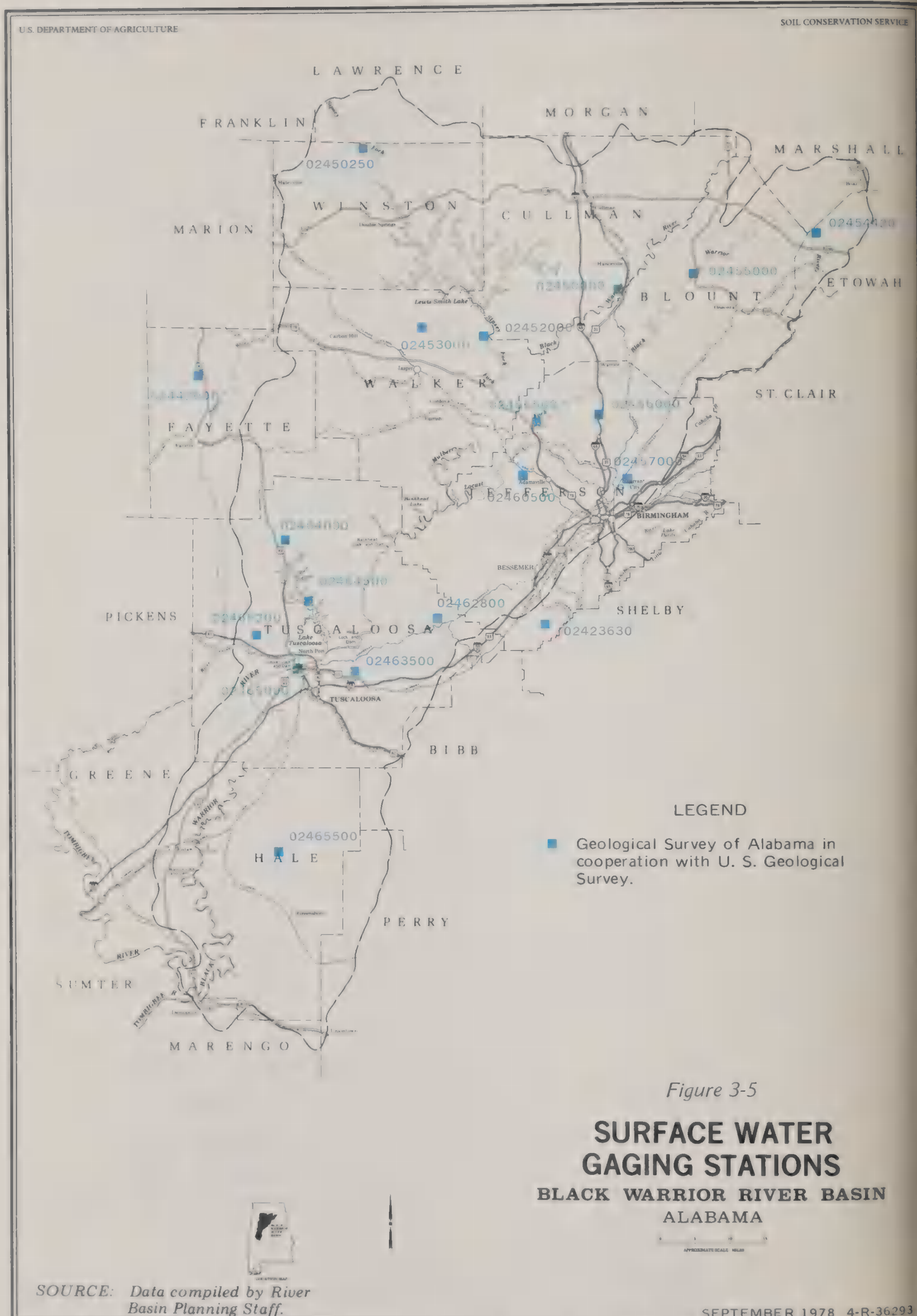


Figure 3-5

SURFACE WATER GAGING STATIONS

BLACK WARRIOR RIVER BASIN

ALABAMA

USDA-SCS-FORT WORTH, TEXAS 1978

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

LEGEND

(25) POTENTIAL RESERVOIR SITES

NOTE: Number of each site corresponds to site number in the Appendix of the Black Warrior River Basin Study Report which lists data for each site.

Selection of Potential Reservoir sites was based on Topographic Map Study. No detailed survey or on-site investigations were made to determine economic or technical feasibility.

Figure 3-6

LOCATION MAP
POTENTIAL RESERVOIR SITES
BLACK WARRIOR RIVER BASIN STUDY AREA
ALABAMA

0 5 10 15
APPROXIMATE SCALE - MILES

LOCATION MAP

SOURCE: Data compiled by River Basin Planning Staff.

SEPTEMBER 1978 4-R-36295

USDA—SCS—FORT WORTH TEXAS 1979

REVISED AUGUST 1978 BASE 4-R-35608

concentrations due to the inflow of mineralized ground water. Water pH, the degree of acidity or alkalinity, is measured on a scale of 0-14; 0 to 7 is acidic, 7 is neutral, and 7 to 14 is alkaline. The basin surface water pH is slightly acidic near Tuscaloosa, ranging from approximately 6.8 to 6.9. In the Sipsey Fork area of Winston County, pH ranges from 7.1 to 7.4.

Color, turbidity, and temperature are other properties of water which affect its use and desirability. Natural or true color refers to the color present after all suspended matter has been removed. True color is usually imported to surface water by organic substances such as decaying vegetation, peat and lignite; however, it sometimes results from iron in soluble form and from industrial waters. Colored water is aesthetically objectionable for drinking and for a number of industrial processes, including dying, brewing, and ice making. The soluble compounds which constitute true color are difficult and expensive to remove. Apparent color includes true color plus color imported by suspended matter. This type color can be reduced through filtration of the suspended matter.

Silt and clay resulting from soil erosion, industrial and mineral wastes, and thermal turnover of lakes create turbid water. Turbidity is aesthetically objectionable as well as detrimental to the stream ecosystem. Farming without proper land protection allows storm runoff to carry soil, fertilizers, and pesticides into the streams. Construction sites for buildings, parking lots and roads contribute sediment to streambeds. Many of the sediments producing turbidity may settle out and form films which are objectionable for many industrial uses. Sedimentation, chemical clarification, or filtration generally provide a means of eliminating turbid conditions from water supply sources.

Mean annual ambient temperature changes lead to natural temperature variations in water, with shallow water areas the most sensitive to changes in air temperature. High stream temperatures usually stimulate microbial activity, resulting in decreased dissolved oxygen and lower water quality. This condition, however, may be advantageous for a few types of industrial processes, water treatment, and irrigation needs.

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 which enter our waters from all sources. The initial thrust was directed toward "point" sources in heavily concentrated municipal and industrial complexes where the sources were rather easily determined. These "designated areas" include Tuscaloosa, Mobile-Baldwin, and Jefferson-Walker-Shelby-St. Clair. The 208 plans for these designated areas were developed by the West Alabama Planning and Development Council, the South Alabama Regional Planning Commission, and the Birmingham Regional Planning Commission, respectively.

Nonpoint pollution sources are much more difficult to locate than are the municipal and industrial sources. Section 208 of PL 92-500 requires that state or regional entities develop a process to identify the sources of pollution from agriculture, forestry, construction, land and subsurface disposal, hydrologic modification, and mining activities. The agencies also must determine the methods, including land use requirements, to control such sources.

In Alabama, the Water Improvement Commission (AWIC) is the designated state agency for developing and implementing water quality management plans. Other than 208 plans developed for point sources in "designated areas" by the respective regional planning commission, AWIC has the responsibility for 208 plan development for both point and non-point sources. The AWIC, in turn, contracted with the State Soil and Water Conservation Committee to develop an agricultural runoff management plan and with the State Forestry Commission to develop a water quality management plan for forest land. All plans for agricultural lands, forest lands, and "designated" areas have been adopted by AWIC, certified by the Governor, and approved by the Regional Administration of the Environmental Protection Agency. All plans are presently in the state of continuing planning and implementation.

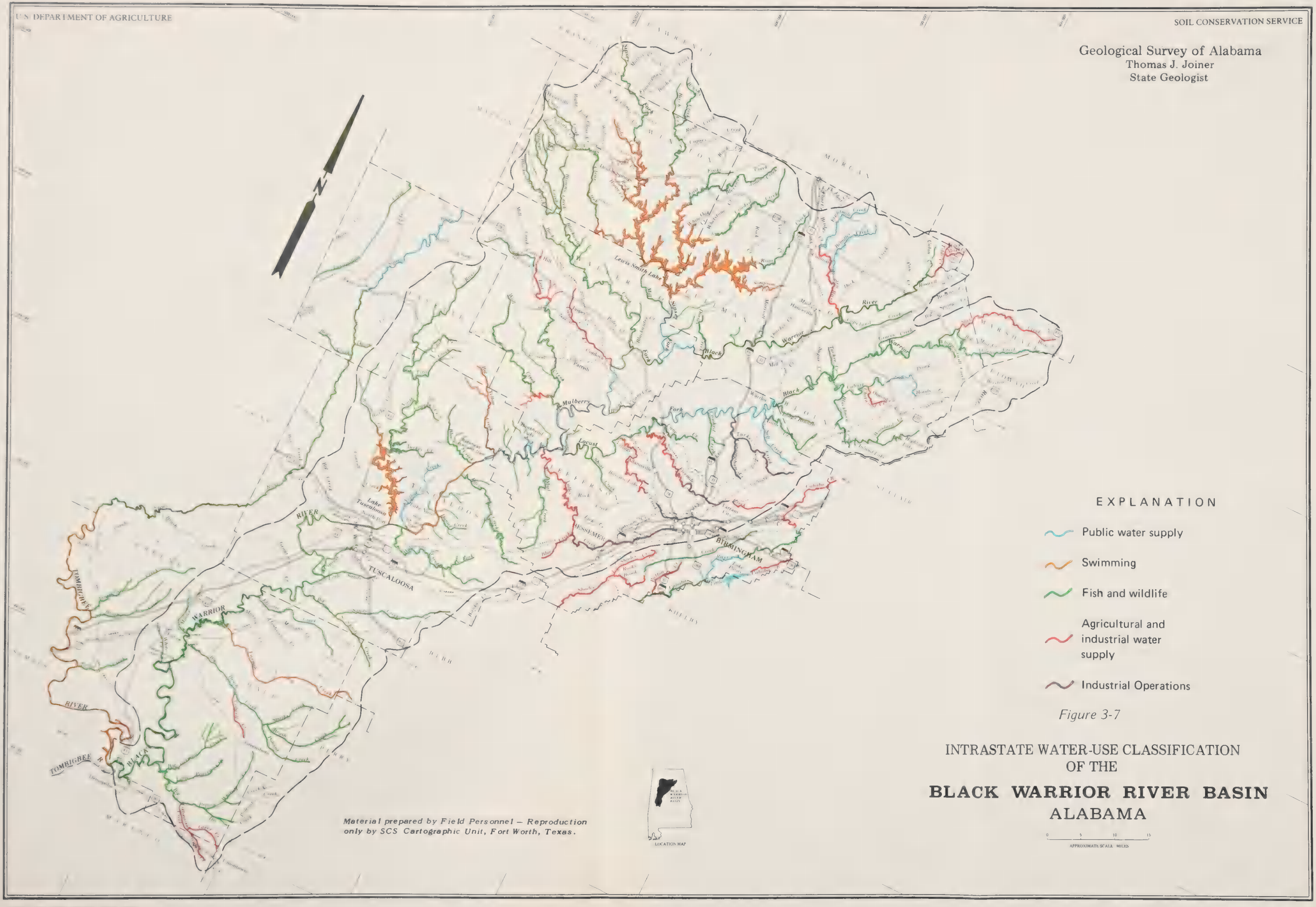
River basin water quality management plans are required under the provisions of Section 303e of PL 92-500. Public hearings have been conducted statewide on 14 plans and all of these have received conditional approval from the Environmental Protection Agency (EPA). The public hearing for the Black Warrior basin water quality management plan was held at the South Central Bell Building in Birmingham, Alabama, on February 10, 1977.

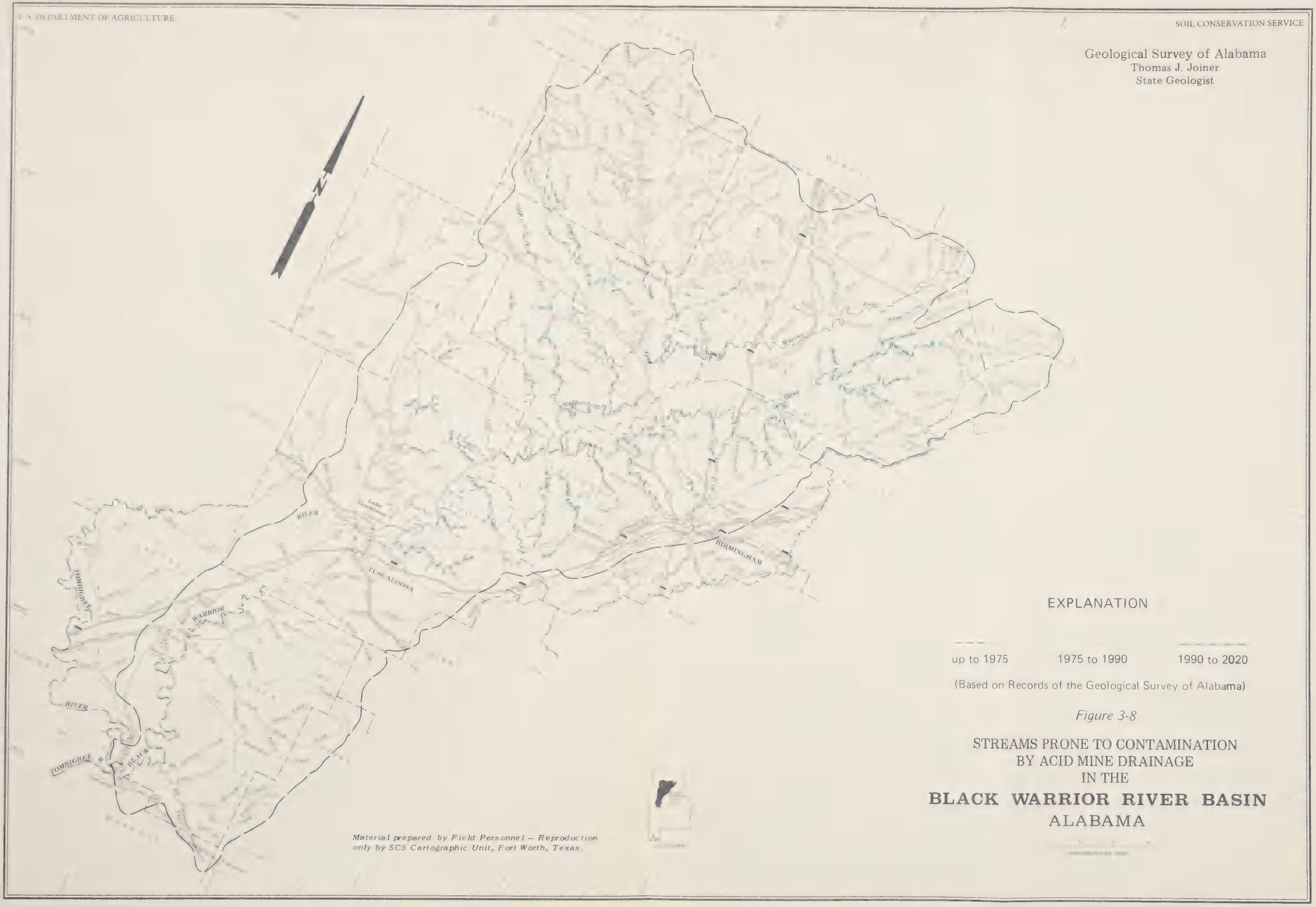
The Soil Conservation Service will have a leading role in coordinating USDA activities among all agencies in connection with PL 92-500 and will maintain liaison with the EPA which is in charge of pollution control throughout the country.

Stream Use Classification: The Alabama Water Improvement Commission's Intrastate Water-Use Classification for the Black Warrior River and its tributaries is shown in figure 3-7. The classification adopted in this figure is that of the highest use. Specifications for each of these water-use classifications are described in appendix 5. Segments of streams in the basin that might be contaminated by acid mine drainage as the result of coal mining are indicated in figure 3-8. The selection of these streams as likely recipients of contaminated acid mine drainage were chosen because of their proximity to present and projected coal surface mining.

Figure 3-9 shows the location in the Black Warrior River Basin of water-quality monitoring stations of the Geological Survey of Alabama, Gulf States Paper Corporation, the Alabama Water Improvement Commission, and the U. S. Environmental Protection Agency. The stations are located on major streams and rivers and the spacing does not allow for identification of specific sources of pollution or the effect of drainage from specific areas of coal mining. To locate sources of pollution and to determine the effect of coal mining would require an intensive continuous field investigation of stream chemistry with closely spaced monitoring stations on additional tributary streams.

The Geological Survey of Alabama, U. S. Geological Survey, Alabama Water Improvement Commission, and U. S. Environmental Protection Agency maintain data files on information collected from the stations indicated in figure 3-9. A study of these data by the Alabama Water Improvement Commission has led to that commission's stream water-use classification shown in figure 3-7. This classification has been approved by the U. S. Environmental Protection Agency.

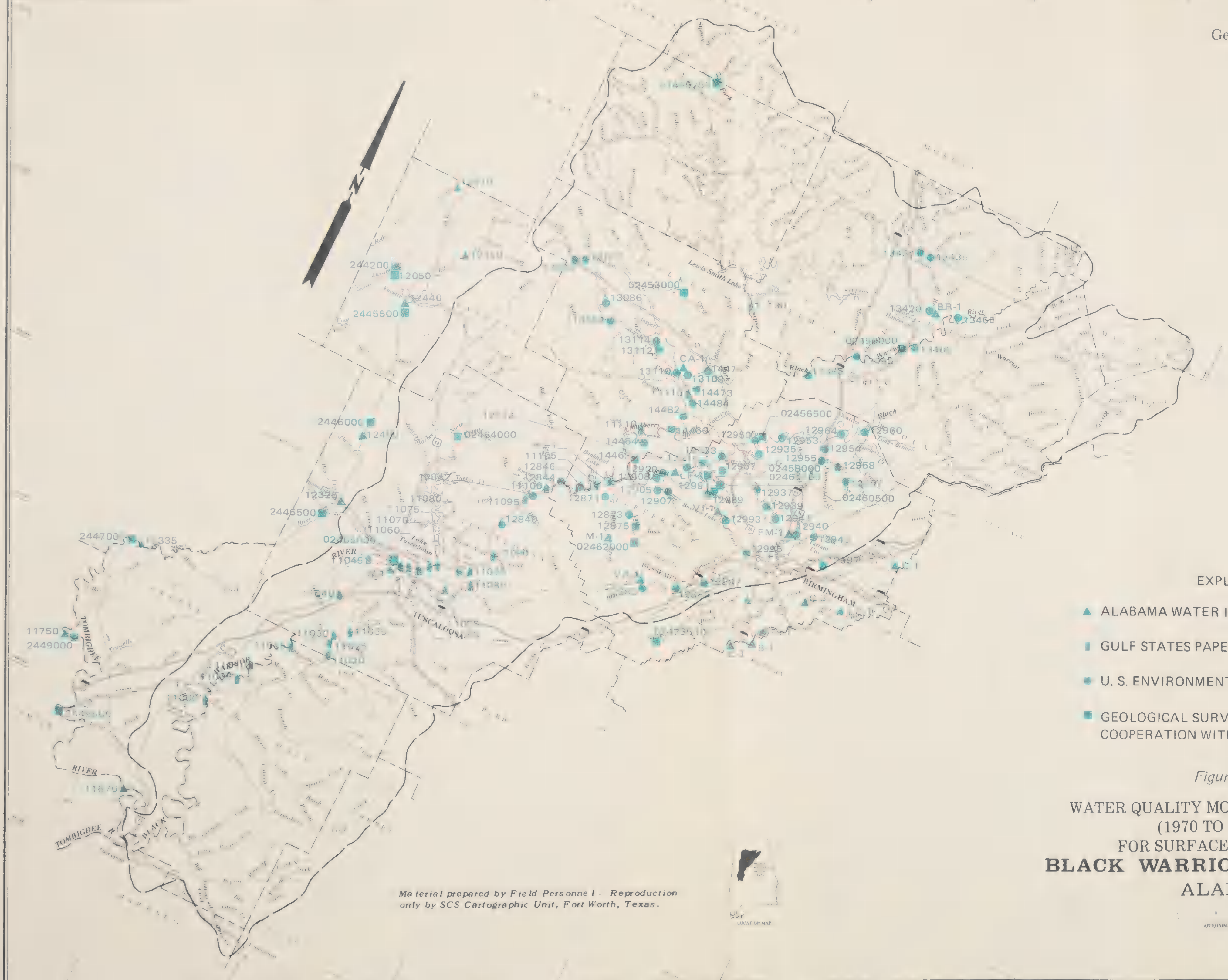

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Geological Survey of Alabama
Thomas J. Joiner
State Geologist
EXPLANATION
Public water supply
Swimming
Fish and wildlife
Agricultural and industrial water supply
Industrial Operations
Figure 3-7
INTRASTATE WATER-USE CLASSIFICATION OF THE
BLACK WARRIOR RIVER BASIN
ALABAMA
APPROXIMATE SCALE MILES
LOCATION MAP
Material prepared by Field Personnel – Reproduction only by SCS Cartographic Unit, Fort Worth, Texas.
Lewis Smith Lake
Lake Tuscaloosa
TUSCALOOSA
BIRMINGHAM
BESSEMER
WARRIOR
RIVER
TOMBIGBEE
BLACK
Mulberry
Locust
Fork
Black
Warrior
River
USDA–SCS–FORT WORTH TEXAS 1979


U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Geological Survey of Alabama
Thomas J. Joiner
State Geologist
N
RIVER
TUSCALOOSA
BIRMINGHAM
WARRIOR
TOMBIGBEE
RIVER
TOMBIGBEE R
BLACK
EXPLANATION
up to 1975
1975 to 1990
1990 to 2020
(Based on Records of the Geological Survey of Alabama)
Figure 3-8
STREAMS PRONE TO CONTAMINATION
BY ACID MINE DRAINAGE
IN THE
BLACK WARRIOR RIVER BASIN
ALABAMA
Material prepared by Field Personnel – Reproduction only by SCS Cartographic Unit, Fort Worth, Texas
USDA—SCS—FORT WORTH, TEXAS 1979

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Geological Survey of Alabama
Thomas J. Joiner
State Geologist



EXPLANATION

▲ ALABAMA WATER IMPROVEMENT COMMISSION

▮ GULF STATES PAPER

● U. S. ENVIRONMENTAL PROTECTION AGENCY

■ GEOLOGICAL SURVEY OF ALABAMA IN COOPERATION WITH THE U. S. GEOLOGICAL SURVEY

Figure 3-9

WATER QUALITY MONITORING STATIONS
(1970 TO PRESENT)
FOR SURFACE WATER IN THE
BLACK WARRIOR RIVER BASIN
ALABAMA

Material prepared by Field Personnel – Reproduction only by SCS Cartographic Unit, Fort Worth, Texas.

USDA—SCS—FORT WORTH, TEXAS 1979

The specific water-quality criteria and respective classifications used in this report were supplied by the Alabama Water Improvement Commission and are based on their water-use classifications as revised on January 3, 1978. The information is based on water-quality data obtained through 1977.

Ground Water--

Availability: A map showing the generalized distribution of shallowest aquifers (figure 3-10) is intended to portray, in very general terms, ground water conditions. The information should be used for area-wide planning and not for specific well locations. More detailed information is available in appendix 4 of this report. The map was generalized from the 1926 Geologic Map of Alabama. Several geologic units (formations) were combined on the map where rock types and water bearing characteristics are similar. The map was developed expressly for this study and is an attempt to show the correlation of ground water occurrence within similar aquifers. In some areas of the basin, additional aquifers may be utilized by wells drilled deeper than the shallowest aquifers.

Ground water occurs in the soil pore spaces and in cracks and crevices in the rocks of the earth. Extremes in well capacities can occur on either side of the usual range for an aquifer because of unusual fracturing or because of rock that is less permeable than usual. Large capacity wells should be located and developed only after consulting personnel of the Geological Survey of Alabama or other competent professionals who have knowledge of ground water conditions of the given local area.

More detailed information on the availability of ground water can be obtained from the Geological Survey of Alabama and/or from the district office of the Water Resources Division, U. S. Geological Survey in Tuscaloosa, Alabama.

Water studies have been completed in most counties of the basin, though all are not published. The published reports and some unpublished information can be reviewed at the offices of the agencies mentioned above. Appendix figures 4-1a and 4-1b indicate the status of water availability maps and geologic mapping.

Ground water availability and quality in the Appalachian Valley and Ridge Section of the Appalachian Highlands is quite variable. The area consists of a series of narrow northeast to southwest trending ridges and valleys. Some of the largest springs in the state are found in this area. These springs issue from highly fractured rock along faults. These highly fractured zones may be tapped for high yielding wells, but the location of these non-typical areas is outside the scope of the present study.

Large quantities of ground water are available throughout most of the Coastal Plain physiographic province. Occurrence of water is controlled by the porosity of the material. The Coastal Plain consists of alternating beds of clay, marl, sand, gravel, and limestone. Aquifers, the porous formations or beds that store and transmit water, are usually sand, gravel or limestone. Silts, clays, or marls are so impermeable that they yield very little water to a well.

Generally the water in these coastal plain aquifers is fresh to depths of 1,000 to 2,000 feet and salty at greater depths. Because of the high yield capacity of the major aquifers and the overlapping of aquifers, municipal or industrial wells commonly tap one or more major aquifers and yield a half million gallons per day (350 gallons per minute) per well. Many wells in the area are capable of producing more than a million gallons per day (mgd) on a sustained basis.

Ground Water Quality: The quality of ground water in the basin is generally good and requires little or no treatment for most uses. Some municipal and industrial supplies are treated for the removal of iron and carbon dioxide by aeration and rapid sand filtration. The addition of chlorine to kill harmful bacteria is a common practice. All treatment should be in accordance with standards set by public health departments and pollution control boards. Appendix 5 shows use limitations of water quality parameters.

The amount and kinds of minerals dissolved in ground water may vary greatly from place to place, depending on (1) the types of minerals in the soil or rocks over or through which the water moves, (2) the content of carbon dioxide in the water, (3) the temperature of the water, and (4) the length of time the water has been in contact with the rocks. Common mineral constituents in ground water are iron, calcium, magnesium, bicarbonate, sulfate, chloride, fluoride, nitrate, sodium, potassium, manganese, and silica.

Determination of the chemical quality of ground water in any given part of the basin can be made only on the basis of chemical analyses. Appendix 4 shows results of chemical analysis at selected locations. More detailed information on the chemical quality of ground water in specific areas may be obtained from the District Office of the Water Resources Division, U.S. Geological Survey, Tuscaloosa, Alabama.

Water Demand

In 1975, water withdrawal for all purposes other than hydroelectric power plants in the Black Warrior River Basin averaged about 2,232 million gallons per day or 0.37 million gallons per day per square mile. 1/ Of the total, 2 percent was ground water and 98 percent was surface water from streams or reservoirs. Thermoelectric power plants (steam, nuclear, and coal-fired) accounted for approximately 84 percent of the total withdrawal. Water withdrawal by users other than hydroelectric and thermoelectric power plants was about 352 million gallons per day. Public water supply systems withdrew 152 million gallons per day; rural use, 22 million gallons per day; and self-supplied industry, 178 million gallons per day (table 3-4).

Public water systems served about 645,000 persons or 75 percent of the basin's population in 1975. Of those served, 91 percent were supplied from surface-water sources (145 million gallons per day) and 9 percent from ground water sources (7 million gallons per day). Of the total 152 million gallons per day used as a public supply, 79 million gallons per day were used for commercial and industrial purposes and 73 million gallons per day, for residential purposes. Per capita residential use averaged approximately 113 gallons per day (table 3-5). Whole county and community water use data are shown in appendix 6.

1/ Use of Water In Alabama, 1975, Geological Survey of Alabama Information Series 48, Mattee, Moser, and Dean.

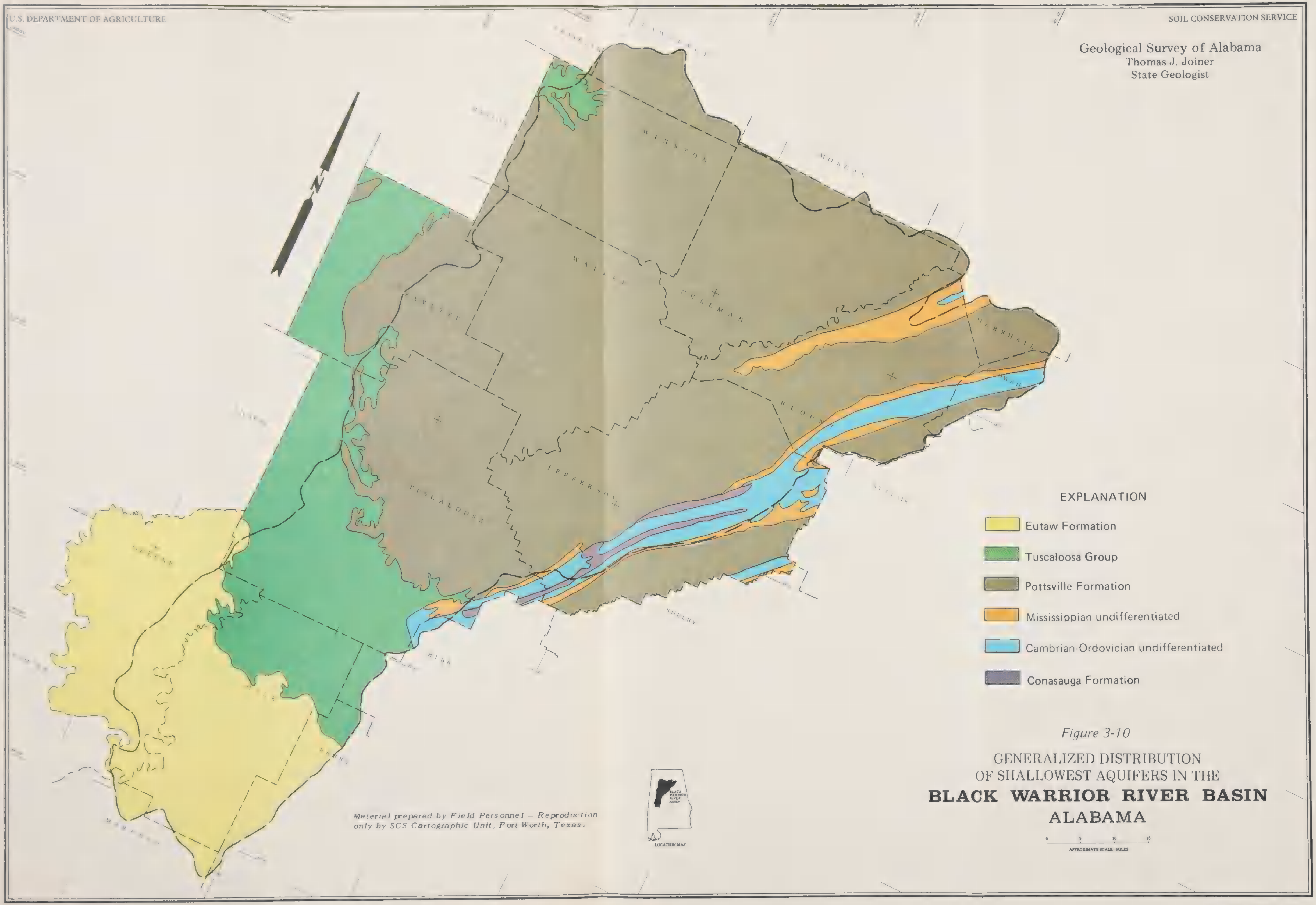


Figure 3-10

GENERALIZED DISTRIBUTION
OF SHALLOWEST AQUIFERS IN THE
BLACK WARRIOR RIVER BASIN
ALABAMA

Water withdrawn by rural residents was used for domestic purposes, (13.7 million gallons per day), livestock watering (4.93 million gallons per day), irrigation (2.35 million gallons per day), and catfish farming (1.1 million gallons per day). Use of ground water for these purposes was about 85 percent of the total withdrawal for rural use (tables 3-4 and 3-6).

Table 3-4 - Estimated withdrawal of water in the Black Warrior River Basin, by source and principal use during 1975

Use	Ground water	Surface water	Total
	Million gal/day		
Public supply	6.979	145.107	152.082
Rural			
Domestic	13.72	0	13.72
Livestock	2.64	2.29	4.93
Irrigation	1.42	0.93	2.35
Catfish farming	1	0.1	1.1
Self-supplied industry	22.09	156.43	178.52
Thermoelectric power plants	0	1,879.5	1,879.5
Hydroelectric plants	0	6,650	6,650
Total	47.855	8,834.307	8,882.162

Source: Use of Water in Alabama, 1975, GSA.

Self-supplied industries, exclusive of thermoelectric power plants, withdrew about 178 million gallons per day, of which 156 million gallons per day (88 percent) was surface water and 22 million gallons per day (12 percent) was ground water (table 3-4). Nonwithdrawal or in-channel use of water by hydroelectric power plants in the basin averaged about 6,650 million gallons per day (tables 3-4 and 3-7).

On the average, residential consumption was about 10 percent of the water used and industrial consumption was about 6 percent of water used. Consumptive use is the quantity of water that is no longer available because it has been "used up", either by being evaporated, incorporated in products or crops, consumed by man or livestock, or otherwise removed from the immediate water environment.

Table 3-5 - Estimated use of public water supply in the Black Warrior River Basin during 1975

County	Population served			No. of services	Persons per service	Average water use (million gallons per day)					Per capita use (gallons per day)	
						Source		User				
	By ground water	By surface water	Total			Ground water	Surface water	Resi-dential	Commer-cial & indus-trial	Total	Resi-dential	Total
Bibb	626	0	626	272	2.3	.04	0	.04	0	.04	64	64
Blount	8,425	821	9,246	3,779	2.4	.909	.260	1.014	.155	1.169	110	126
Cullman	350	33,300	33,650	10,756	3.1	.030	5.3	3.33	2.0	5.33	99	158
Etowah	1,700	0	1,700	637	2.6	.099	0	.089	.010	.099	52	58
Fayette	1,000	0	1,000	385	2.6	.075	0	.075	0	.075	75	75
Franklin	0	0	0	0								
Greene	3,350	0	3,350	1,170	2.9	.276	0	.266	.01	.276	79	83
Hale	5,000	0	5,000	1,837	2.7	.995	0	.385	.61	.995	77	199
Jefferson	3,110	450,045	453,155	184,936	2.4	.56	115.36	51.31	64.61	115.92	113	256
Lawrence	0	0	0									
Marengo	1,040	0	1,040	320	3.3	.297	0	.027	.270	.297	27	93
Marshall	0	8,200	8,200	3,189	2.6	.04	1.07	.54	.57	1.11	66	135
Morgan	12	271	283	96	2.9	.00	.081	.021	.06	.081	83	307
Perry	2,400	0	2,400	850	2.8	.61	0	.2	.410	.610	98	254
Tuscaloosa	20,550	69,330	89,880	34,492	2.6	2.84	18.17	12.65	8.36	21.01	141	234
Walker	1,675	27,748	29,423	11,857	2.5	.12	4.16	2.81	1.47	4.28	95	145
Winston	2,000	5,250	7,250	2,673	2.7	.162	.707	.694	.175	.869	96	120
Totals	50,238	594,965	645,203	256,492		6.979	145.107	73.376	78.71	152.086		
Averages					2.5						113	236

Source: Same as 3-4

Table 3-6 - Estimate of rural water use in the Black Warrior River Basin during 1975
(million gallons per day)

County	Domestic	Livestock		Irrigation		Catfish farming		Total		Total
	G.W.	G.W.	S.W.	G.W.	S.W.	G.W.	S.W.	G.W.	S.W.	
Bibb	.017	.01	.02	.002	0	0	0	.029	.02	.049
Blount	1.093	.639	.315	.027	.063	.04	.05	1.8	.428	2.23
Cullman	1.168	.932	.629	.098	.23	0	.02	2.2	.88	3.08
Etowah	.07	.02	.028	.012	.027	0	0	.102	.055	.157
Fayette	.506	.04	.052	.007	.002	0	0	.553	.054	.607
Franklin	.001	0	.001	0	0	0	0	.001	.001	.002
Greene	.348	.04	.09	0	0	0	0	.388	.09	.478
Hale	.525	.23	.383	.214	.15	.501	0	1.47	.533	2.03
Jefferson	5.745	.125	.127	.14	.059	0	0	6.01	.186	6.196
Lawrence	.109	.024	.021	.009	.004	0	0	.142	.025	.167
Marengo	0	0	.001	0	0	0	0	0	.001	.001
Marshall	.176	.091	.063	.006	.003	0	0	.273	.066	.339
Morgan	.001	0	0	0	0	0	0	.001	0	.001
Perry	.039	.021	.032	0	0	0	0	.06	.032	.092
Tuscaloosa	1.631	.152	.235	.507	.217	.26	.03	2.55	.482	3.032
Walker	1.689	.161	.164	.398	.171	.20	0	2.448	.335	2.783
Winston	.598	.157	.130	0	0	0	0	.755	.13	.885
Totals	13.72	2.64	2.29	1.42	.93	1.0	.1	18.78	3.32	22.10
Total by category		4.93		2.35		1.1				

G.W. - Ground water
S.W. - Surface water

Source: Same as 3-4

Table 3-7 - Water used by hydroelectric and thermoelectric power plants in the Black Warrior River Basin during 1975

Hydroelectric power plants

Plant	Owner	Stream	Gross power head (feet)	Average annual generation (1,000 megawatt hours)	Average water use[1] (millions gallons per day)
Lewis Smith	APC[2]	Sipsey Fork	255	209	900
Bankhead	APC	Black Warrior	69	188	2,970
Holt	APC	Black Warrior	64	165	2,780

Thermoelectric power plants

Plant	Owner	County	Average daily use self-supplied surface water	Stream	Plant capacity (1,000 kilowatts)	Use[1] Condenser cooling (million gallons per day)	Use[1] Other (million gallons per day)
Gorgas	APC	Walker	1,447.0	Black Warrior	641	1,419.362	27.638
Greene Co.	APC	Greene	432.5	Black Warrior	500	406.55	25.95

[1]Some may be recycled
[2]Alabama Power Company

Source: Same as 3-4

Land Resources

Land Use--

General: The land and water areas of the Black Warrior River Basin encompass 4,007,000 acres, or about 12 percent of the state, table 3-8. Seventeen of the state's 67 counties lie partially within the drainage area of the Black Warrior. No county is entirely within the basin.

Approximately 67.2 percent of the basin, or 2,694,000 acres, are forested. Other land uses include cropland, 13.1 percent; pasture, 8.5 percent; incorporated areas and transportation corridors, 6.6 percent; surface water, 1.9 percent; and all other land areas, 2.7 percent (figure 3-11). The 527,000 acres of cropland in 1975 represent an increase of 10 percent over the 1967 total. Hale and Greene Counties reported the most rapid expansion of cropland acreage, with most of the increase on soil with a slight to moderate wetness problem on moderate slopes. Generally, the trend was to fewer acres of pasture and forest over this period. Between 1967 and 1975 pasture acreage declined 4.2 percent, with major reductions coming in Hale and Tuscaloosa Counties.

Urbanization, transportation, and other non-agricultural uses are constantly reducing the agricultural base. Accurate figures on this depletion rate are difficult to obtain because of constant change taking place. However, measure--ments of incorporated city boundaries and all road and rail systems reveal that almost 300,000 acres were devoted to these nonagricultural uses in 1975. The annual rate of depletion has been declining, dropping from about 0.9 acres per person during the 1960's, to around 0.5 acres per person presently. A continued decline is expected. Overall, the amount of agricultural land lost annually to urban uses is quite small.

The basin land use map is a result of a 1978 reconnaissance survey by field personnel of the Soil Conservation Service. Base maps for their use were made from high altitude photography (60,000 plus feet) under cooperative agreement between the USDI Geological Survey and the State of Alabama, Office of State Planning and Federal Programs. The USDI Geological Survey developed a land use and land cover classification system for use with remote sensor data which has been adopted by the State of Alabama. The system shows land use within the basin to be urban or built-up land, open agricultural land, forest land, water, or barren land. Field personnel reviewed the land classified as open agricultural and divided this use into cropland, pastureland, or a mixture of the two (see land use index figure 3-12 and map sheets figure 3-13).

Agricultural Land Use: A 1975 land use update of the Conservation Needs Inventory revealed that 3.6 million of the basin's 4 million acres are used for agricultural purposes (table 3-9). This represents 9 of every 10 acres. Three-fourths of the basin's farmland was utilized for timber production in 1975, with cropland accounting for 15 percent and pasture the remaining 10 percent.

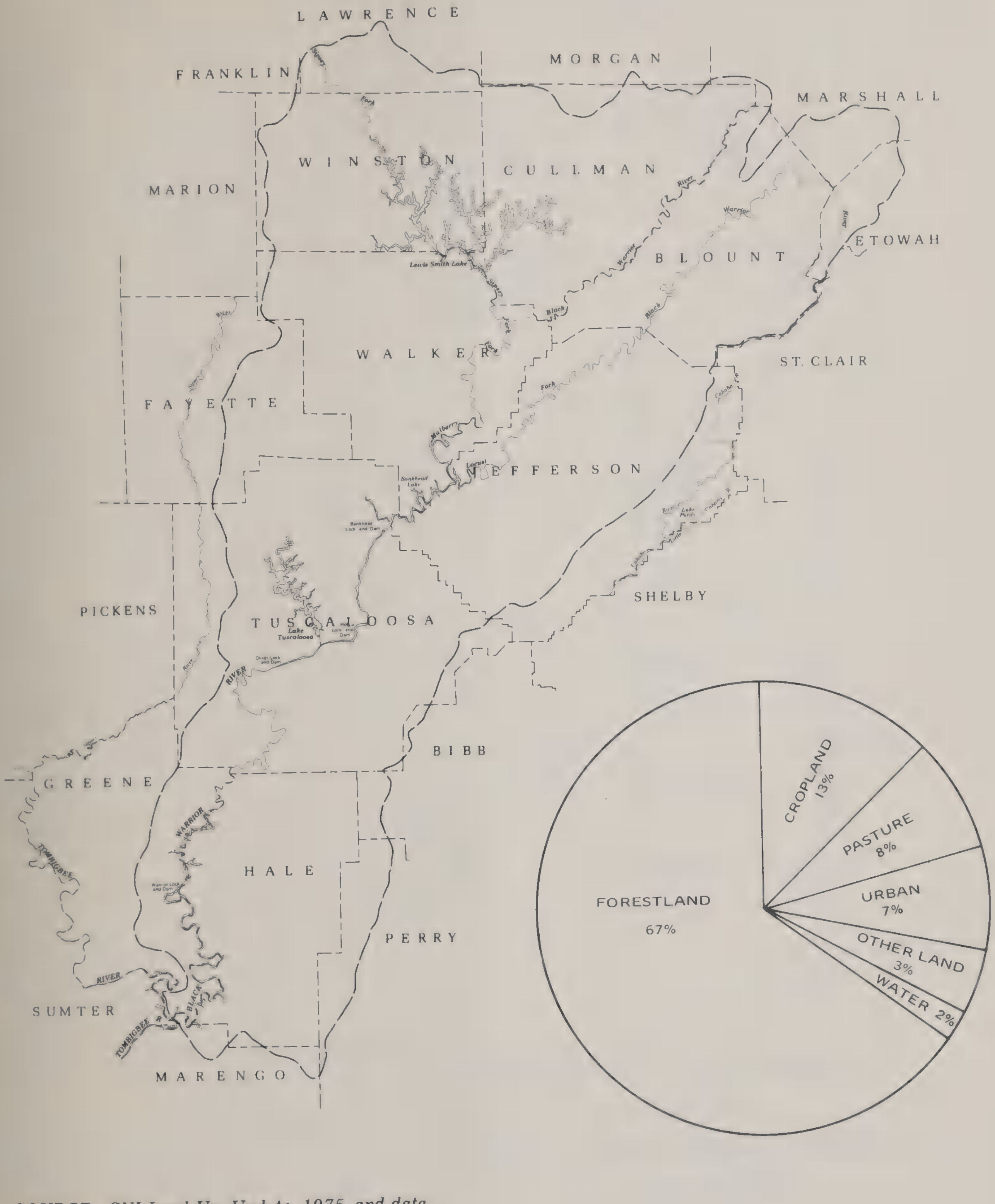
Total cropland dropped sharply between 1949 and 1959. Since then, however, the decline has continued at a much slower rate, roughly 10,000 acres per year leaving 527,000 acres of cropland in 1975. Slightly more than one-half of the available cropland was harvested in 1975. Crop production is concentrated in

Table 3-8 -- Land use, Black Warrior River Basin, 1975

County	Total area in basin	Cropland	Pasture	Forest	Incorporated area and transportation corridors 1/	All other land	Water area
				Acres			
Bibb	27,800	8	56	27,727	0	5	4
Blount	392,600	81,321	43,981	227,600	17,318	15,620	6,760
Cullman	449,800	110,811	58,947	222,900	27,285	15,765	14,092
Etowah	60,900	16,902	4,392	27,600	5,272	5,735	999
Fayette	137,000	22,287	6,221	103,200	1,407	2,185	1,700
Franklin	600	0	0	600	0	0	0
Greene	126,000	14,612	10,409	91,300	3,704	2,685	3,290
Hale	420,800	94,647	80,323	219,900	10,241	6,945	8,744
Jefferson	535,000	15,360	15,159	381,500	104,966	14,550	3,465
Lawrence	82,300	0	0	82,000	226	0	74
Marengo	25,000	9,057	4,614	5,500	5,203	470	156
Marshall	63,000	27,236	4,556	14,800	13,775	2,050	583
Morgan	1,300	0	0	1,300	0	0	0
Perry	77,000	13,201	19,025	43,300	529	497	448
Tuscaloosa	718,000	56,220	15,341	565,900	37,980	22,470	20,089
Walker	509,000	41,258	50,038	376,800	24,313	10,980	5,611
Winston	380,900	23,677	24,951	302,100	11,732	6,810	11,630
Basin Total	4,007,000	526,597	338,013	2,694,027	263,951	106,767	77,645
Percent	100.0	13.1	8.5	67.2	6.6	2.7	1.9

Source: SCS analyses of land use by soil group utilizing 1975 SRS crop acreages; SCS and ESS urban and surface water measurements, 1978; and SCS National Resources Inventory, 1978.

1/ Includes the area within incorporated cities and towns, all road systems, and railroad rights-of-way.



SOURCE: CNI Land Use Update, 1975, and data compiled by River Basin Staff.

Figure 3-11

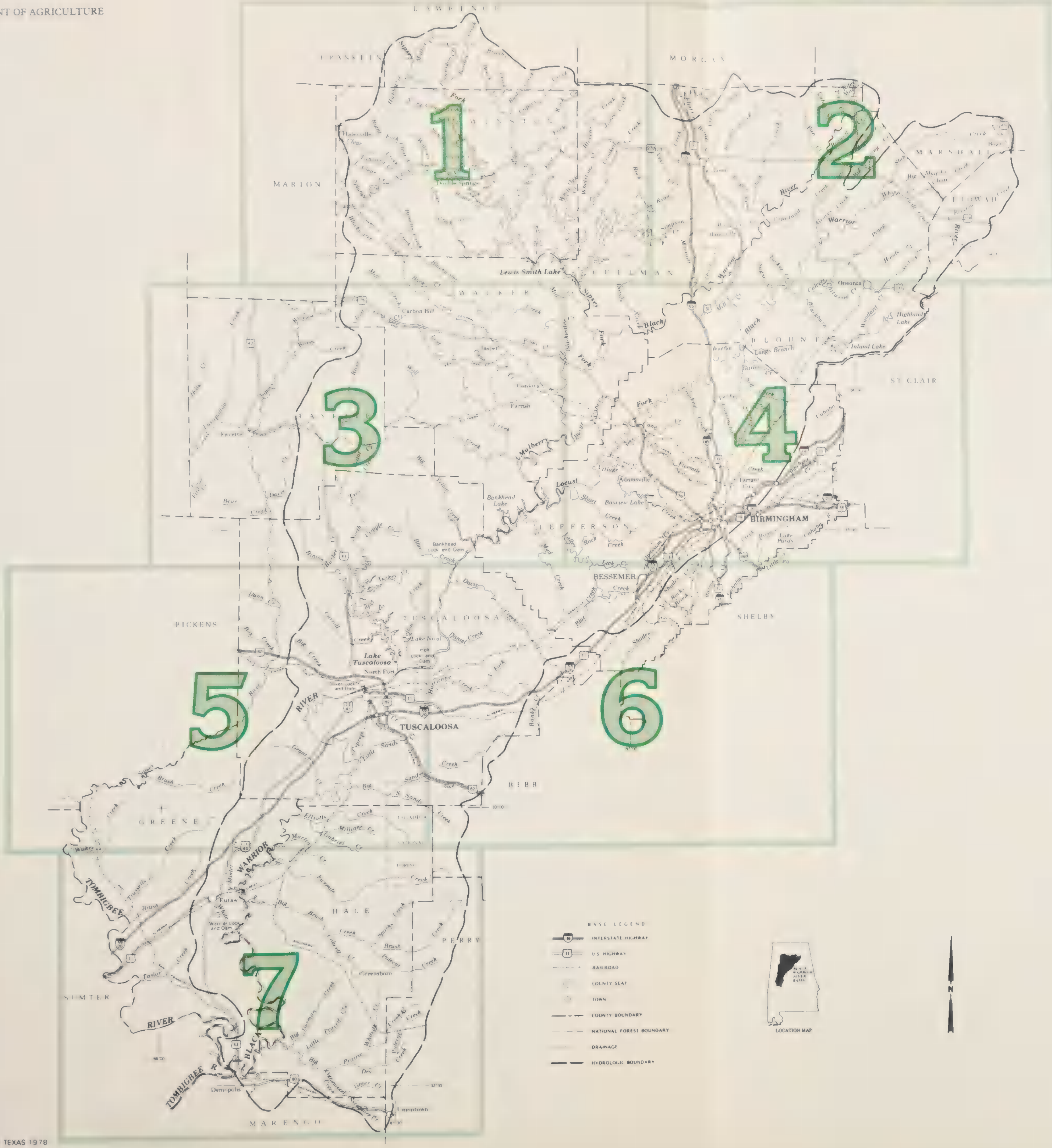
LAND AND WATER USE DISTRIBUTION, BLACK WARRIOR RIVER BASIN, 1975

Table 3-9 - Distribution of land in agricultural production, by counties, Black Warrior River Basin, 1975

Land Use	Basin total	County Areas within the Black Warrior River Basin																
		Bibb	Blount	Cullman	Etowah	Fayette	Franklin	Greene	Hale	Jefferson	Lawrence	Marengo	Marshall	Morgan	Perry	Tuscaloosa	Walker	Winston
		Acres																
Cropland:	526,597	8	81,321	110,811	16,902	22,287	0	14,612	94,647	15,360	0	9,057	27,236	0	13,201	56,220	41,258	23,677
Corn	55,462	0	7,995	20,089	2,516	1,470	0	1,743	4,600	588	0	1,048	4,660	0	938	2,977	3,207	3,622
Soybeans	104,684	0	6,428	10,992	1,595	2,714	0	4,739	49,000	442	0	3,690	10,165	0	6,923	5,473	592	1,931
Cotton	29,356	0	5,844	6,027	745	1,429	0	1,487	5,800	0	0	160	1,197	0	376	6,291	0	0
Wheat	3,660	0	100	276	0	190	0	357	1,200	167	0	0	116	0	126	933	95	100
Hay	80,389	0	13,402	13,082	1,156	2,254	0	3,375	17,790	5,113	0	641	1,229	0	2,968	7,404	8,024	3,881
Minor crops	16,415	0	2,025	3,025	360	480	0	700	4,700	380	0	335	1,050	0	685	1,385	715	575
Pastured, fallow, idle or failure	236,631	8	45,527	57,320	10,530	13,750	0	2,211	11,557	8,670	0	3,183	8,740	0	1,185	31,757	28,625	13,568
Pasture:	338,013	56	43,981	58,947	4,392	6,221	0	10,409	80,323	15,159	0	4,614	4,556	0	19,025	15,341	50,038	24,951
Improved	276,585	45	37,380	50,100	2,640	4,350	0	6,250	72,290	13,640	0	2,300	2,960	0	11,410	10,740	40,030	22,450
Forest:	2,694,027	27,727	227,600	222,900	27,600	103,200	600	91,300	219,900	381,500	82,000	5,500	14,800	1,300	43,300	565,900	376,800	302,100
TOTAL *	3,558,637	27,791	352,902	392,658	48,894	131,708	600	116,321	394,870	412,019	82,000	19,171	46,592	1,300	75,526	637,461	468,096	350,728

*Excludes non-agricultural land uses shown in table 3-8 and other agricultural lands (farmsteads, farm roads, feed lots) in table 3-10.

Source: SCS analyses of land use by soil group and county utilizing 1975 SRS data; SCS and ESS urban and surface water measurements, 1978; and SCS LIM study, 1978.



LEGEND

	URBAN OR BUILT-UP LAND
	AGRICULTURAL LAND
	Cropland
	Pasture
	Cropland and Pasture*
	Orchards, Groves, Vinyards, Nurseries and Ornamental Horticultural Areas
	Confined Feeding Operations
	FOREST LAND
	Deciduous
	Evergreen
	Mixed
	WATER AREAS
	WETLAND
	Forested
	Nonforested
	BARREN LAND
	Strip Mines, Quarries and Gravel Pits
	Transitional Areas
	Mixed

* Areas less than 230 acres not differentiated

Figure 3-12

INDEX TO MAP SHEETS
LAND USE
BLACK WARRIOR RIVER BASIN STUDY AREA ALABAMA

0 5 10 15
APPROXIMATE SCALE - MILES

BASE COMPILED FROM 1:250,000 USGS TOPOGRAPHIC MAPS, TRANSVERSE MERCATOR PROJECTION

50,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 16

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USDA-SCS-FORT WORTH, TEXAS 1978

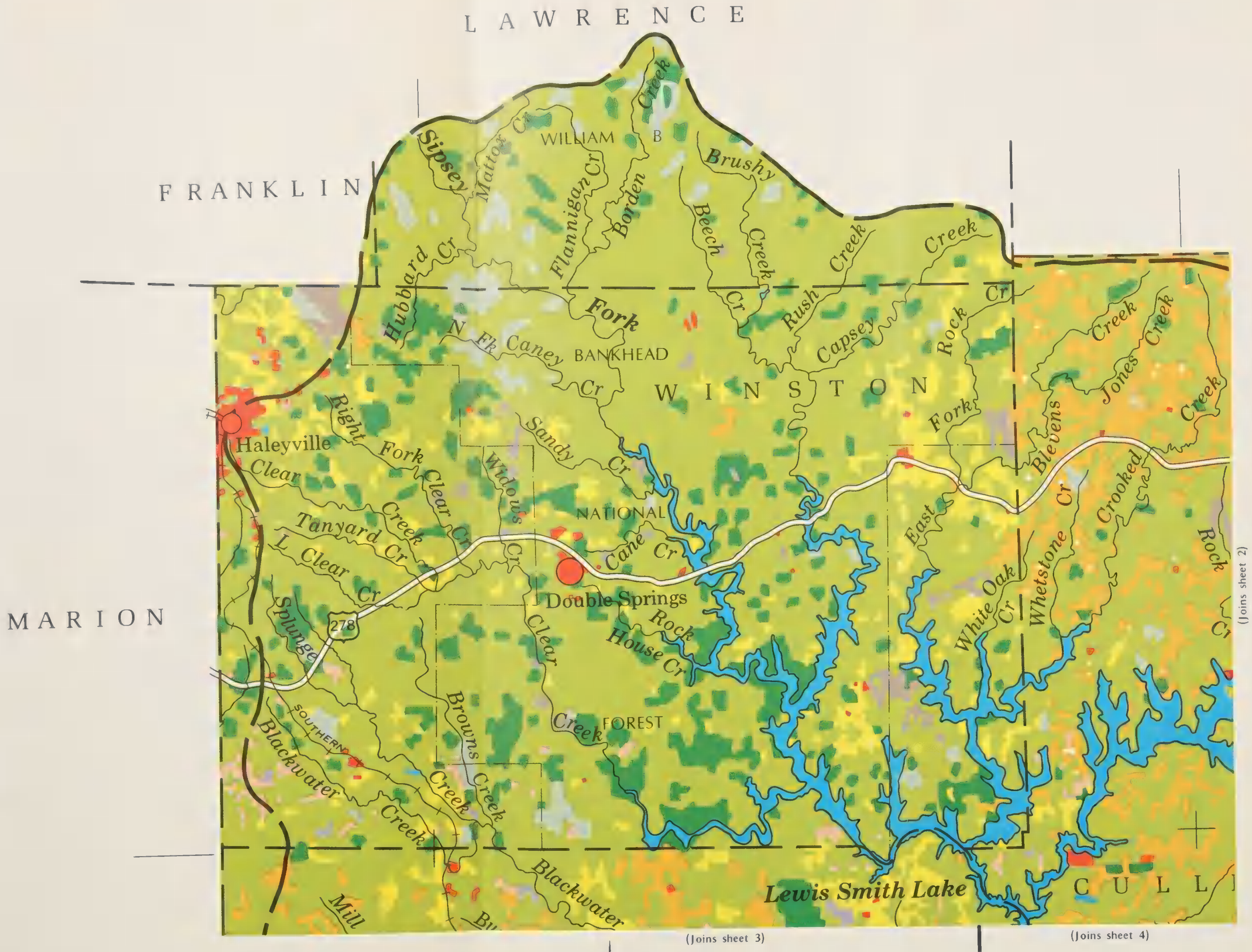

Figure 3-13

LAND USE
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0 5 10 15
APPROXIMATE SCALE - MILES

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Figure 3-13

LAND USE

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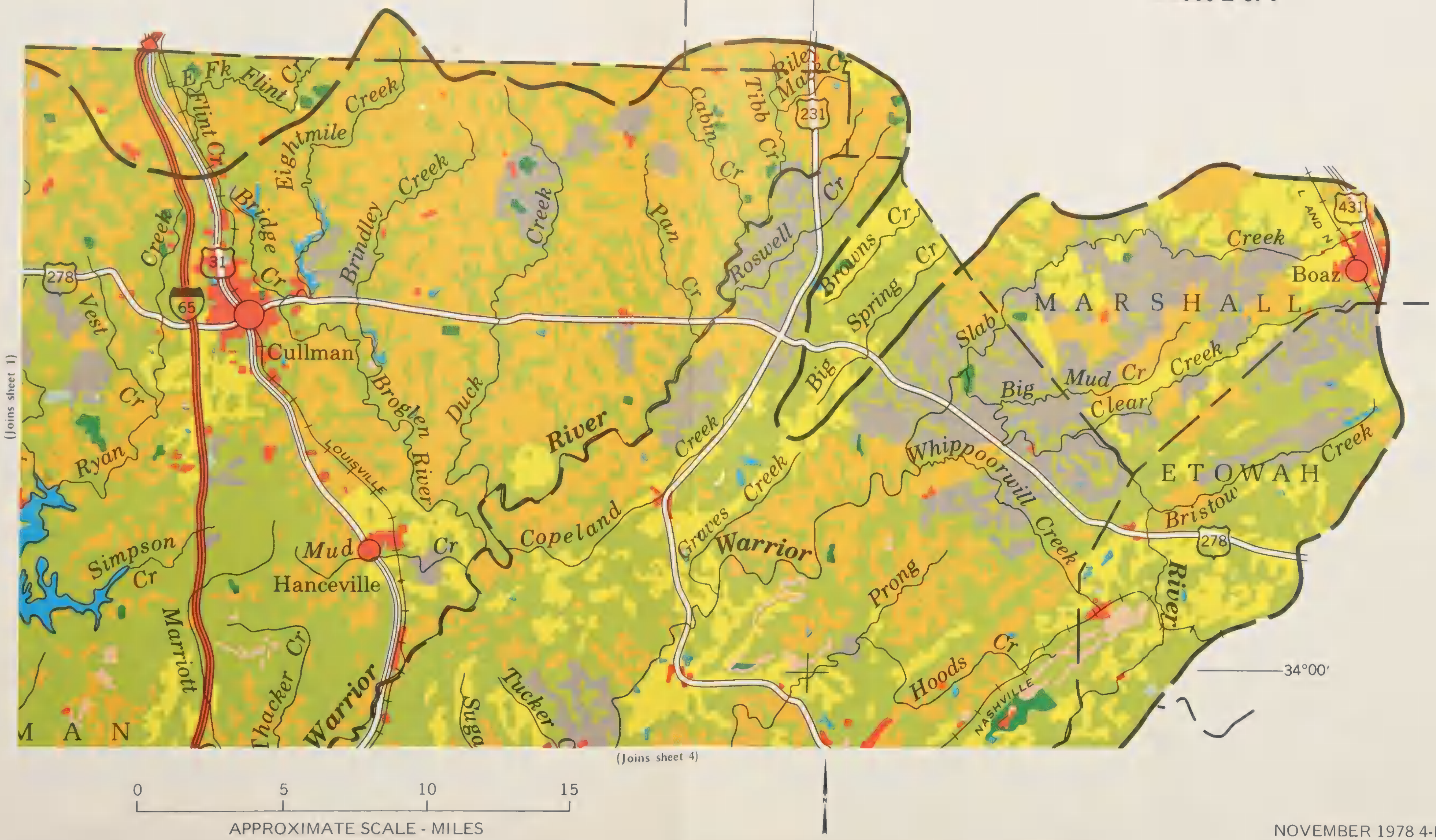

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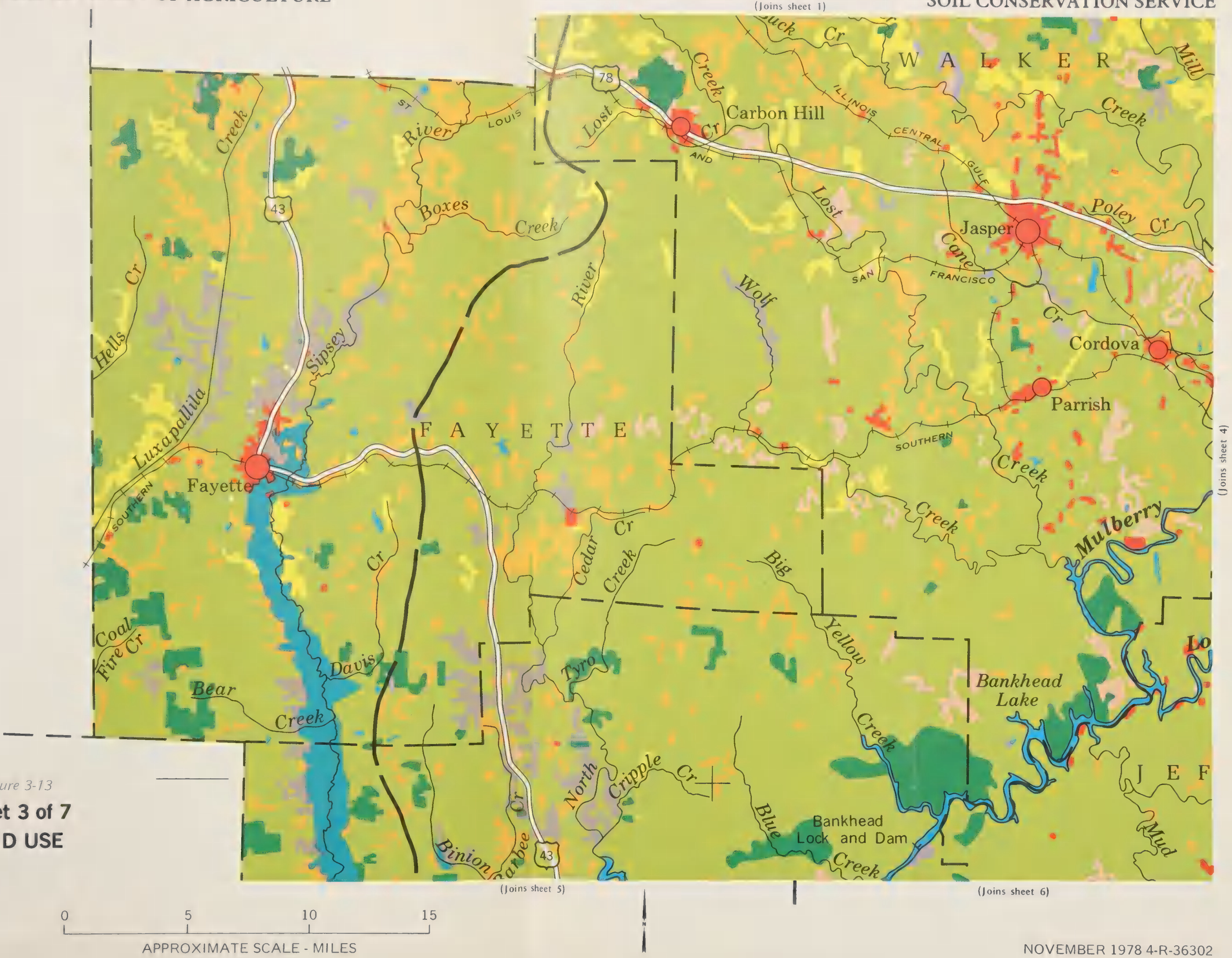

Figure 3-13

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LAND USE

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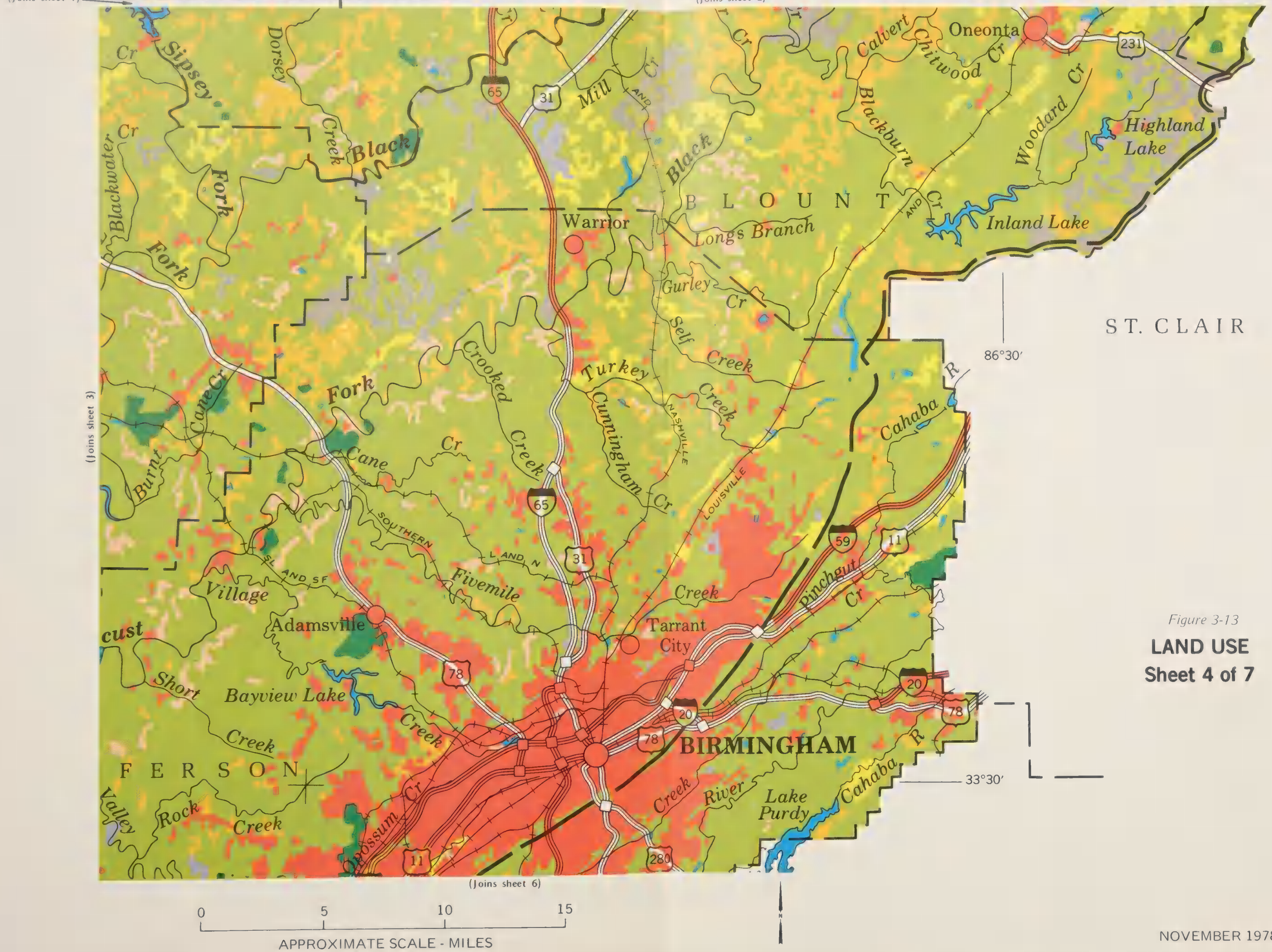

Figure 3-13

LAND USE
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Figure 3-13

LAND USE

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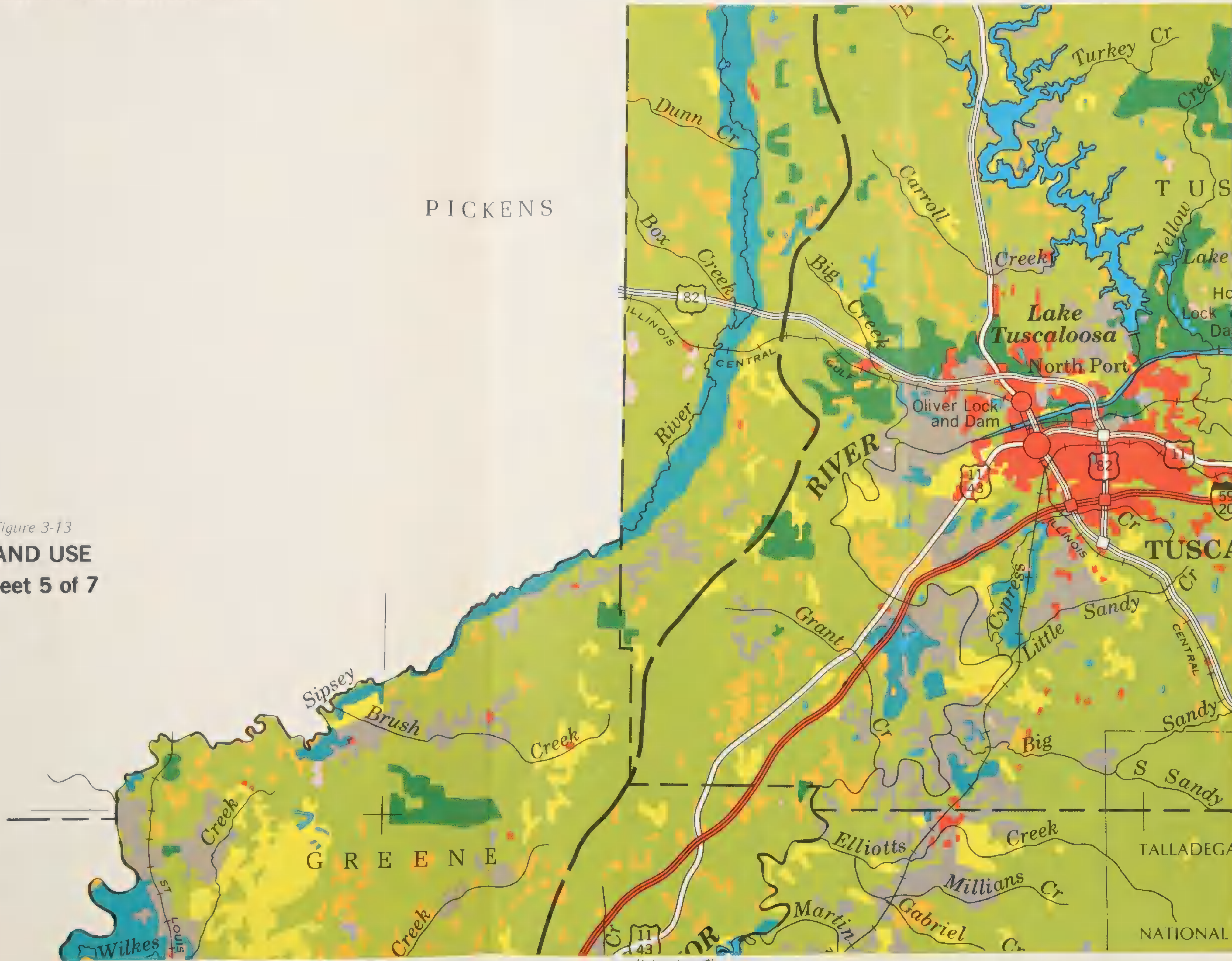

0 5 10 15
APPROXIMATE SCALE - MILES

NOVEMBER 1978 4-R-36302

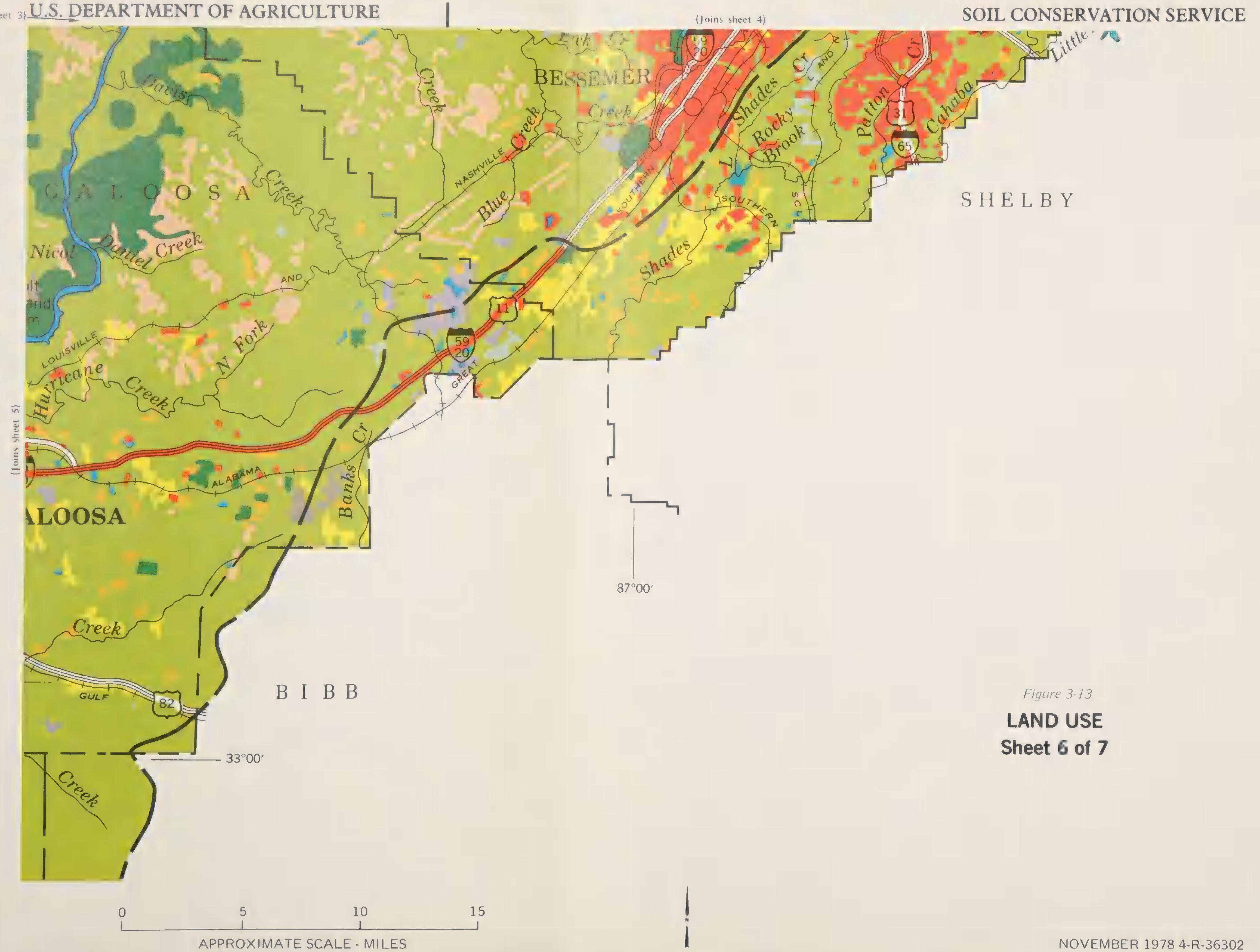

Figure 3-13

LAND USE
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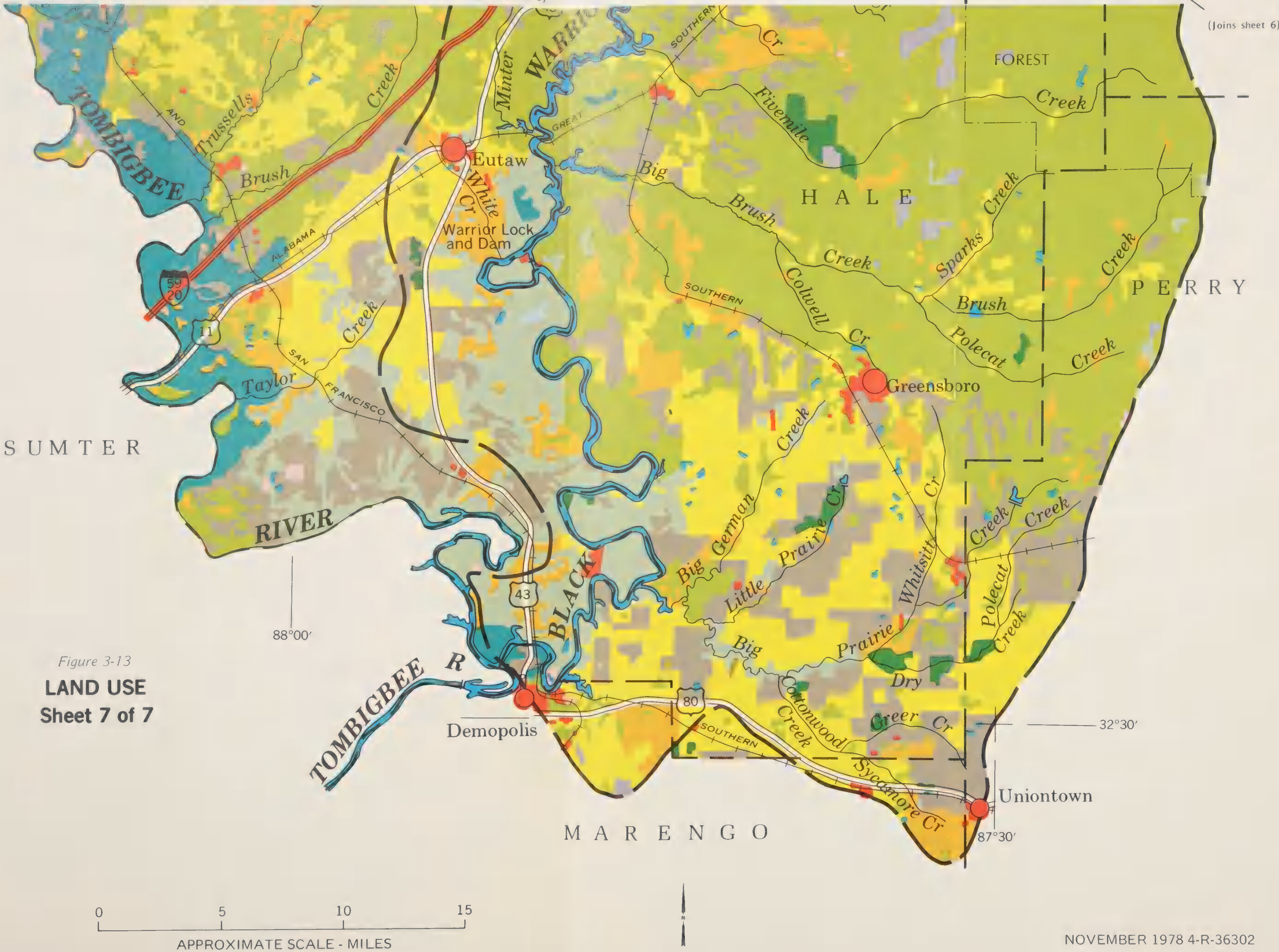

Figure 3-13

LAND USE
Sheet 7 of 7

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Blount, Cullman, and Hale Counties. For several years, soybeans have been both the basin's and state's leading money crop. In 1975, a record 105,000 acres of soybeans were harvested, accounting for nearly one third of the total 290,000 acres harvested. Hay and corn are the only other crops of major importance. An estimated 200,000 acres of cropland were pastured in 1975 leaving about 37,000 acres of idle cropland (Table 3-10).

Irrigation is not a common practice in the basin. In 1974, less than 1,000 acres were irrigated. The high initial cost of irrigation equipment, the shortage of labor during the growing season, the cost of wells or surface impoundments and the increased cash-flow needs for operation and payment schedules have discouraged any widespread increase in use of irrigation. The unstable market price of primary crops along with relatively small fields that can be irrigated tend to keep the expansion of irrigation within the basin at a low level.

Table 3-10 - Trend in agricultural land use, Black Warrior River Basin, 1949-1975

Item	1949	1959	1969	1975
	1,000 Acres			
Cropland, total	1,215	690	573	527
Harvested	(616)	(357)	(246)	(290)
Irrigated	*	*	*	*
Pastured	(94)	(118)	(225)	(200)
Idle or fallow	(505)	(215)	(102)	(37)
Forest land, total	2,740	2,800	2,750	2,694
Pastured	(N/A)	(N/A)	(110)	(100)
Pasture	235	335	372	338
Misc. agriculture *	140	97	102	107
TOTAL	4,330	3,922	3,797	3,666

*Less than 1,000 acres.
Source: Census of Agriculture, 1949-1969, Alabama Agriculture Statistics, 1977, and Conservation Needs Inventory, 1967, Alabama Forest Survey Reports, 1954, 1963, and 1973.

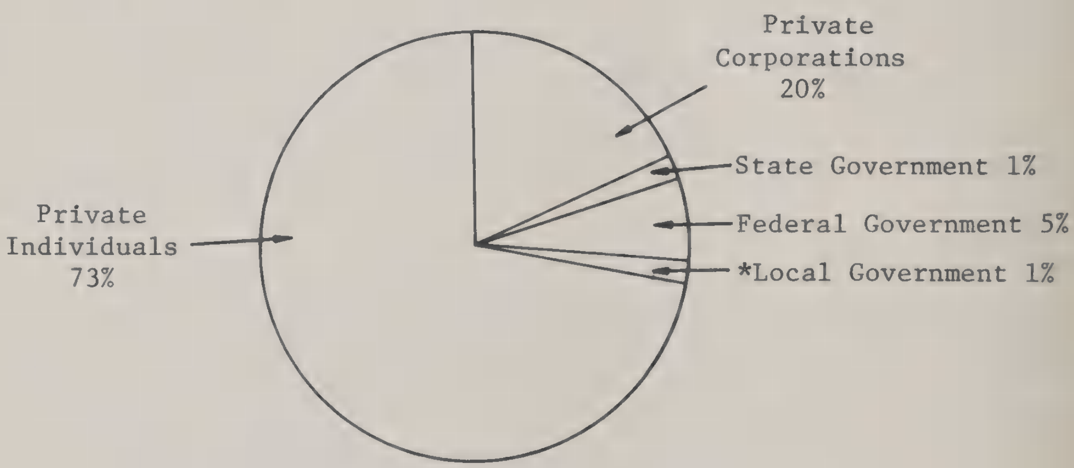
Commercial Forest Land: Commerical forest land is defined as forest land capable of producing crops of industrial wood and has not been withdrawn from timber utilization. According to forest surveys, commercial forest land acreage in the basin declined 3.7 percent between 1963 and 1972. The decline in commercial forest land reverses an increasing trend apparent in the previous survey period 1953-1963. Commercial forest land acreage for the 1975 base year was estimated at 2,694 thousand acres and represents approximately 67 percent of the basin.

The greatest losses within the basin occurred in Walker, Jefferson, and Cullman Counties which collectively lost 79.7 thousand acres of forest land between the 1963 and 1972 forest surveys. Blount, Hale and Tuscaloosa Counties were most stable having a collective gain of 2.3 thousand acres.

Most of the decline in forest land acreage was attributed to conversion to other agricultural uses. An estimated 96.8 thousand acres were cleared for agricultural purposes, mostly pasture. An additional 43.3 thousand acres were diverted for other purposes. A total of 39.3 thousand acres reverted to forest during this period but was insufficient to offset the losses from land clearing.

Land Ownership-- The inventory of land ownership within the basin was based on information obtained from local sources within each county (Figure 3-14). Ownership was divided between private, federal, state, and local holdings. The results of this study shows that approximately 2,942,000 acres are privately owned. Remaining are 210,000 acres held by the federal government, 41,500 acres owned by the State of Alabama, 10,500 acres owned by local governments, and 803,000 acres in corporate holdings (table 3-11). Included in all categories of ownership are about 77,000 acres of water and 3,930,000 acres of land. The land ownership map shows the general location of holdings of private individuals and private corporations as well as a breakdown of lands owned by the state, local, and federal government. Figure 3-15 shows percent ownership by categories.

Figure 3-15 -- Land ownership distribution, Black Warrior River Basin, 1975



*Less than 1% rounded

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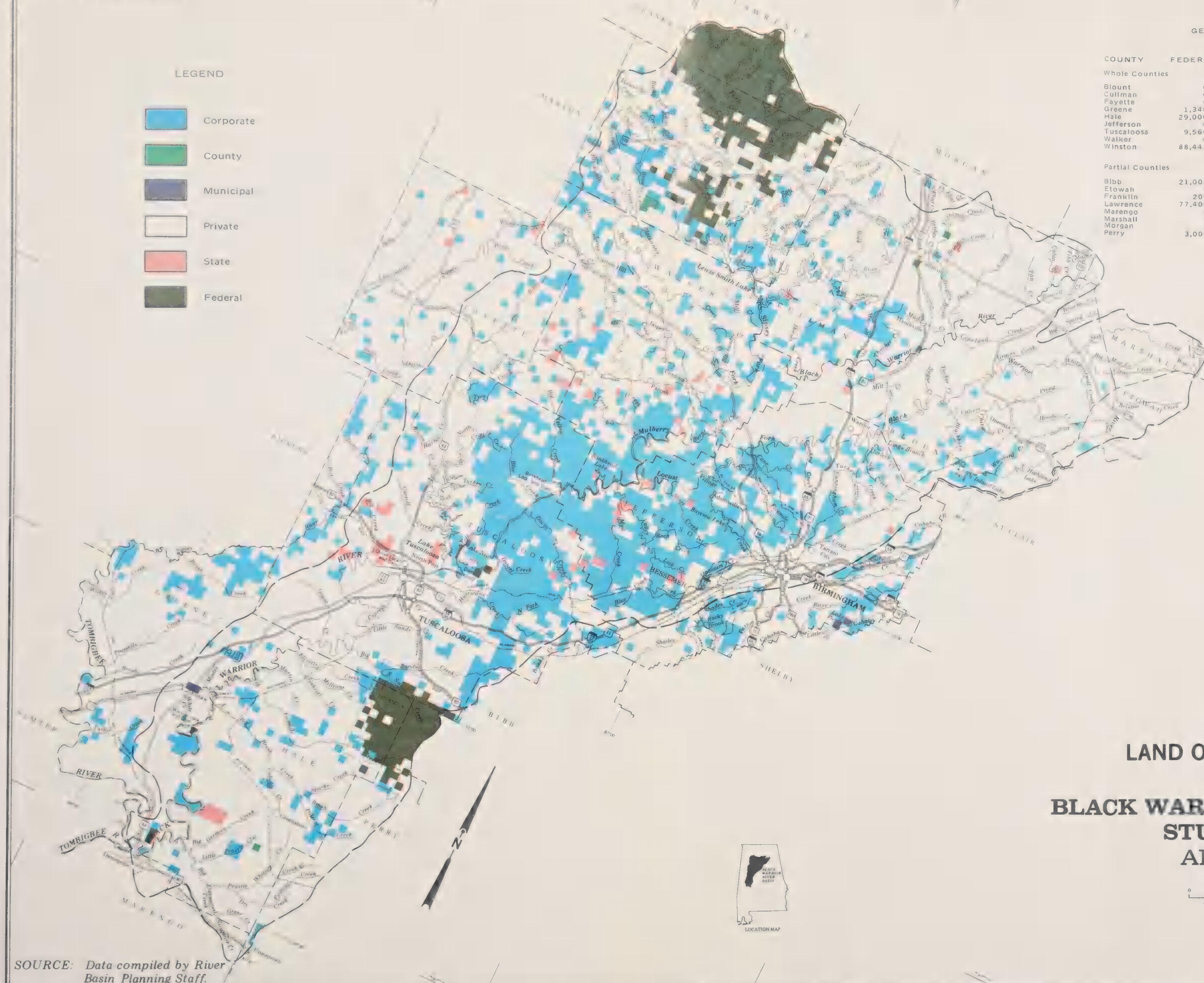

GENERAL LAND OWNERSHIP IN ACRES

COUNTY	FEDERAL	STATE	LOCAL GOVT.	PRIVATE	CORPORATE
Whole Counties					
Blount	0	360	0	373,720	37,440
Cullman	0	1,920	1,000	412,712	59,888
Fayette	0	9,820	0	355,300	36,160
Greene	1,340	0	1,440	364,940	53,760
Hale	29,000	4,720	480	370,760	19,360
Jefferson	0	10,260	2,880	419,980	284,320
Tuscaloosa	9,560	10,400	4,200	560,540	278,660
Walker	0	14,640	1,900	345,400	156,460
Winston	88,442	360	2,040	306,908	76,960
Partial Counties					
Bibb	21,000	0	0	5,600	1,200
Etowah	0	0	0	60,260	640
Franklin	200	0	0	400	0
Lawrence	77,400	0	0	4,380	520
Marengo	0	0	0	25,000	0
Marshall	0	0	0	63,000	0
Morgan	0	0	0	1,300	0
Perry	3,000	0	0	72,720	1,280

Figure 3-14

LAND OWNERSHIP MAP
1975
BLACK WARRIOR RIVER BASIN
STUDY AREA
ALABAMA

SOURCE: Data compiled by River Basin Planning Staff.

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Table 3-11 - General land ownership in acres, Black Warrior River Basin, 1975

County	Total area in basin 1/	Federal	State	Local govt.	Private	Corporate
	--------	--------	Acres	--------	--------	--------
Blount	392,600	0	343	0	356,538	35,719
Cullman	449,800	0	1,816	946	390,389	56,649
Fayette	137,000	0	3,353	0	121,302	12,345
Greene	126,000	401	431	0	109,097	16,071
Hale	420,800	29,000	4,681	476	367,443	19,200
Jefferson	535,000	0	7,651	2,148	313,182	212,019
Tuscaloosa	718,000	7,950	8,649	3,493	466,165	231,743
Walker	509,000	0	14,375	1,866	339,137	153,622
Winston	380,900	70,965	288	1,637	246,258	61,752
Bibb	27,800	21,000	0	0	5,600	1,200
Etowah	60,900	0	0	0	60,260	640
Franklin	600	200	0	0	400	0
Lawrence	82,300	77,400	0	0	4,380	520
Marengo	25,000	0	0	0	25,000	0
Marshall	63,000	0	0	0	63,000	0
Morgan	1,300	0	0	0	1,300	0
Perry	77,000	3,000	0	0	72,720	1,280
Basin total	4,007,000	209,916	41,587	10,566	2,942,171	802,760
Percent	100.0	5.0	1.0	* 2/	73.0	20.0

1/ This total includes only that portion of a county within the river basin. For whole county data see figure 3-14.

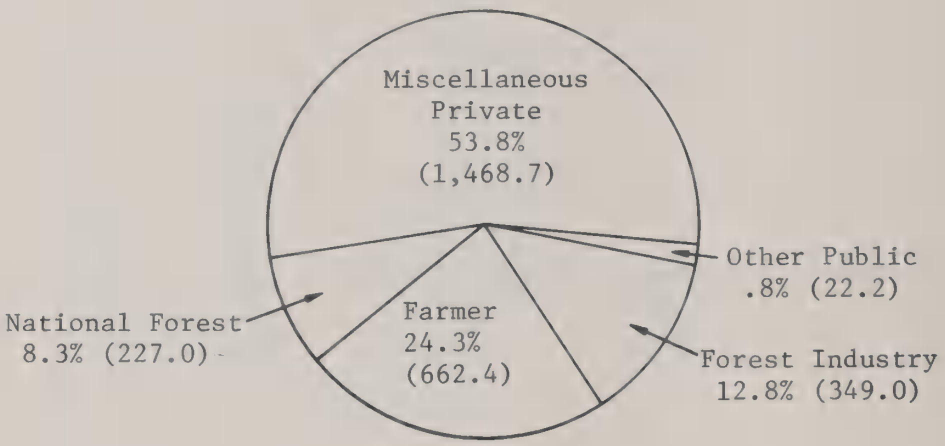
2/ Less than one percent.

Source: Update "Land Ownership" Alabama Development Office and revised maps by Espy Survey and Map Service from tax records in each county. Acreage may not include single tracts of less than 40 acres.

Forest ownership patterns did not change substantially between the 1963 and 1972 forest surveys. Farmer-owned forest land has declined slightly statewide as farm operators switched to other occupations and because of land clearing for agriculture and other purposes. The distribution of forest land by ownership classes is displayed in figure 3-16.

Figure 3-16 - Forest Ownership by Acreage and Percent of Commercial Forest Land, Black Warrior River Basin, 1971

(thousand acres)



Source: USDA Forest Service, Southern Forest Experiment Station, Alabama Forest Survey, 1972.

About three-fourths of the basin's commercial forest land is held by private, non-industrial owners. Most of the acreage occurs in small tracts of less than 500 acres. It is distributed throughout the basin but largest concentrations occur in the central counties.

Forest industry ownership is well distributed throughout the basin with the exception of Blount and Jefferson Counties. Tuscaloosa County contains the most industrial-owned forest land, amounting to over 30 percent of the forest-industry ownership for the basin. Most of the acreage held by forest industry is in large tracts of greater than 500 acres.

Public ownership accounts for a little over 9 percent of the basin's commercial forest land. Most of this is in National Forest ownership. The Bankhead National Forest located in Lawrence, Winston and Franklin Counties contains approximately 166,000 acres (appendix figure 6A). Another 61,000 acres is within the Oakmulgee Division of the Talladega National Forest located in Bibb, Perry, Hale and Tuscaloosa Counties (appendix figure 6B). A small amount is in other federal ownership.

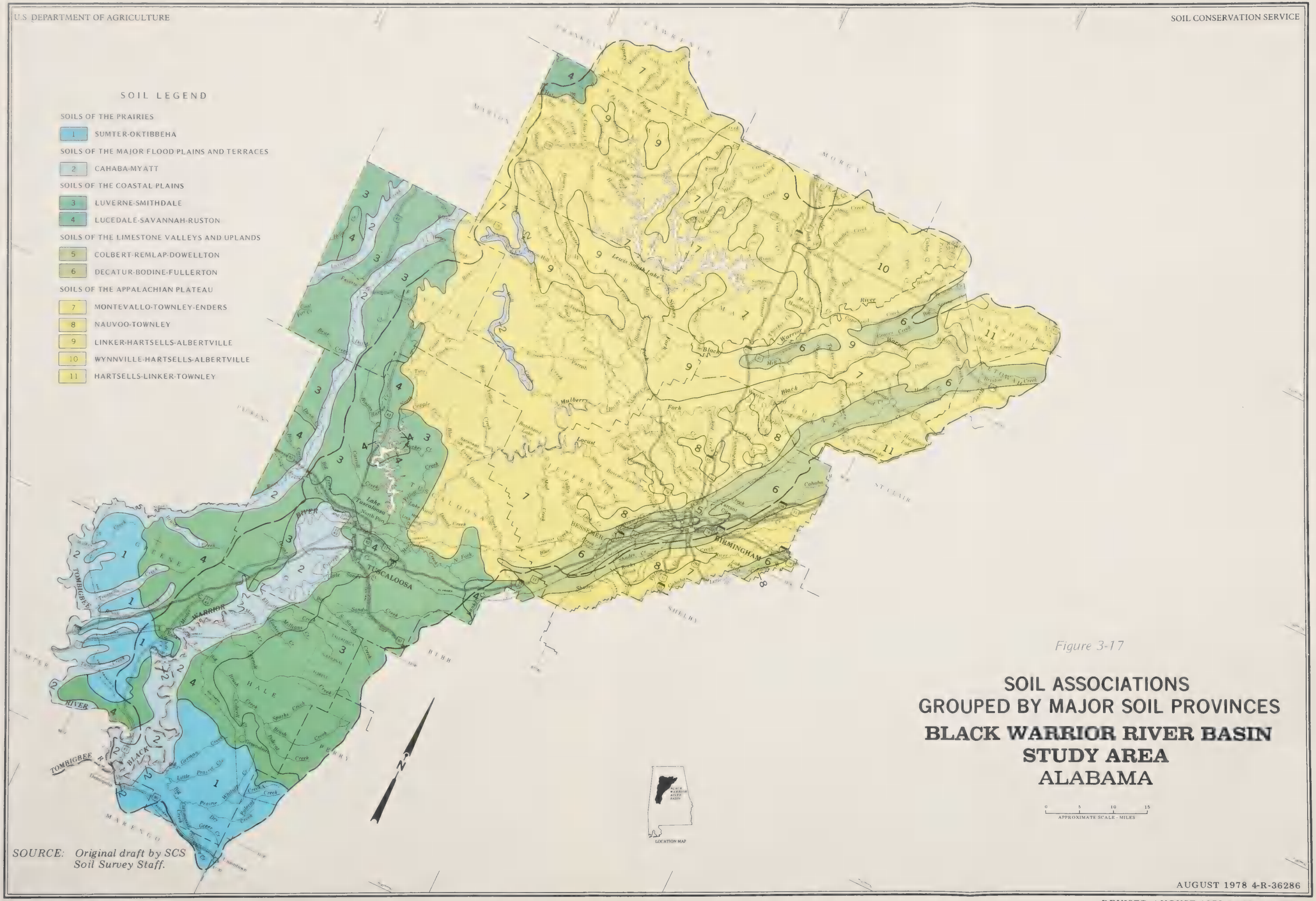
Soils-- The general soils map (figure 3-17) shows the distribution of soil associations. A description of each association is shown in appendix 7A. (Appendix figures 7-C through 7-I shows interpretive information for seven selected land uses.) Each soil association is a broad landscape that has a repeating pattern of soils and is named according to the one or more most extensive soil series. Each area also includes other soils which are less extensive and may or may not have characteristics similar to those of the dominant soils. The scale of the map included prohibits use of this information in detailed planning. However, detailed information from completed soil surveys is presently being stored in the Alabama Resources Information System. About 77 percent of the basin, or 3,075,500 acres has a detailed soil survey completed. Of the 9 whole counties, 6 counties have completed detailed soil mapping.

Information on smaller areas or tracts for planning can be obtained from detailed soil maps at local Soil Conservation Service field offices. Status of the publication of detailed soil surveys is shown in appendix figure 7-B.

Land Capability Classification-- Capability classification is a grouping of soils to show their suitability for various agricultural uses. It is a practical classification based on the degree and kind of permanent soil limitations. The degree of limitation is designated by Roman Numerals I through VIII; the numerals indicating progressively greater limitations and narrower choices for agricultural use (see appendix 8 for description).

Class I lands have few limitations that restrict their use while Class VIII lands have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, water supply, or aesthetic purposes. Figure 3-18 shows land use and acreage within each capability class in the basin. Class I to IV soils are best suited for crop production, but in 1975, about one-half of the land in these most suitable capability classes was still in timber. Only 46 percent was considered openland, i.e., cropland or pasture.

Prime Farm Land-- Land that is ideally suited for agricultural uses is, in most cases, also easily adapted to many other uses. However, with increased population and expanded foreign trade, the demand for land to produce more food and fiber will be greater. Increased population has placed the potential 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.



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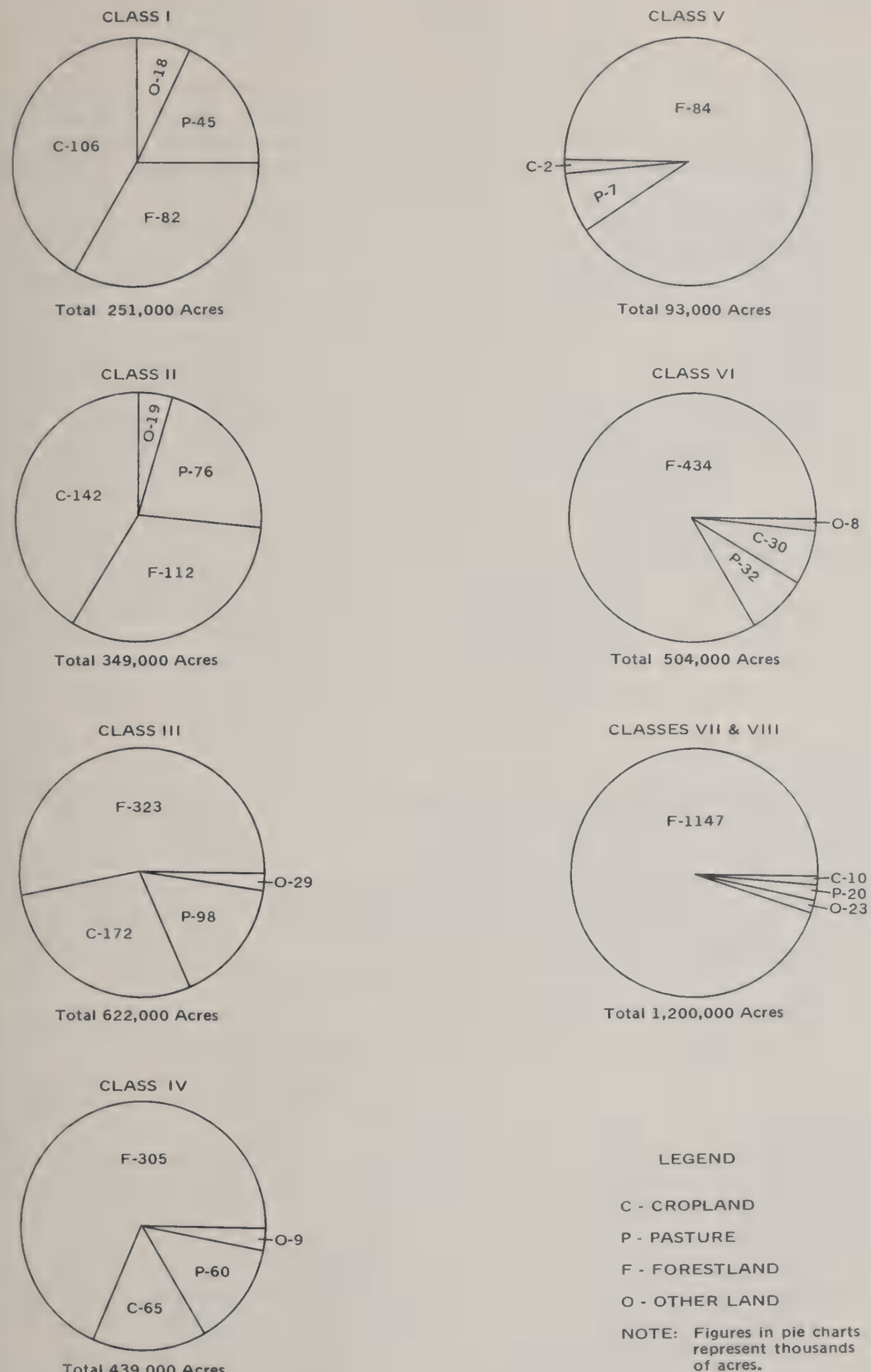

SOURCE: CNI Land Use Update, 1975, and data compiled by River Basin Staff.

Figure 3-18

LAND CAPABILITY DISTRIBUTION BY LAND USE IN THE BLACK WARRIOR RIVER BASIN

Prime farmlands have the best combination of physical and chemical characteristics for producing agricultural crops. They have the soil quality, growing season, and moisture 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 the SCS. Maps that delineate prime farmland are being developed for each county and the soils data stored in the Alabama Resources Information System. These maps are wholly dependent on the published soil survey for the county. In making these maps the soils data is generalized using 6.25 hectare (15.44 acre) cells. At present, soil surveys have been completed on 11 of 17 counties within the Black Warrior River Basin. It has been estimated that about 18 percent of the basin will be classified as prime farmland. Major areas of prime farmland are shown in figure 3-19.

Some indication of the magnitude of the cropland reserve can be obtained through a classification of capability classes into high, medium, and low potential for conversion to cropland. Classes I and II are assumed to have a high potential for conversion; Class III, a medium potential; and Class IV, low potential. Using these criteria, 315,000 acres (from a total 1,176,000 acres of non-cropland in Classes I-IV) have a high potential for cropland development. Another 421,000 are in the medium potential category.

Forest Resources

The following inventory of forest resources is largely based on data published for the latest forest survey of Alabama completed in 1972. Forest survey statistics were summarized for the Black Warrior River Basin area by the USDA Forest Service, Southern Forest Experiment Station. The Southern Forest Experiment Station is presently conducting a new survey of Alabama's forest resources. However, the results of the current survey were not available for use during the course of this study.

Forest Types-- Commercial forest land in the basin has been classified into six broad forest types (table 3-12).

The forest type map, figure 3-20, depicts the general range or potential for these broad forest types to occur. However, actual site conditions and the history of land use determine the vegetation type which actually occupies a site. The loblolly-shortleaf pine type is the most extensive in the basin accounting for 37 percent of the forest area and 42 percent of the total timber volume.

Forest survey data indicates the acreage in the pine forest types, longleaf-slash and loblolly-shortleaf, has been declining. The loss is due to the conversion of forest land to other uses and because pine stands are naturally regenerating to mixed pine hardwoods or upland hardwood types following pine harvest operations.

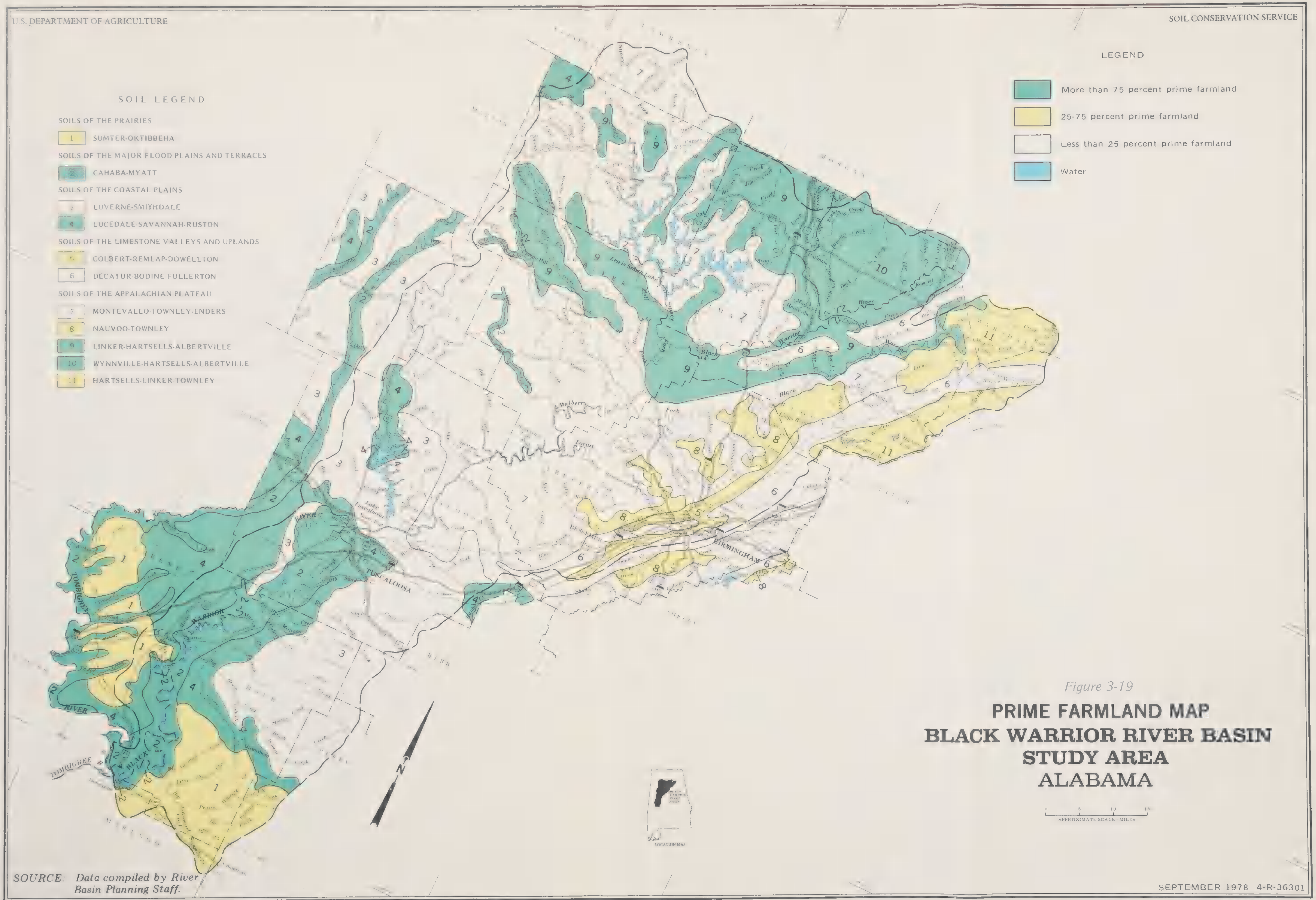

Figure 3-19

PRIME FARMLAND MAP
BLACK WARRIOR RIVER BASIN
STUDY AREA
ALABAMA

USDA—SCS—FORT WORTH, TEXAS 1979

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Table 3-12 - Forest Types, Black Warrior River Basin, 1972

Forest type	Thousand acres	Percent Of basin
Longleaf-slash pine.--Forest in which longleaf or slash pine, singly or in combination, comprise a plurality of the stocking. Common associates include other southern pines, oak, and gum.	40.7	1.5
Loblolly-shortleaf pine.--Forests in which southern pine, except longleaf or slash, and eastern redcedar, singly or in combination, comprise a plurality of the stocking. Common associates include oak, hickory, and gum.	1019.2	37.4
Oak-pine.--Forests in which hardwoods (usually upland oaks) comprise a plurality of the stocking but in which softwoods, except cypress, comprise 25-50 percent of the stocking. Common associates include gum, hickory, and yellow-poplar.	740.8	27.1
Oak-hickory.--Forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking except where pines comprise 25-50 percent, in which case the stand would be classified oak-pine. Common associates include yellow-poplar, elm, maple, and black walnut.	726.3	26.6
Oak-gum-cypress.--Bottomland forests in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, comprise a plurality of the stocking except where pines comprise 25-50 percent, in which case the stand would be classified oak-pine. Common associates include cottonwood, willow, ash, elm, hackberry, and maple.	191.3	7.0
Elm-ash-cottonwood.--Forests in which elm, ash, or cottonwood, singly or in combination, comprise a plurality of the stocking. Common associates include willow, sycamore, beech, and maple.	10.9	.4
	2729.2	100.0

Source: Alabama Forests: Trends and Prospects, USDA Forest Service, Southern Forest Experiment Station, 1973.

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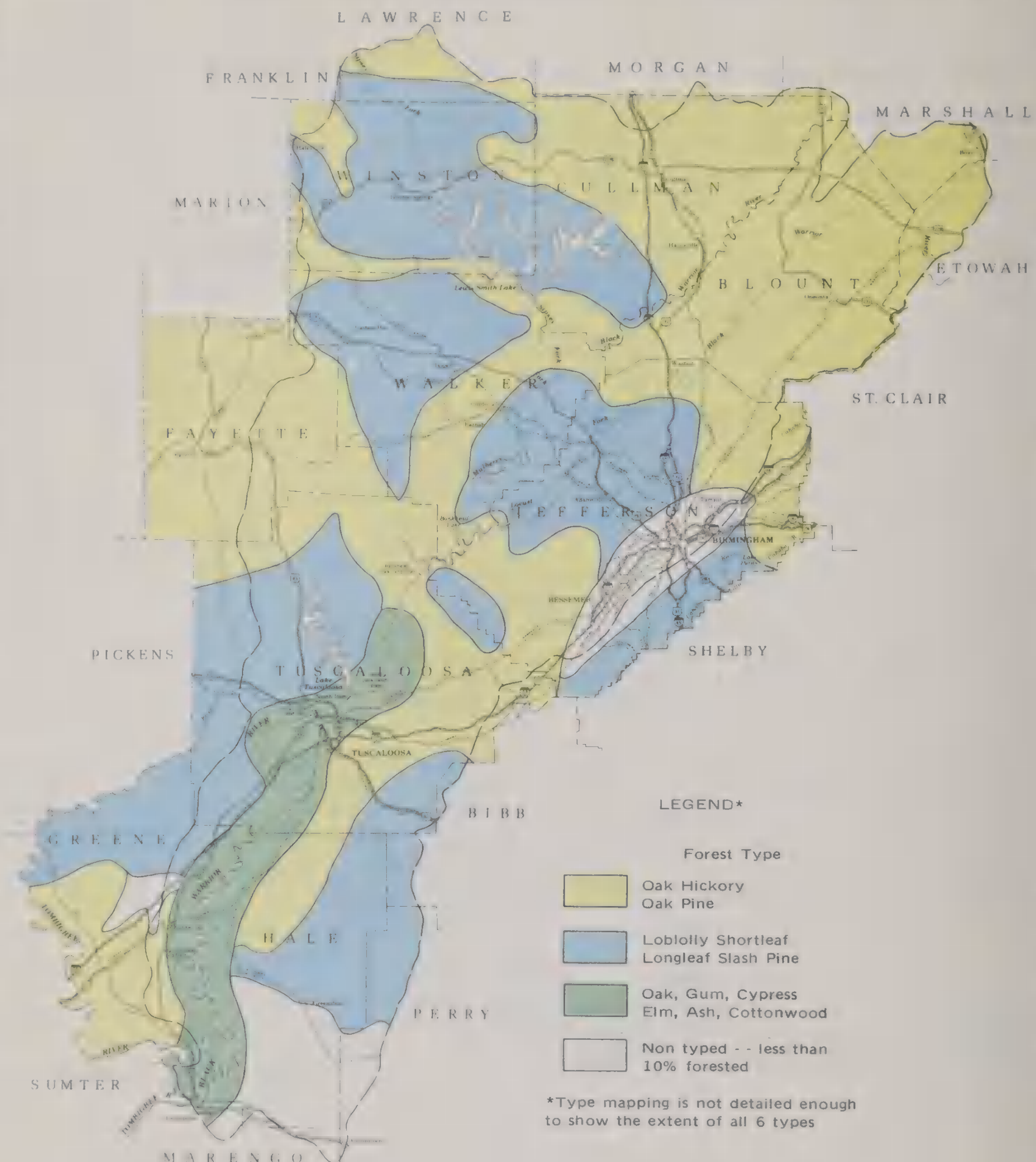

Figure 3-20

FOREST TYPES

BLACK WARRIOR RIVER BASIN

ALABAMA

SOURCE: Data compiled by River Basin Planning Staff.

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Growing Stock Volume-- The total volume of living trees in the study area was approximately three billion cubic feet in 1971 (table 3-13). About 8 percent of the total volume is in cull trees, mostly hardwood species. Another 3 percent of the total volume is in saplings and seedlings. In addition, there are 1.8 million cubic feet of salvageable dead trees in the basin, mostly softwood.

Growing stock volume refers to that portion of the timber inventory which is in the commercially important sawtimber and poletimber size classes. These volumes increased from 2.7 billion cubic feet in 1971 to an estimated 3.2 billion cubic feet in 1975. Growing stock averaged 1,180 cubic feet per acre of basin forest land versus about 1,000 cubic feet per acre of forest land, statewide.

Table 3-13 -- Total forest inventory volume of live trees, Black Warrior River Basin, 1971

	Softwood	Hardwood	All species
	------------Million cu. ft.--------------		
Sawtimber trees	978.8	581.4	1560.2
Poletimber trees	542.9	558.7	1101.6
Saplings and Seedlings	59.3	38.6	97.9
Rough trees	15.5	140.5	156.0
Rotten trees	9.3	74.9	84.2
Salvageable dead trees	1.3	.5	1.8
Total volume	1607.1	1394.6	3001.7

Source: USDA Forest Service, Southern Forest Experiment Station, Forest Survey of Alabama, 1972 - Black Warrior River Basin Summary.

Table 3-14 displays the percentage of total volume by species. Red and white oaks account for slightly over half of the hardwood volume. Loblolly pine is the most important species of softwood accounting for about 60 percent of the volume in that category.

Table 3-14 -- Growing stock volume breakdown by species
Black Warrior River Basin, 1972.

Softwoods	Percent	Hardwoods	Percent
Loblolly pine	60	Red Oaks	26
Shortleaf pine	19	White Oaks	25
Virginia pine	16	Hickory	13
Longleaf pine	4	Sweetgum	12
Other	1	Yellow Poplar	7
		Blackgum	6
		Other	11
	100		100

Source: USDA Forest Service, Southern Forest Experiment Station, Forest Survey of Alabama, 1972 - Black Warrior River Basin Summary

Fire, Insect, and Disease Losses -- Mortality reduced the basin's growing stock volume by about 6 percent in 1971. Most of the mortality was attributed to unknown causes. Over 60 percent of the losses (72 percent of the losses from known causes) occurred to softwood species. Total mortality in the state decreased by 22 percent from 1962 to 1971. Table 3-15 shows mortality from known causes.

Table 3-15 - Losses of growing stock tree volumes from fire, insect, disease and other known causes, Black Warrior River Basin, 1971.

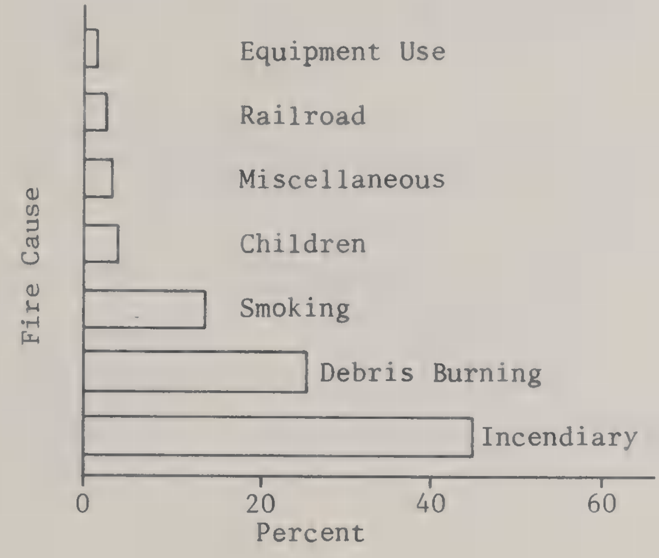
Cause	Softwood	Hardwood
	---------Million cubic feet-----------	
Fire	.39	.10
Insects	1.19	-
Disease	.78	.07
Other	.95	1.14
Total losses	3.31	1.31

Source: USDA Forest Service, Southern Forest Experiment Station, Forest Survey of Alabama, 1972 - Black Warrior River Basin Summary

Based on a 10-year record (1967 through 1976), it is estimated that fires annually burn over 16,200 acres (.6 percent) of the basin's forest land.

Figure 3-21 shows the relative importance of the various causes of forest fire. Smoking and debris burning are the leading accidental causes of forest fires. However, the dominant cause of forest fires is intentional ignition or incendiary which accounts for about 46 percent of all fires and 67 percent of the total acres burned.

Figure 3-21 - Cause of forest fires by percent of all fires, Black Warrior River Basin 1974-1976



Source: USDA Forest Service

Condition and stocking -- Twenty one percent of all live trees on commercial forest land are classed as rough and rotten or cull trees (table 3-16). However, cull trees account for only 7 percent of total live tree volume. A rather high 28 percent of all hardwood species are classified as rough and rotten. Approximately 6 percent of all softwood trees are cull accounting for only 2 percent of the total softwood volume.

Table 3-16 - Rough and rotten trees, Black Warrior River Basin, 1971

	Softwood	Hardwood	Total
	------------Million trees------------		
Rough and rotten	48.6	492.4	541.0
All live	800.5	1,782.4	2,582.9
Percent cull	6%	28%	21%

Source: USDA Forest Service, Southern Forest Experiment Station, Forest Survey of Alabama, 1972 - Black Warrior River Basin Summary

Potential Productivity of Commercial Forest Land -- Site class is a classification of forest land in terms of inherent capacity to grow crops of industrial wood based on fully stocked natural stands (table 3-17).

Table 3-17 - Area by site class, Black Warrior River Basin, 1971

Site class Cubic feet/acre	Area --Thousand acres--
165 to 225	44.2
120 to 165	232.8
085 to 120	1006.7
050 to 085	1287.9
Less than 50	157.6
Total, All Classes	2729.2

Source: USDA Forest Service, Southern Forest Experiment Station, Forest Survey of Alabama, 1972 - Black Warrior River Basin Summary

Land capable of growing wood at an average annual growth rate of 85 cubic feet per acre or greater under a system of management that maintains soil productivity and protects water quality is considered prime forest land. Forty-seven percent of the commercial forest land within the basin meets the prime forest land standard. These lands represent about 59 percent of the productive capacity of the commercial forest land in the basin.

The 11 general soil associations have been grouped by their characteristic site indices into forest production potential classes (figure 3-22). Each site index is a numerical rating which indicates the inherent capability of a site to produce commercial roundwood. The most productive forest soils occur in the lower one-third of the basin. Most of the prime forest land in the basin is located within the fair and good production potential classes.

Forest Range Resource-- The major range type occurring in the basin is the loblolly-shortleaf-hardwood type which includes the loblolly-shortleaf pine and oak-pine forest cover types. Under natural conditions forage production is usually relatively low. Forage vegetation usually consists of shade tolerant species, often with low palatability for livestock (Figure 3-23).

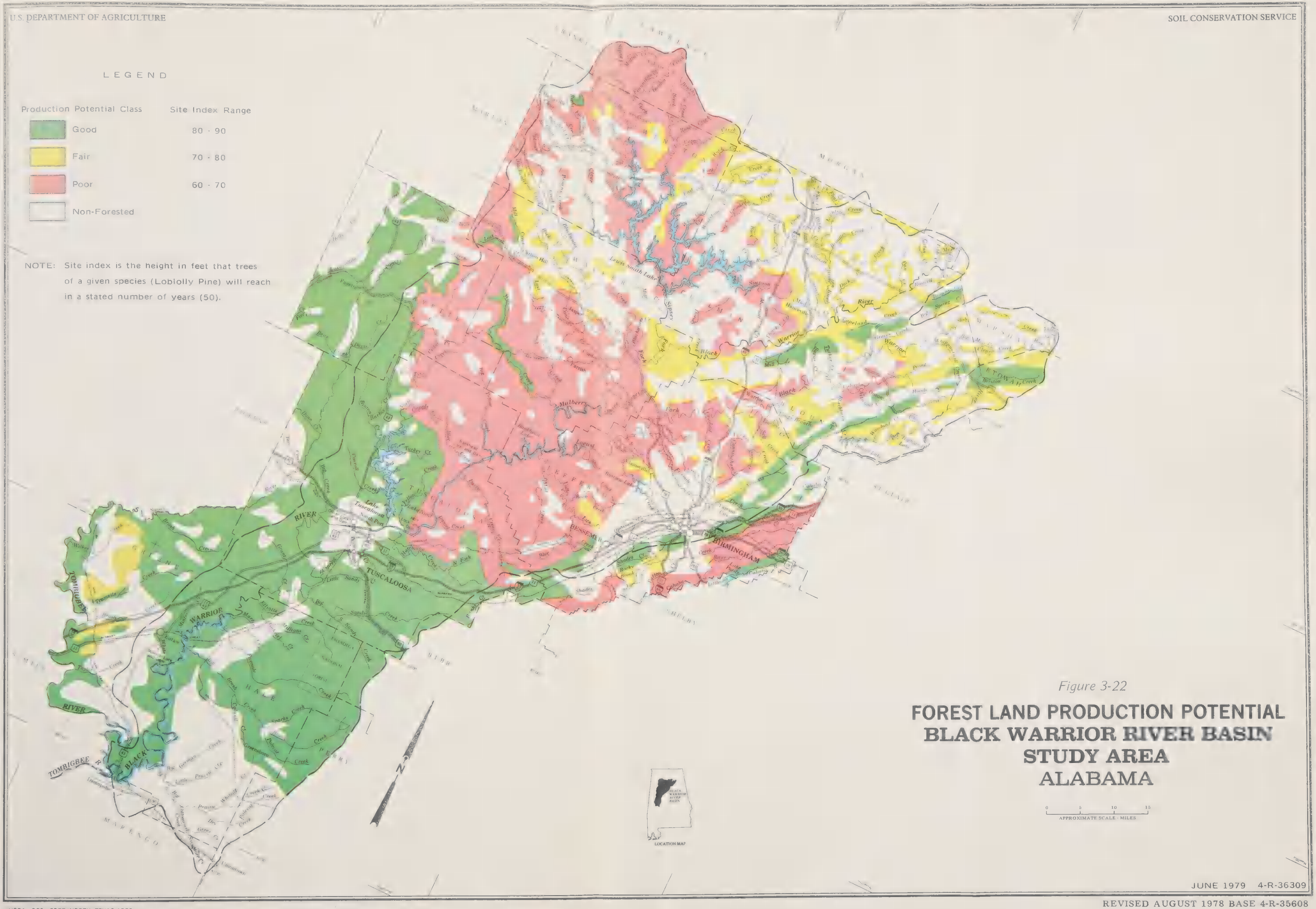
The major part of the forest grazing occurs on sites within fenced pastures on farms. These forest areas serve as links between pastures. Forest grazing on these areas is unmanaged to the extent that very little top growth remains on range plants. Many of these plants have become eliminated by over-grazing. There are about 80,000 to 100,000 acres of unmanaged grazed forest land in the basin. Trends suggest that little change in utilization of forest land for livestock grazing will occur in the foreseeable future. Based on present and projected costs of operation, increased beef production in response to consumer demands can be met on improved and unimproved pasture and feed lot operations. Managed forest range could provide a greater portion of the grazing demand if excessive costs of operation create a reduction in the projected production of beef on pasture. Forest land suitable for grazing is shown in table 3-18.

Table 3-18 - Forest grazing potential and acreage
Black Warrior River Basin, 1975.

Forest type	Forest Grazing Potential	Acreage 1/
Longleaf-Slash	Good	20,200
Loblolly-Shortleaf	Good	504,650
Oak-Pine	Fair	365,700
Total		890,550

1/ Estimated acreage that is suitable for forest range has been reduced by 50 percent to eliminate areas with physical, social, cultural, or other barriers that make them unavailable for forest grazing.

Source: USDA Forest Service


U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LEGEND
Production Potential Class
Site Index Range
Good
80 - 90
Fair
70 - 80
Poor
60 - 70
Non-Forested
NOTE: Site index is the height in feet that trees of a given species (Loblolly Pine) will reach in a stated number of years (50).
TUSCALOOSA
BIRMINGHAM
BESSEMER
RIVER
WARRIOR
BLACK
TOMBIGBEE
Lewis Smith Lake
Mulberry
Locust
LOCATION MAP
APPROXIMATE SCALE - MILES
Figure 3-22
FOREST LAND PRODUCTION POTENTIAL
BLACK WARRIOR RIVER BASIN
STUDY AREA
ALABAMA
JUNE 1979 4-R-36309
REVISED AUGUST 1978 BASE 4-R-35608

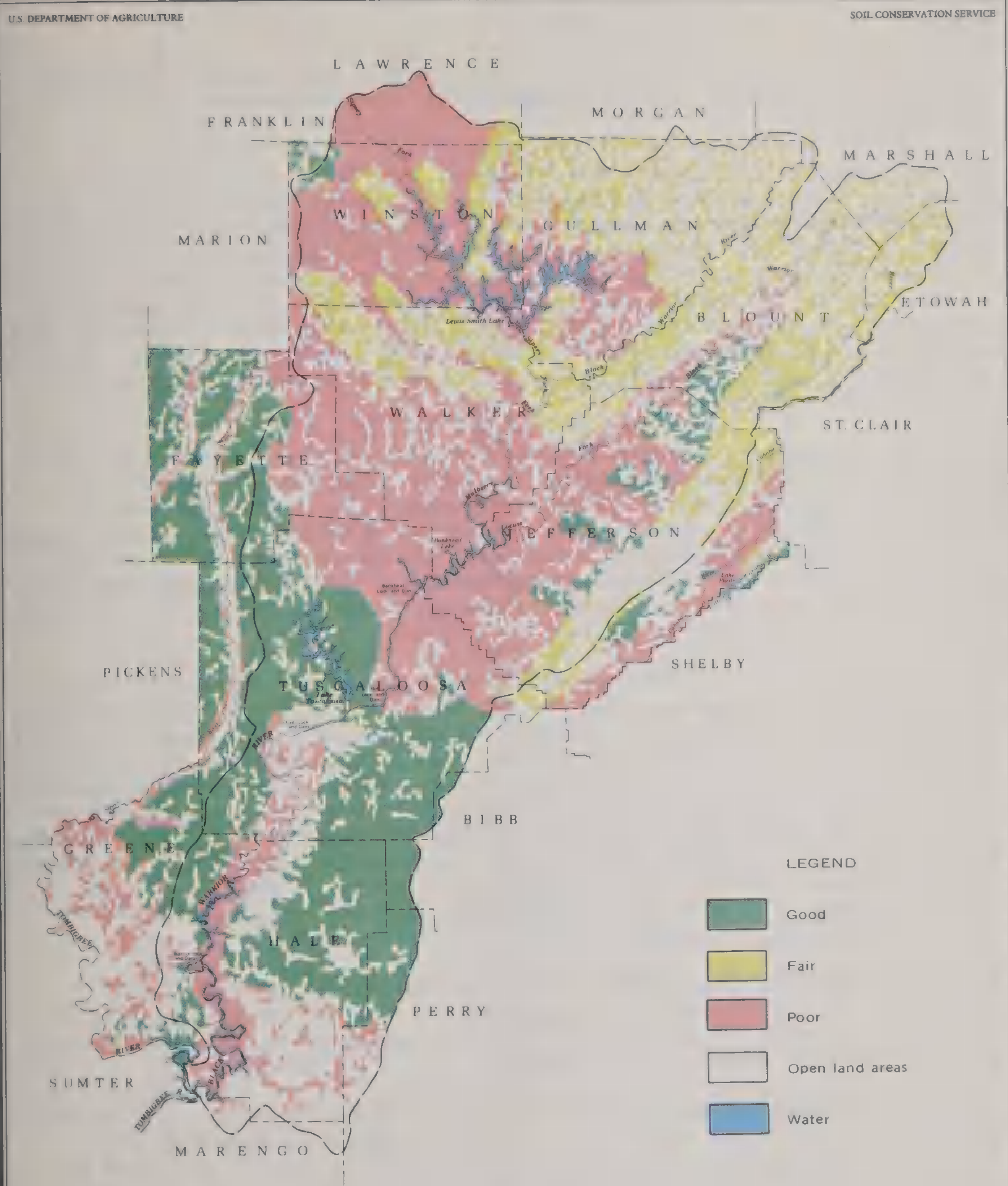


Figure 3-23

FOREST GRAZING POTENTIAL

BLACK WARRIOR RIVER BASIN

ALABAMA

SOURCE: *Data compiled by River Basin Planning Staff.*

SEPTEMBER 1978 4-R-36288

REVISED AUGUST 1978 BASE 4-R-35608

Minerals

The value of mineral production, the areas to be mined, and the consequences of erosion and sediment make this resource an important economic activity in the future.

The non-energy mineral deposits in the Black Warrior River Basin include ceramic and bloating clays and shales, chalk, dolomite, brown iron ore, red iron ore, chert, limestone, manganese ore, phosphate, sandstone, sand and gravel (figure 3-24). Brown iron ore, red iron ore, manganese ore, and phosphate are not presently mined for commercial use. Other mineral deposits are used for such industrial and construction purposes as cement, aggregate, metallurgical flux, building stones, structural clay products, industrial sand and agricultural soil conditioners. During 1974, non-energy mineral production from the basin's 26 active mines and quarries exceeded 57 million dollars (figure 3-25 and table 3-19).

Clay and Shale-- Extensive reserves of clay and shale suitable for the manufacture of structural clay products such as common brick, face brick, structural tile, quarry tile, glazed tile, conduit or sewer pipe, culvert pipe, and lightweight aggregate occur in the Black Warrior River Basin. Shale suitable for the manufacture of structural clay products occurs in the Red Mountain Formation and the Pottsville Formation. The Red Mountain Formation also contains shale beds suitable for the manufacture of quarry tile and face brick.

Underclays, which occur with many of the coal beds of the Pottsville Formation, have considerable value for the manufacture of structural clay products. The underclay of the Mary Lee coal bed near Cordova in Walker County is widely used in the manufacture of face brick and is shipped throughout the Eastern United States because of its high quality. Underclays of the Polecat coal bed in Winston County and the Brookwood coal bed in Tuscaloosa County have properties similar to those of the Cordova clays. Clays of the Black Creek coal bed in Jefferson and Blount Counties are presently used in the manufacture of low-temperature fire brick and have potential for use in face brick. An important aspect of these underclays is that they can be produced as an integral part of mining the coal.

Extensive clay deposits suitable for the manufacture of structural clay products occur in the Coker and Gordo Formations of Cretaceous age. Clay of the Gordo Formation can generally be used for making brick, tile, and pottery products.

The Coker and Gordo Formations contain at least 200 million tons of clay of potential use in the manufacture of ceramic products, which include face brick, tile, and pottery. Plastic clay from near the base of the Coker has been used in a blend with shale in manufacture of pipe, and clay from the upper part of the Coker and Gordo Formations has been used in Tuscaloosa County in the manufacture of pottery.

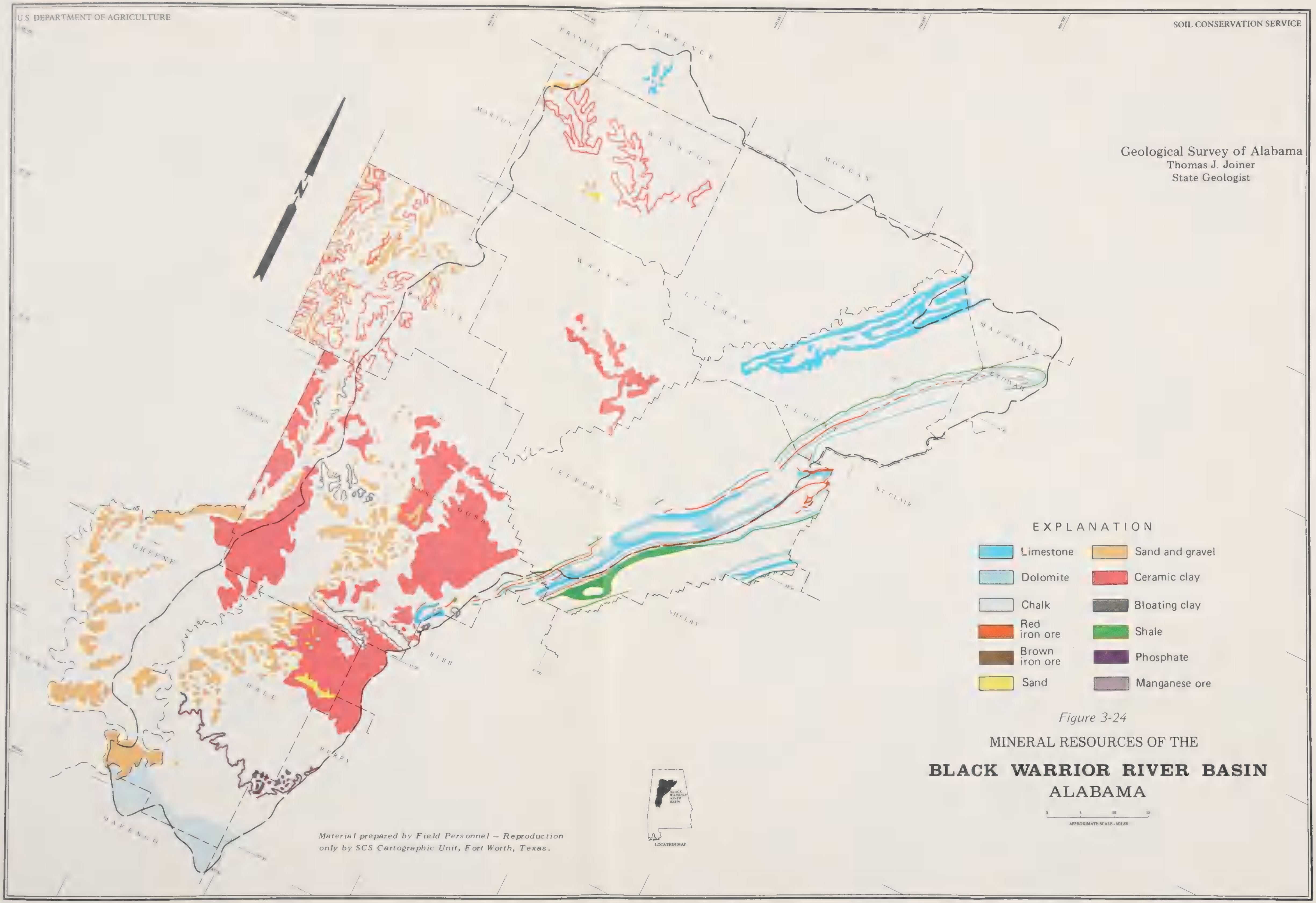


Figure 3-24

MINERAL RESOURCES OF THE

BLACK WARRIOR RIVER BASIN

ALABAMA

USDA—SCS—FORT WORTH TEXAS 1979

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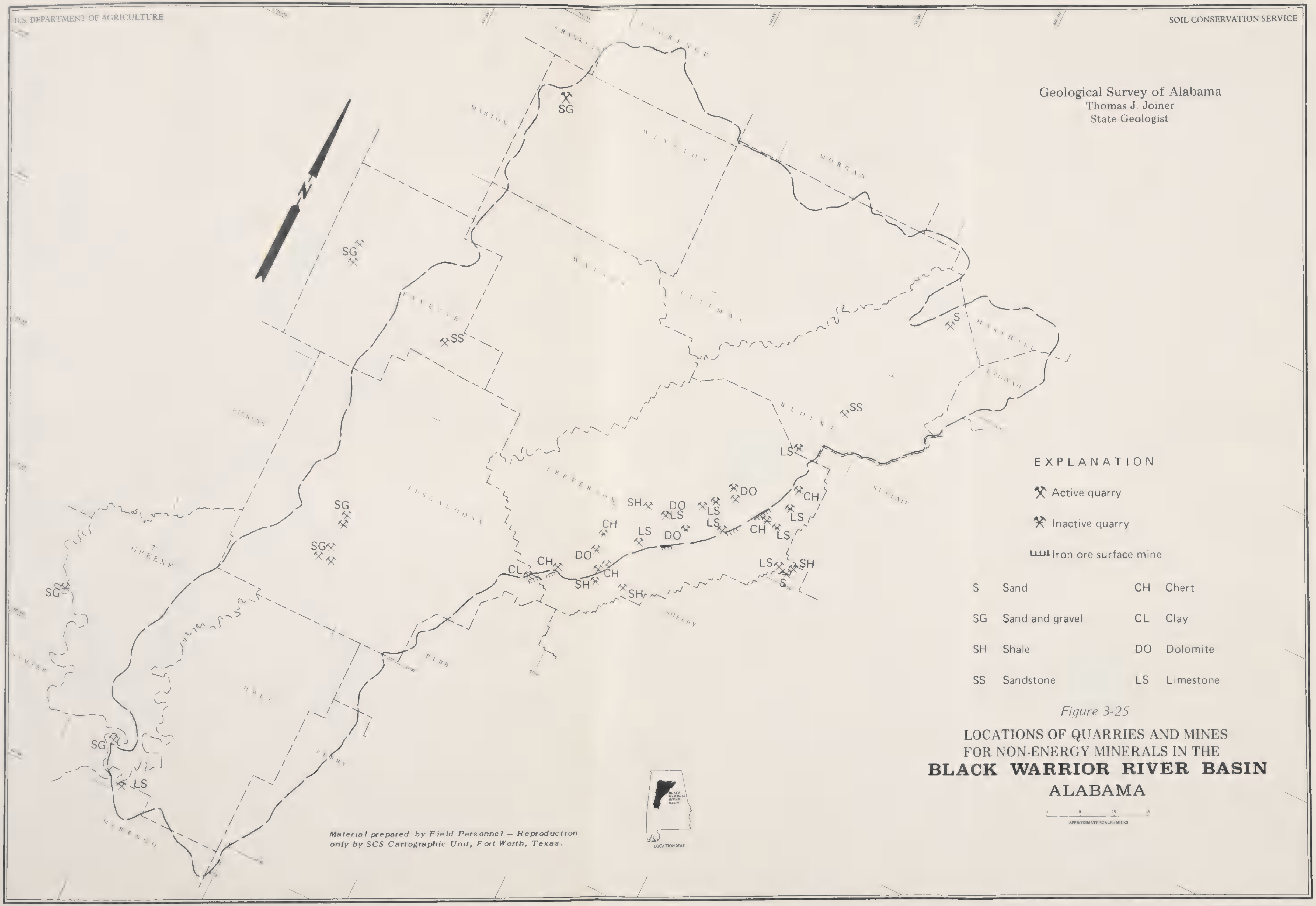


Figure 3-25

LOCATIONS OF QUARRIES AND MINES FOR NON-ENERGY MINERALS IN THE
BLACK WARRIOR RIVER BASIN
ALABAMA

USDA—SCS—FORT WORTH TEXAS 1979

REVISED SEPTEMBER 1977 BASE 4-R-35608

Table 3-19 -- F.O.B. values* of non-energy minerals commercially produced in county areas of the Black Warrior River Basin

County	65	66	67	68	69	70	71	72	73	74
	Thousand dollars									
Bibb	0	0	0	0	0	0	0	0	0	0
Blount	430	772	305	673	341	419	522	203	217	142
Cullman	0	61	104	0	0	0	0	0	0	0
Etowah	0	0	0	0	0	0	0	0	0	0
Fayette	0	0	0	0	0	0	0	0	0	0
Franklin	0	0	0	0	0	0	0	0	0	0
Greene	0	71	121	0	0	0	0	0	0	0
Hale	0	2	2	28	33	0	0	0	0	0
Jefferson	35,584	35,700	41,438	41,638	43,425	45,529	29,746	31,691	37,424	54,713
Lawrence	0	0	0	0	0	0	0	0	0	0
Marengo	3	322	478	513	500	579	699	830	527	1,238
Marshall	0	0	0	0	0	0	0	0	0	0
Morgan	0	0	0	0	0	0	0	0	0	0
Perry	0	0	0	0	0	0	0	0	0	0
Tuscaloosa	478	339	524	290	299	242	213	521	1,097	268
Walker	533	577	202	120	48	966	639	713	1,124	1,097
Winston	0	0	0	0	0	0	0	0	0	0
Total	37,208	37,844	43,174	43,162	44,646	47,755	31,819	33,958	40,389	57,458

*F.O.B. - Value for material loaded on board a carrier at point of production.
Source: U.S. Bureau of Mines, Minerals Yearbooks, various years, USDI.

Some clay and shale from the Coker Formation, the Pottsville Formation, and the Parkwood and Pride Mountain Formations are suitable for use as lightweight aggregate raw material. Clay and shale in the Coker and Pottsville Formations should produce aggregate of acceptable bulk density, but the temperature range required to produce satisfactory aggregate necessitates firing controls that are difficult to obtain in commercial rotary-kiln processing (Hollenbeck and Tyrrell, 1969, p. 11). Bloating of the shale from the Parkwood and Pride Mountain Formations is generally the result of the shale's carbon content, and expansion usually occurs at temperatures ranging from 1900°F to 2100°F.

Presently, lightweight aggregate is being manufactured from expanded shale by the Birmingham Clay Products Division of Vulcan Materials Company at Parkwood, Jefferson County, using shale from the Parkwood Formation.

Limestone and Dolomite-- Limestone and dolomite are the basic raw materials of the construction industry. They are used for the production of crushed aggregate, cement, lime, and building stones. These rocks are also the source of fluxes used in the smelting of iron and steel; raw material for the manufacture of glass and refractories; filler used in rubber, plastic, and paper manufacturing; abrasives; agricultural soil conditioners; and ingredients in a host of chemical processes.

Limestone and dolomite suitable for commercial uses occur in the Black Warrior River Basin. They are found in the Conasauga Formation, Chickamauga Limestone, Fort Payne Chert, Tuscumbia Limestone, Pride Mountain Formation, and Bangor Limestone of the Birmingham-Big Canoe Valley district; in the Chickamauga Limestone, Fort Payne Chert, Tuscumbia Limestone, Pride Mountain Formation, and Bangor Limestone of the Sequatchie and Murphrees Valleys districts; in the Longview, Newala, Odenville, Lenoir, Little Oak and Tuscumbia Limestones and Fort Payne Chert of the Cahaba Valley district; and in the Demopolis and Mooreville Chalks of the Black Prairie district.

Sand and Gravel-- The Black Warrior River Basin has an abundant supply of sand and gravel which is presently being mined and processed for construction and industrial uses.

The sand and gravel deposits occur throughout the Coker and Gordo Formations and the alluvium and terrace deposits in the Fall Line Hills and Alluvial Plain districts. Sand occurs in the form of friable sandstone of the Hartselle Sandstone and in basal beds of the Pottsville Formation. These deposits contain a minimum of 500 million cubic yards of material suitable for commercial use.

The alluvium and terrace deposits generally contain subangular to rounded quartz, quartzite, and chert gravel in a matrix of fine- to coarse-grained angular to subrounded quartz sand, clay, and iron oxide. Materials from these deposits have been used in road fill, road pavement, and construction aggregates and are suitable for use as foundry sand.

The Hartselle Sandstone contains friable medium- to thick-bedded quartz sand that is a suitable source of industrial and construction sand. In the vicinity of Gate City in Jefferson County, Sandstone was used in the 1920's for the manufacture of glass sand. In the vicinity of Trussville, Jefferson County, the Hartselle was mined until 1964 for use as foundry sand, and intermittent attempts have been made in Blount County to use the sandstone for the production of construction aggregate.

In many areas, the lower part of the Pottsville Formation includes friable conglomerate and sandstone suitable for use as construction aggregate. The material has been mined at several locations in areas surrounding the Black Warrior River Basin.

Sandstone-- Sandstone, suitable for use as rip-rap, construction aggregate, and building stone occurs in the Pottsville Formation and Hartselle Sandstone. The Pottsville was previously mined for use as an aggregate from a pit in eastern Fayette County, and the Hartselle is presently mined in Blount County for use as a decorative building stone. The Pottsville Formation in the southern part of the Warrior Basin district contains massive beds of well-indurated sandstone suitable for use as crushed aggregate. The Hartselle Sandstone in the Sequatchie, Murphrees, and Birmingham-Big Canoe Valleys, is suitable for use as building stone.

Other Mineral Deposits-- Both red and brown iron ore occur in the Black Warrior River Basin. Although iron ore is not presently mined in Alabama, it is projected that as foreign iron ore becomes less available and more expensive, the iron ores of Alabama, especially the red iron ores in the Birmingham-Big Canoe and Murphrees Valleys, will once again be mined.

Deposits of manganese ore are present in Murphrees Valley in the Walnut Grove area of Etowah County, Alabama. Because of the erratic nature of the manganese occurrence in the area, reserve calculations based on data presently available are not feasible. There are many areas where little or no prospecting has been attempted.

Phosphatic material in the form of fossil casts, bone fragments, and concretions occur along the contact between the Eutaw Formation and the Mooreville Chalk in Hale and Perry Counties. The P_2O_5 content of the phosphate-bearing zone is usually less than 2 percent. Under present economic conditions, the zone should be classified only as a potential reserve of low-grade phosphate.

Energy Resources

Coal, petroleum, and natural gas are present in the Black Warrior River Basin. Coal occurs in the Pottsville Formation in the Warrior Basin, Sand Mountain, and Blount Mountain districts and east of the basin in the Cahaba Ridge district. Oil and gas are produced in the basin from Paleozoic rocks in northern Tuscaloosa, Fayette, and Walker Counties.

Coal-- Coal is present in the Warrior coal field in the southern part of the Warrior Basin district, in the Plateau coal field in the northern part of the Warrior Basin, in the Sand Mountain and Blount Mountain districts and in the Cahaba coal field in the Cahaba Ridge district (figure 3-26). Also, coal in the Warrior Basin extends beneath the unconsolidated sediments of the Fall Line Hills and Alluvial Plain.

The coal beds of the Warrior Basin are generally flat-lying. This essentially horizontal attitude is interrupted by an anticlinal fold in the central part of the basin and a fault on the southeast margin of the basin where the beds are folded and, in some cases, are steeply dipping. In the Sand Mountain, Blount Mountain, and Cahaba Ridge districts, coal beds follow the general trend of the synclinal structures.

Coal beds of the Warrior coal field occur predominantly in the upper part of the Pottsville Formation; coals of the Plateau coal field and Cahaba coal field occur in the lower part of the Pottsville.

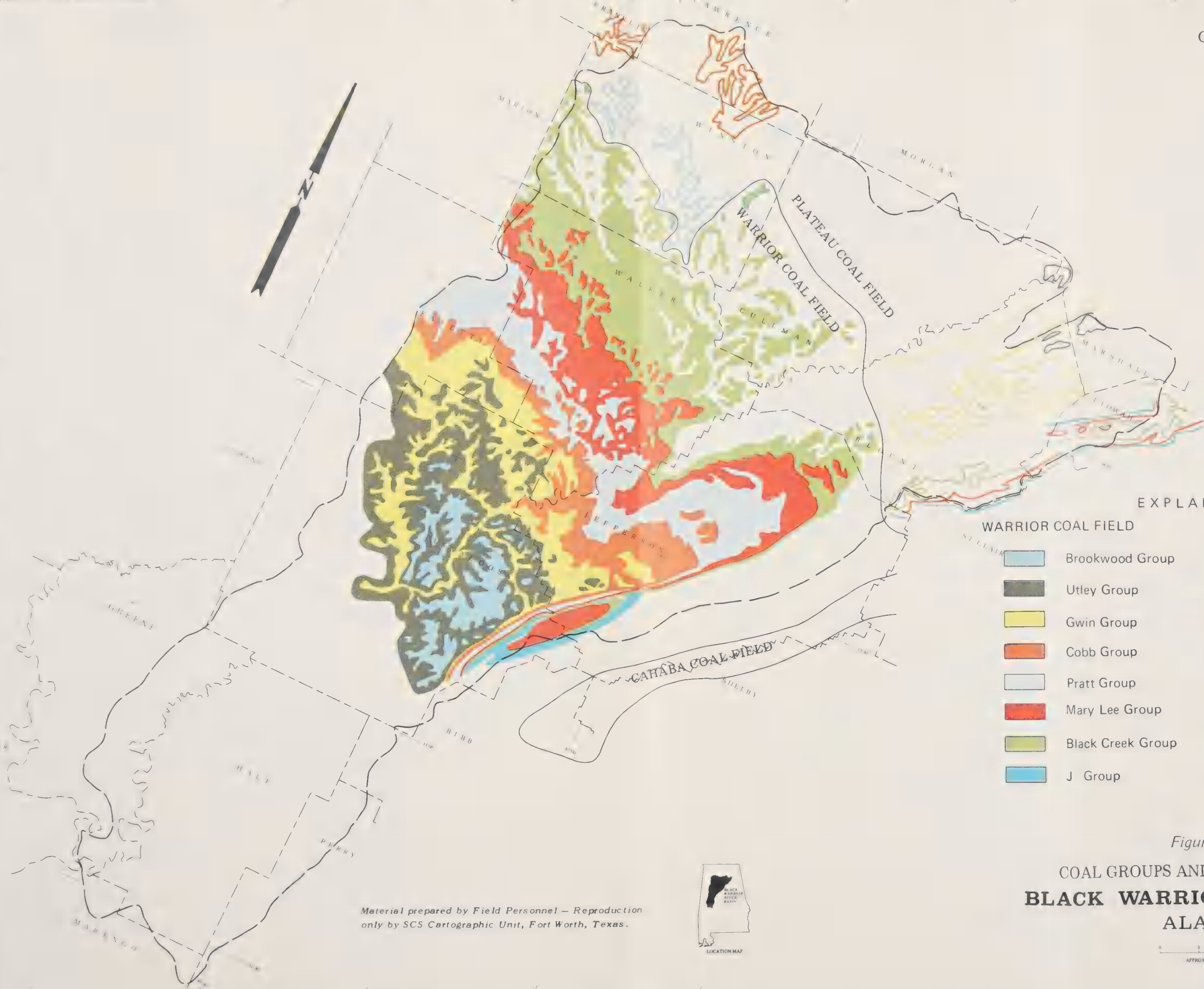
Warrior Coal Field: Eight major coal groups are exposed in the Warrior coal field. These are, in ascending order, the "J", Black Creek, Mary Lee, Pratt, Cobb, Gwin, Utley, and Brookwood groups. Descriptions of the groups are found in appendix 9.

All of the coals are classed as bituminous and ranked principally as high-volatile "A" bituminous, with substantial amounts of medium-volatile, particularly in the Pratt and Mary Lee groups. The coals range between 12,000 and 14,500 in Btu value, averaging about 13,250 Btu's. Much of the coal is of metallurgical quality, particularly in the Brookwood, Mary Lee, and Black Creek coal groups. Average analyses of many of the coals described are also listed in appendix table 9A.

The beds of the Pottsville generally dip southward and westward in the basin and the most northerly coal groups are found at increasingly lower elevations and greater depths and are overlain by successively younger coal groups; therefore, the south-central part of the basin has the greatest potential for commercial deposits of deep coal. Available coal data for depths exceeding 1,000 feet are scarce, but they are generally adequate to confirm the presence of at least several coal beds or groups of beds sufficiently thick for deep mining. Some are proven and currently mined at depths exceeding 2,000 feet in Tuscaloosa County.

Plateau Coal Fields: Unlike other Alabama coal fields, the Plateau coal field lacks distinctive natural boundaries. It encompasses a number of discontinuous but highly similar areas among which there has been little correlation of coal beds. Therefore, the same bed may have a different name in several areas. Further, the beds underlie beds of the Warrior coal field in such a manner that they might be perceived simply as a northerly extension of the Warrior coal field. Beds in the several component areas of the field are shown on figure 3-26 and are described in appendix 9A. Groupings of beds in this field are not recognized.

Geological Survey of Alabama
Thomas J. Joiner
State Geologist



EXPLANATION

WARRIOR COAL FIELD	PLATEAU COAL FIELD
Brookwood Group	Upper Cliff Bed
Utley Group	Rosa Bed
Gwin Group	Bynum Bed
Cobb Group	Altoona Bed
Pratt Group	Swansea Bed
Mary Lee Group	Brock Bed
Black Creek Group	Caskie Bed
J Group	Bear Creek Bed
	Polecat Bed

Figure 3-26

COAL GROUPS AND COAL BEDS IN THE
BLACK WARRIOR RIVER BASIN
ALABAMA

Material prepared by Field Personnel – Reproduction only by SCS Cartographic Unit, Fort Worth, Texas.

USDA–SCS–FORT WORTH, TEXAS 1979

REVISED SEPTEMBER 1977 BASE 4-R-35606

The coals of the Plateau coal field are highly variable in quality. Average analyses of some of the coals in the Plateau coal field are presented in appendix 9B.

Information on coal beds of the Plateau coal field is scarce except for areas where the beds are exposed. The thicknesses of the beds are highly variable over short distances, and underground mining has been limited to small drift mines. It is doubtful if large, relatively deep mines will ever be developed in the beds of this field.

Cahaba Coal Field: The Cahaba coal field contains approximately 52 coal beds and is present in the Cahaba Ridge district. Most of the beds occur intermittently and only a few have adequate thickness to be mined commercially. Although there are several abandoned underground and surface mines in the Jefferson County area of the field the expansion of the populace of metropolitan Birmingham into this area will probably preclude further commercial use of the coal. Therefore, discussion and distribution of the coal beds are not included as a part of this report.

Exploitation: From 1966 to 1977 records indicate that eight counties of the Black Warrior River Basin have produced coal from both surface and underground mines (table 3-20). Figure 3-27 shows the location of strip-mined areas observable on aerial photographs taken in 1975 and the entrances to active underground mines in the basin. The surface areas of land disturbed by strip-mining for coal in each county of the basin are given in table 3-21. The area of the disturbed land was computed without regard to field or coal bed identity.

In addition to areas strip-mined through 1975, figure 3-27 shows the areal distribution of probable areas to be strip-mined during 1975 to 1990 and 1990 to 2020.

Strip mining for coal has had, and probably will continue to have, a most profound effect on surface areas in the Black Warrior River Basin. Whereas, underground mining has produced, and will generally produce, relatively insignificant areas of disturbance at the surface. Therefore, no estimated production rates or probable areal extent of future underground mining has been made for this report.

Table 3-20 -- Summary of annual coal production from counties within the Black Warrior River Basin (1966-77)

Fiscal	Blount		Cullman		Etowah		Fayette		Jefferson		Tuscaloosa		Walker		Winston	
year	SM2/	UG3/	SM	UG	SM	UG	SM	UG	SM4/	UG	SM	UG	SM	UG	SM5/	UG
1966	.1734	1.345	NR	2.200	.0950	NR	.0297	NR	.7787	171.93	1.4365	15.17	1.8144	83.59	.0803	1.88
67	.2034	NR6/	NR	NR	.0881	NR	.1082	NR	1.5690	144.78	0.8659	19.54	1.9543	34.99	.0952	1.81
68	.2668	NR	.1198	NR	.0773	NR	.1076	NR	2.2078	133.87	.9996	24.87	1.9705	18.11	.0919	1.53
69	.2022	NR	.2037	NR	.0726	NR	NR	NR	2.0672	105.14	1.4379	4.36	1.9376	13.11	.1755	1.90
70	.2313	NR	.0983	NR	.0676	NR	NR	NR	2.6428	85.93	1.6062	7.43	2.1517	2.12	.1722	0.82
71	.2456	NR	.2444	NR	.0421	NR	NR	NR	3.8746	165.12	2.1270	NR	2.4545	NR	.2498	NR
72	.2440	NR	.4008	NR	.0421	NR	NR	NR	3.4743	30.26	1.5690	NR	2.8814	NR	.1777	NR
73	.2310	NR	.7229	NR	.0017	NR	NR	NR	3.6323	26.51	1.6686	NR	3.4220	NR	.1661	NR
74	.3166	15.127	.7540	NR	NR	NR	.0489	NR	3.6657	10.96	1.8421	NR	3.3418	NR	.5729	NR
75	.7292	13.100	.5989	NR	NR	NR	.3048	NR	3.0873	20.20	2.3926	NR	3.7387	NR	.8360	NR
76	.7625	13.200	.7321	NR	.0242	NR	.2575	NR	2.4140	14.26	2.4580	NR	3.7660	NR	.5377	NR
77	.6516	9.014	.6913	NR	.0182	NR	.1610	NR	2.2162	7.89	3.5345	NR	4.3904	NR	.7455	NR

1/ From records of Alabama Department of Industrial Relations.
2/ SM - Strip-mine production given in million of tons.
3/ UG - Underground production given in thousands of tons.
4/ Figures include Cahaba Field production, estimated to be less than 5%.
5/ As much [redacted] 10% of county total may be from areas outside Warrior River Basin.
6/ NR - no production reported.

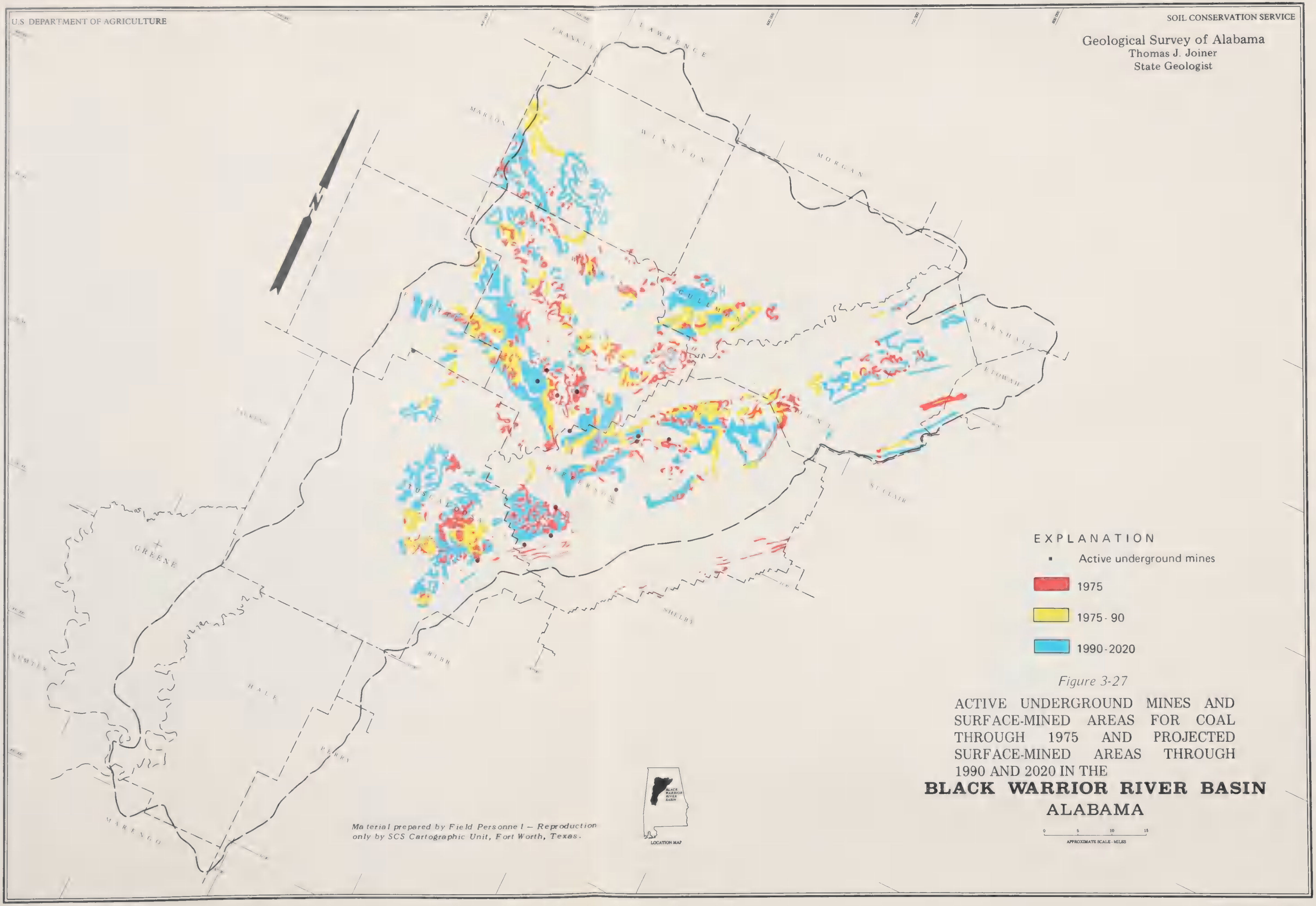


Figure 3-27

ACTIVE UNDERGROUND MINES AND SURFACE-MINED AREAS FOR COAL THROUGH 1975 AND PROJECTED SURFACE-MINED AREAS THROUGH 1990 AND 2020 IN THE

BLACK WARRIOR RIVER BASIN
ALABAMA

USDA—SCS—FORT WORTH TEXAS 1979

Table 3-21 -- Area of land disturbed by strip-mining through 1975 in coal-producing counties of the Black Warrior River Basin

County	Disturbed areas		Percentage of area	
			Inside basin	Outside basin
	Acres	Square Mi.	--------Percent-------	
Blount	3,052	4.77	100	0
Cullman	2,688	4.20	100	0
Etowah	611	.95	100	0
Fayette	987	1.54	100	0
Jefferson	20,139	31.47	97	3
Tuscaloosa	16,025	25.04	100	0
Walker	31,905	49.85	100	0
Winston	709	1.11	75	25

Source: U.S. Geological Survey

Coal Reserves: Strippable coal reserves in the Black Warrior River Basin are presented in table 3-22. An approximate percentage estimate of the reserves occurring outside the Black Warrior River Basin in each county is included. The total estimated intra-basin coal reserves are 4.2 billion tons.

Oil and Gas-- Gas is produced in the Black Warrior River Basin from the Wiley Dome Field, approximately 15 miles north of Tuscaloosa, three fields in eastern Fayette County, and an unnamed field in Walker County (figure 3-28).

The presence of the small fields in Tuscaloosa and Walker Counties, the larger fields in Fayette County and additional fields in adjacent areas is an encouraging indication of the possibility of finding more oil and gas in the Black Warrior River Basin.

Well records, production figures, and other information concerning the occurrence and production of oil and gas in the Black Warrior River Basin are available from the State Oil and Gas Board of Alabama at Tuscaloosa, Alabama.

Table 3-22 -- Strippable coal reserves in the Black Warrior River Basin area (short tons)

County	Original* identified resource	Production to date	Remaining* identified resource (1978)	Demonstrated* reserve base (1978)	Estimated percentage of demonstrated reserve base		Coal field
					In basin	Outside basin	
Blount	172,968,378	11,849,310	161,119,068	86,171,875	100	-	Plateau & Warrior
Cullman	149,786,254	10,373,811	139,412,443	88,432,384	100	-	do
Etowah	104,499,986	2,220,669	102,279,317	35,176,990	75	25	do
Fayette	178,596,996	2,796,135	175,800,861	55,950,630	95	5	Warrior
Franklin	140,694,073	3,041,478	137,652,595	102,794,171	-	100	Plateau
Jefferson	777,990,316	115,827,857	622,162,459	277,169,085	85	15	Warrior & Cahaba
Lawrence	35,297,423	0	35,297,423	5,528,115	90	10	Plateau
Marshall	68,637,270	129,096	68,508,174	12,935,799	18	82	do
Morgan	9,266,180	0	9,266,180	8,007,440	5	95	do
Tuscaloosa	1,241,594,835	84,147,718	1,157,447,117	275,529,967	100	-	Warrior
Walker	1,576,203,960	124,302,869	1,451,901,091	582,426,503	100	-	do
Winston	470,472,090	12,335,480	458,136,610	110,688,535	95	5	Warrior & Plateau
TOTAL	4,926,007,770	367,024,423	4,558,983,338	1,640,811,494			

*U. S. Geological Survey's descriptive categories:

Original identified resource - Coal originally in place with 3-mile radius of each data point; includes measured, indicated, and inferred categories of reliability.

Remaining identified resource - Original identified resource less production to date.

Demonstrated reserve base - Coal originally in place with 3/4-mile radius of each data point, less production to date; includes only measured, and indicated categories of reliability.

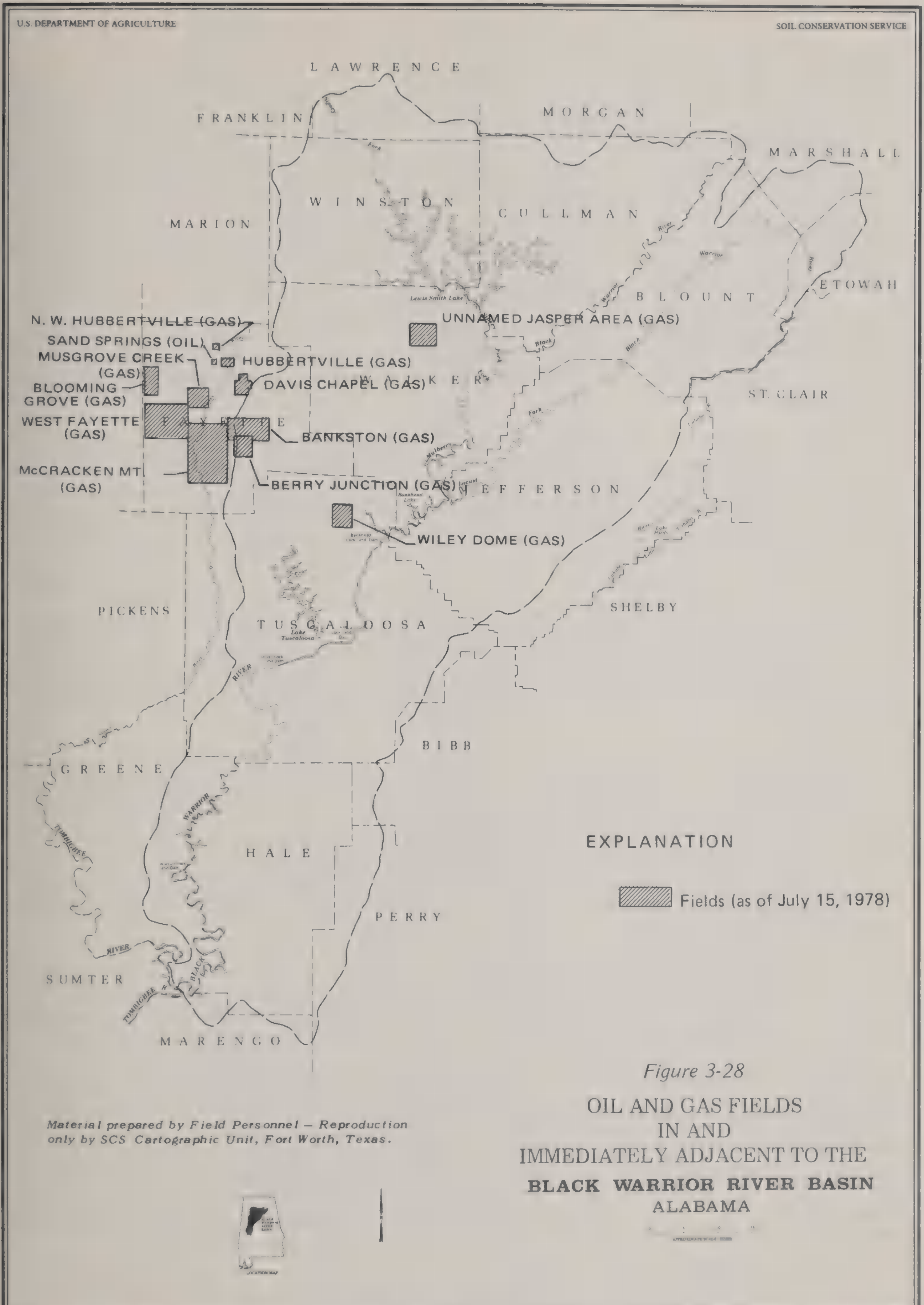


Figure 3-28

OIL AND GAS FIELDS
IN AND
IMMEDIATELY ADJACENT TO THE
BLACK WARRIOR RIVER BASIN
ALABAMA

USDA–SCS–FORT WORTH, TEXAS 1979

REVISED AUGUST 1978 BASE 4-R-35608

FISH AND WILDLIFE

General--Vertebrate fauna of Alabama consists of about 352 species of birds, 79 species of mammals, 134 species of reptiles and amphibians, and 252 species of fishes. Although distribution of some species within the state is limited, probably 60 percent or more of them can be found in the Black Warrior River Basin either as residents or as seasonal visitors. The Black Warrior River Basin study area contains a rich variety of fish and wildlife resources. These include interesting species which attract sportsmen and wildlife observers from distant locations.

The Alabama Department of Conservation and Natural Resources is responsible for protecting, managing, and developing wildlife resources in Alabama. However, primary responsibility of administering migratory bird programs rests with federal agencies.

Fish--About 136 species of fishes are known to exist in the main stream and tributaries of the Black Warrior drainage system. About 18 species, although generally classified as sport fishes, have commercial value. Twelve forage fishes are adapted to impoundments or reservoirs. Commercial varieties include buffalo, catfish, and drum. Principal species of sport fish are bluegill, white bass, largemouth bass, spotted bass, and white crappie. Channel catfish and blue catfish are taken on trotlines. Minnows, shinners, chub, and shad are some of the common forage fishes. The gizzard shad is generally abundant. Gar, bowfin, and the American eel are of limited commercial and sport value. The American eel spawns in saltwater and generally does not migrate above the dams. Species also absent from the impounded waters, although known to inhabit free-flowing streams in Alabama, include speckled chub, frecklebelly madtom, river redhorse, and blue sucker.

Wildlife--The mammalian fauna includes opossum, shrew, mole, bat, armadillo, rabbit, squirrel, chipmunk, gopher, beaver, rat, mouse, fox, black bear, raccoon, weasel, mink, skunk, otter, and bobcat. The white-tail deer is an important game species, and the southern gray squirrel is heavily hunted. The beaver inhabits some tributary streams. The Indiana and Mississippi myotis are rare species of bat. The black bear and the cougar although occasionally found in heavily timbered areas are considered rare in both the state and the basin.

The bird population is both extensive and varied. About 250 or more species including game birds and rare species inhabit the basin as transients or nesting residents. These include birds which utilize as habitats the impounded waters, shallow waters, and mud flats and sandbars. The common loon, double-crested cormorant, and mergansers are particularly adapted to the deep-water impoundments. Transient and rarely seen species are the bald eagle, golden eagle, osprey, peregrine falcon, swallow-tailed kite, Mississippi kite, and sandhill crane. Game birds in the basin include quail, dove, woodcock, turkey and species of waterfowl. Among the waterfowl are the Canada goose, mallard, pintail, green-winged teal, and wood duck. Common non-game species include the Great Blue Heron, Killdeer, Screech Owl, Barred Owl, Red-bellied Woodpecker, Downy Woodpecker, Carolina Chickodee, Tufted Titmouse, Loggerhead Shrike, Pine Warbler, Red-winged Blackbird, and the Rufous-sided Towhee.

Twenty-six species of wild ducks and four species of wild geese are found in Alabama and in coastal waters of the state. Only one species--the wood duck--normally breeds in appreciable numbers in the state. To some extent, ducks use nearly all ponds, lakes, reservoirs and other water areas in Alabama. However, a study in North Alabama indicates that 80 to 90 percent of the young wood ducks are produced in beaver ponds and natural ponds.

Turtles, lizards, and snakes comprise the bulk of the reptilian fauna of the basin. The flattened musk turtle is a rare and endemic species. The American alligator is not as widespread as it was in the past. Few snakes, aside from those of the genus Nerodia (watersnakes) and the cottonmouth, are closely associated with water. Salamanders, frogs, and toads comprise the amphibian population of the river system and are generally found in abundance. The Alabama waterdog, a subspecies of Necturus alabamasis, is endemic to the Sipsey Fork.

The species composition and number of mollusks presently inhabiting the streams are not known with certainty. Forty-eight species of native mussels (Pelecypoda) and 15 species of snails (Gastropoda) have been reported as inhabitants of the waterway. Twelve species of crayfish (Crustacea) have been reported from the drainage system. It may be assumed that some of the foregoing mollusks have been destroyed because of impoundments or pollution, or both.

Hunting: The estimated hunting effort in Alabama during the 1974-1975 season was more than 6.0 million man-days which was essentially the same effort expended during the 1977-78 season (see table 3-23). Estimated harvest for selected species was taken from the game kill survey of the Alabama Department of Conservation and Natural Resources and from field biologists and technicians.

Since 1972, deer hunting has been the most popular type of hunting in the basin and in the state. In 1974-75, about 196,000 Alabama deer hunters harvested 103,000 deer during 2.0 million man-days of deer hunting. By 1977-78, there were about 214,000 deer hunters who harvested 147,000 deer during 2.34 million man-days of deer hunting. Presently, the deer population in the river basin is about 120,000 compared to a state deer population of more than 1 million (figure 3-29). Every county in the basin had an open season on deer in 1977-78. Figure 3-30 shows the deer population by counties based on a relative density expressed as high, medium or low. Density ratings were calculated by dividing the land area in each county, excluding urban and built-up areas, by the estimated deer population. The highest deer populations and deer concentrations are located in the southwestern portion of the river basin.

The eastern wild turkey, perhaps the most magnificent of all game birds, is native to the southeast. Through a dedicated program of trapping, relocation, and protection, Alabama has become one of the leading states in the production of wild turkeys. The state population (fall 1975) was estimated to be about 275,000 with approximately 25,000 in the Black Warrior River Basin (figure 3-31). The highest populations are in the southwestern portion, primarily in Tuscaloosa and Hale Counties (see figure 3-32).

Table 3-23 - Alabama harvest and hunting effort for selected game species, 1970 and 1977.

Species	Hunters		Man-days effort		Man-days per hunter		Harvest		Man-days per harvest	
	1970	1977	1970	1977	1970	1977	1970	1977	1970	1977
Deer	146,952	214,364	1,188,500	2,338,130	8.09	10.90	63,502	147,133	18.72	15.89
Turkey	33,114	45,789	211,361	308,513	6.38	9.32	19,290	40,556	10.96	7.61
Quail	97,352	77,459	830,028	577,702	8.53	7.46	2,318,180	1,627,530	.36	.35
Dove	96,775	136,784	673,235	930,350	6.96	6.80	3,357,050	4,309,020	.20	.22
Squirrel	173,424	164,635	1,164,630	1,029,870	6.72	6.25	1,894,490	1,870,460	.61	.55
Rabbit	105,547	91,940	754,438	529,007	7.15	5.75	899,294	772,045	.84	.68
Duck	23,640	28,661	124,825	151,654	5.28	5.29	178,429	203,920	.70	.74
Goose	5,020	4,165	18,632	16,360	3.71	3.93	4,421	5,580	4.21	2.93
Woodcock 1/	-	7,207	-	24,652	-	3.42	-	40,327	-	.61
Total	681,824	771,004	4,965,649	5,906,238			8,734,656	9,016,571		

1/ Data not recorded for 1970-71.
Source: Alabama Department of Conservation and Natural Resources.

Traditionally, squirrel hunting has attracted more people than any other type of hunting. However, the trend has recently been changing toward increased deer and dove hunting. Further reduction of mature hardwood forests should continue to reduce the percent of hunters who primarily hunt squirrels. Other game animals that provide hunting opportunity in the basin include raccoon, opossum, fox, bobcat, snipe, and woodcock.

Non-Harvest Values: Interest in bird watching, wildlife photography, and nature study in general is growing rapidly. Every year more and more people are becoming interested in wildlife; yet the proportion of hunters in the total population is decreasing. For example, more people are visiting wildlife refuges than ever before, but the sale of duck stamps is below the levels reached 2 or 3 decades ago. People are becoming more and more interested in watching, hearing, seeing, photographing, and otherwise enjoying wildlife without harvesting it. This is somewhat of a departure from tradition, of course. It is an interest that must be recognized in managing wildlife not only for the present, but also for future generations.

According to the National Survey of Hunting and Fishing, more than 48 million people in the U.S. participated in bird watching in 1975 and more than 15 million people took wildlife pictures during that year. By comparison, the same study revealed that slightly fewer than 20 million people 9 years of age and older participated in hunting in 1975. Other published reports of localized application reveal the same general pattern--an increased interest in non-harvest or non-consumptive uses of wildlife.

In all probability, the increase in demand for wildlife and wildlife-oriented recreational activities within the basin will accelerate. It appears, therefore, that a desirable wildlife management objective should be to provide the greatest satisfaction from wildlife for all the people. This would include the effective preservation and management of habitat for all wildlife--not only for hunting but also for non-consumptive uses.

Invertebrates--Invertebrates reported in the general drainage system and expected to be present in the river proper include the classes Sarcodina, Mastigophora, and Ciliata of the Phylum Protozoa. Porifera of the genera *Spongilla*, *Meyenia*, and *Heteromyenia* should occur in slower moving, less silty reaches. Freshwater coelenterates of the genera *Hydra* and *Chlorhydra* are found on substrates in areas of slow current. Aquatic flatworms, including the genera *Curtisia* and *Shalloplana*, are common benthic organisms. Gastrotrichs of the family Chaetonotidae are widely distributed in littoral areas which contain a good bit of organic debris.

Rotatoria, planktonic feeders, are common in many streams of the drainage system, as are the plentiful nematodes and horsehair worms of the genera *Gordium* and *Paragordius*. Bryozoa occur widely in slow moving littoral areas free of pollution. Annelids are benthic organisms reported frequently in the waters of the river system. Larval forms of aquatic insects found in the drainage basin include a number of generic groups. The invertebrate microfauna are an essential link in the food chains of many larger aquatic forms; and, as such, they are susceptible to the adverse effects of turbidity and siltation.

Endangered Organisms--Few species of plants and animals have been studied to the extent that one can state with certainty their places in the biological complex, their relationship with other organisms, and ultimately their influence on man's welfare. Each living species, plant and animal, is a complex of genetic material not duplicated by any other species. Extermination of a species can be neither corrected nor reversed. From a strictly commercial standpoint, the extermination of a species could result in depriving mankind of a product that might be of immense value.

Obviously, threatened and endangered organisms should be given careful consideration in future planning. More comprehensive listings and detailed location maps are available in publications from various agencies and universities. A list of endangered organisms is presented in appendix 10. Information regarding the status of the plant and animal species listed was compiled from Endangered and Threatened Plants and Animals of Alabama and from the Federal Register.

Habitats--It is generally agreed that the quality, quantity, and pattern or distribution of food, cover, and water determine the quality of wildlife habitat on any area. The Black Warrior River Basin with its streams, swamps, bluffs, agricultural fields, and forests provides good habitat for many species of wildlife. The distribution of these diverse kinds of fish and wildlife throughout the basin depends, of course, upon the distribution of their respective habitats.

Terrestrial: Terrestrial species have available about 4 million acres of habitat of which about 13 percent is cropland, 8 percent pastureland, 67 percent forest land, and 7 percent urban. Water and other lands comprise the remaining 5 percent of the basin.

The basin's forests provide habitat for a wide variety of wildlife. White-tailed deer, gray squirrel, and eastern wild turkey are the most important forest game species.

Forest types were rated for their value as forest game habitat based on determinations from the Wildlife Habitat Evaluation Program (WHEP) for the Alabama River Basin Study (table 3-24).

Table 3-24 - Relative value of forest types as habitat for game

Forest type	Squirrel	Deer	Turkey
	Habitat value		
Longleaf-slash	Poor	Poor	Fair
Loblolly-shortleaf	Poor	Fair	Fair
Oak-pine	Fair	Fair	Good
Oak-hickory	Good	Good	Good
Bottomland hardwoods	Good	Good	Good

Source: USDA Forest Service

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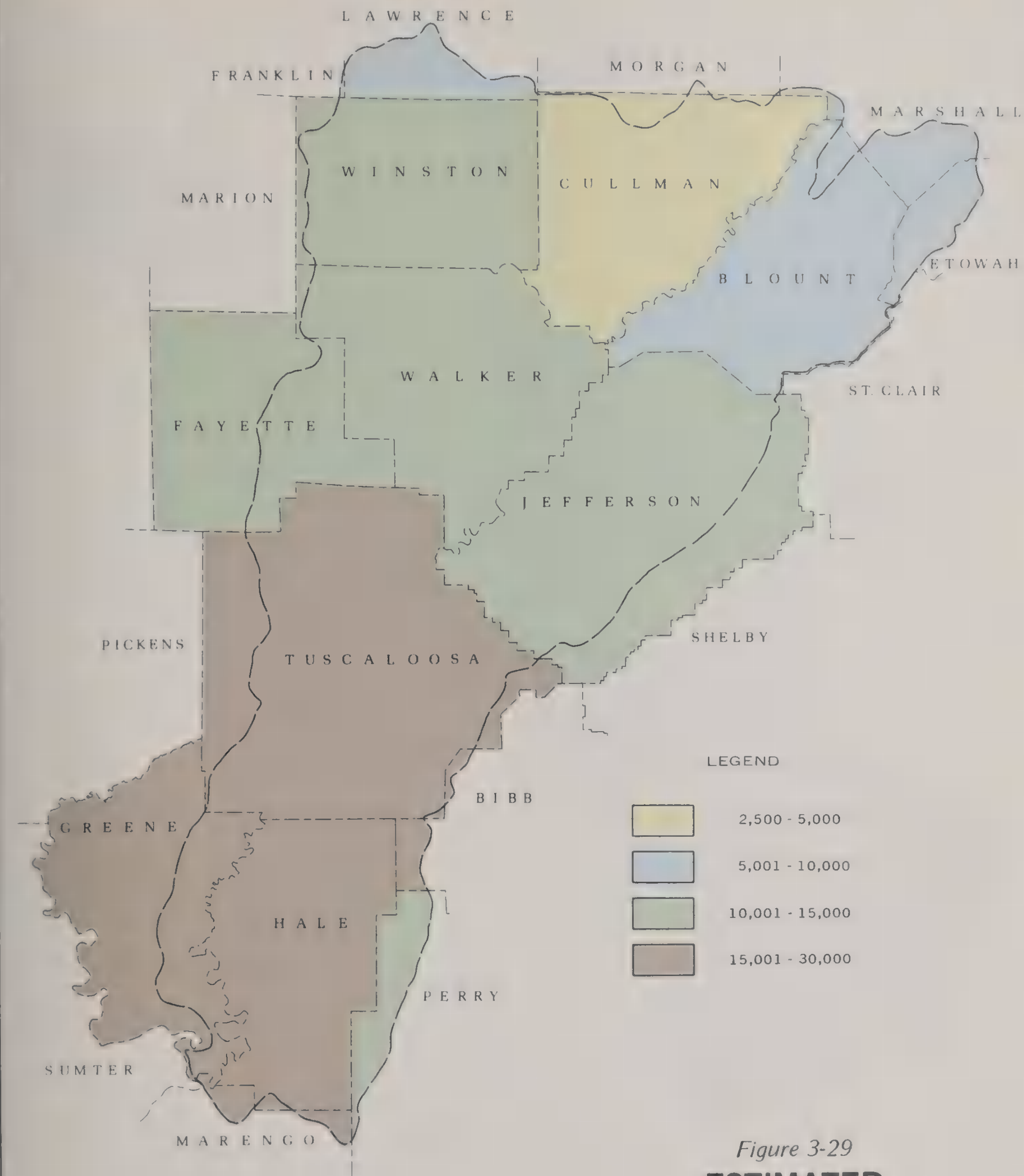

Figure 3-29

ESTIMATED DEER POPULATION FALL 1978

BLACK WARRIOR RIVER BASIN

ALABAMA

SOURCE: *Alabama Department of Conservation and Natural Resources.*

MAY 1979 4-R-36304

USDA-SCS-FORT WORTH TEXAS 1978

REVISED AUGUST 1978 BASE 4-R-35608

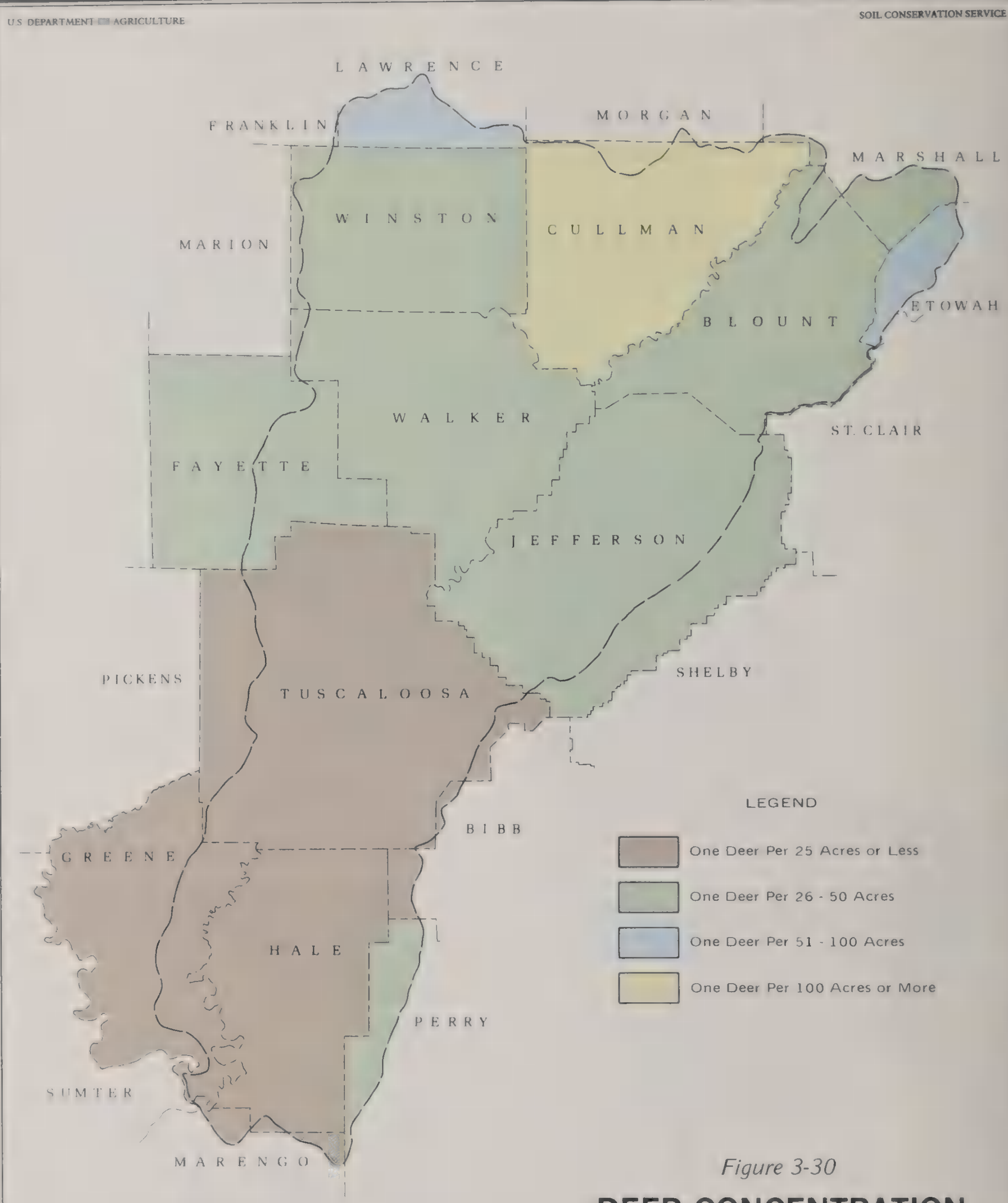

Figure 3-30

DEER CONCENTRATION WITHIN EACH COUNTY FALL 1978

BLACK WARRIOR RIVER BASIN
ALABAMA

SOURCE: Based on 1975 CNI Data for Openland and Forestland.

MAY 1979 4-R-36305

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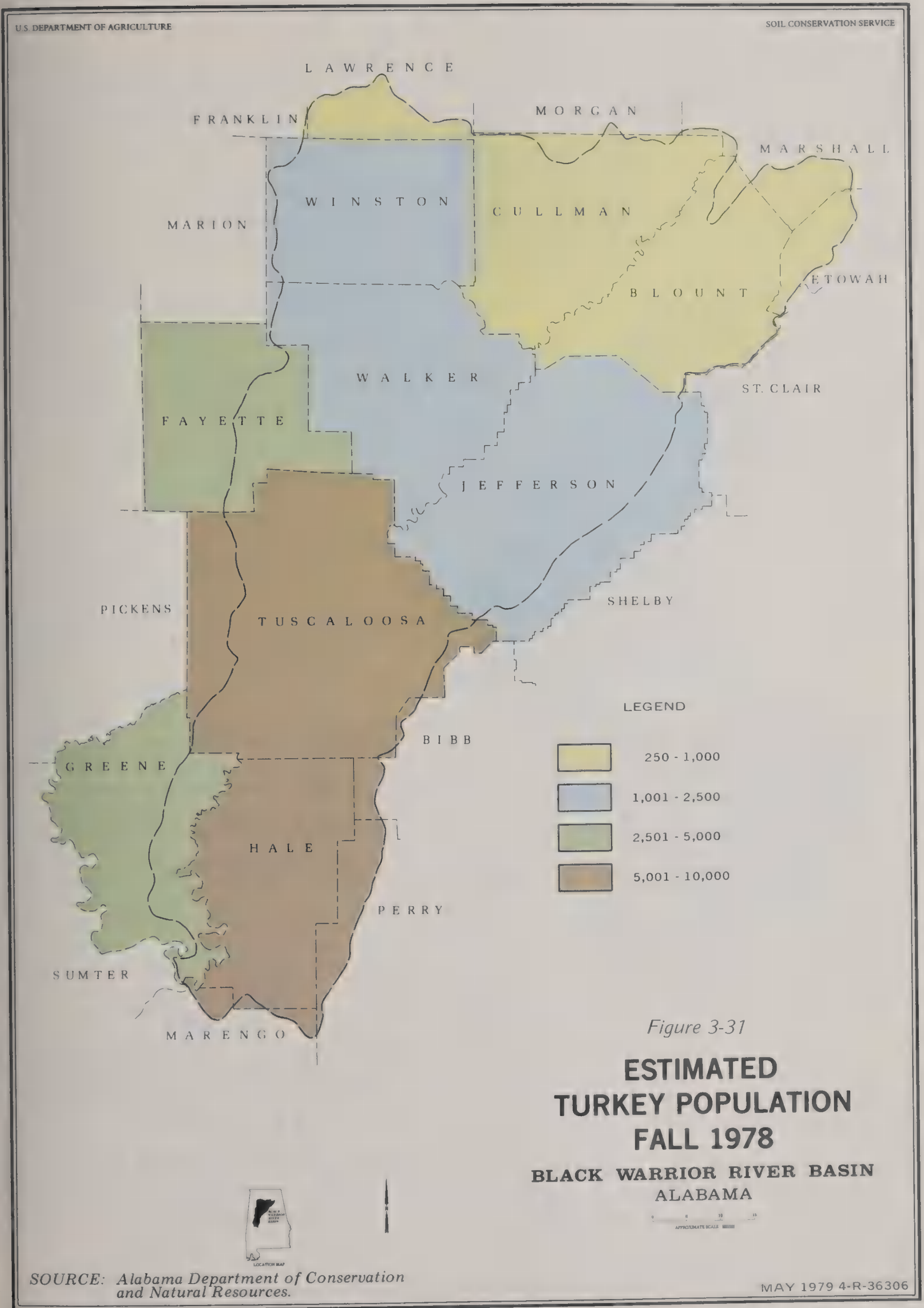

Figure 3-31

ESTIMATED TURKEY POPULATION FALL 1978

BLACK WARRIOR RIVER BASIN

ALABAMA

SOURCE: *Alabama Department of Conservation and Natural Resources.*

MAY 1979 4-R-36306

USDA-SCS-FORT WORTH TEXAS 1978

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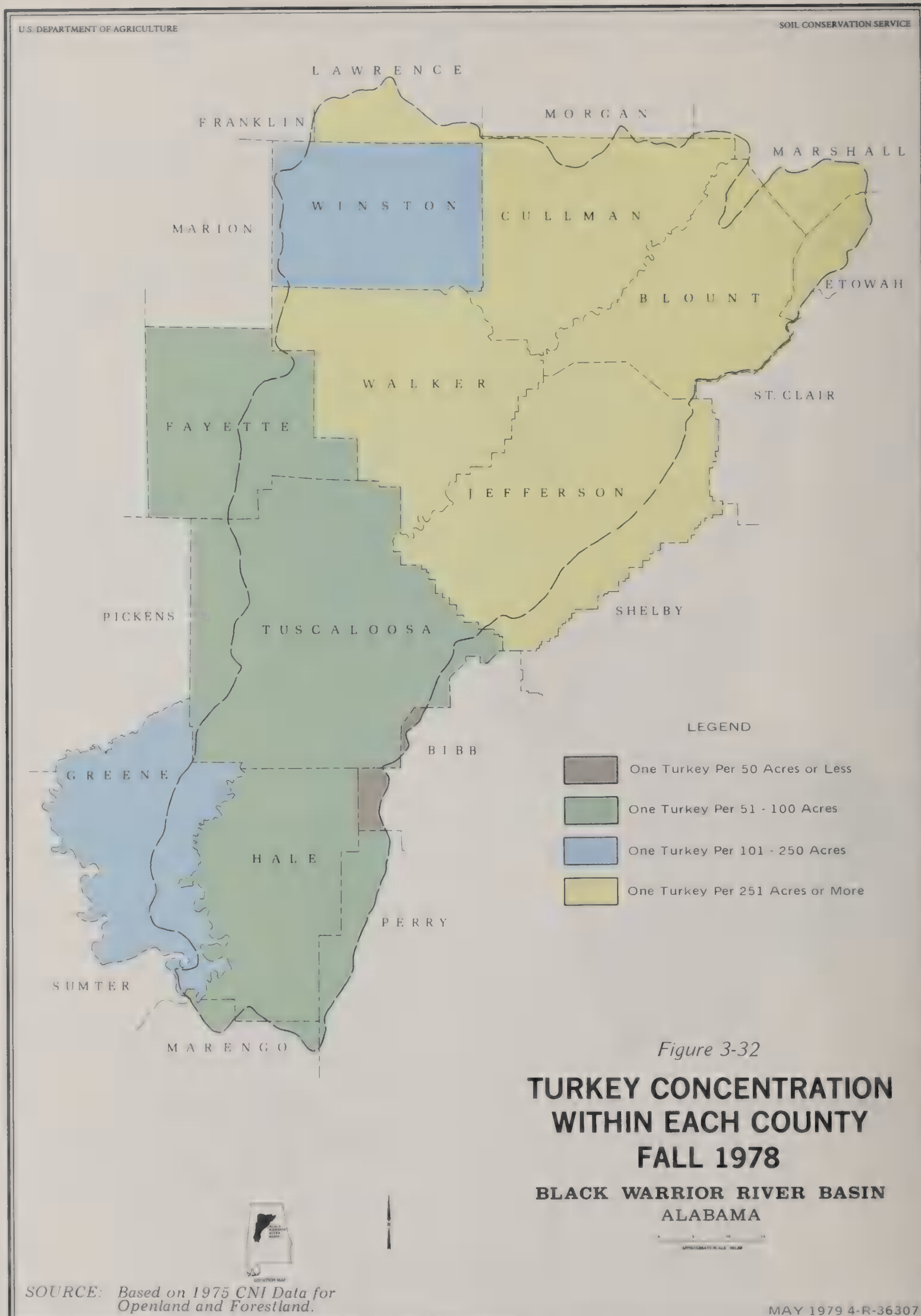

Figure 3-32

TURKEY CONCENTRATION WITHIN EACH COUNTY FALL 1978

BLACK WARRIOR RIVER BASIN
ALABAMA

SOURCE: Based on 1975 CNI Data for Openland and Forestland.

MAY 1979 4-R-36307

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Aquatic: Habitat for aquatic wildlife and fishes in the basin is provided by (1) principal streams, with a total length of about 1,410 miles and a total surface area of about 4,775 acres; (2) 40,684 acres of large water impoundments; (3) 19,281 acres of small lakes; and (4) 12,905 acres of natural impoundments (table 3-25).

The most productive fish habitat in the basin is found in small impoundments. In small ponds and lakes, many factors affecting productivity can be controlled. Pollution and inaccessibility limit the use of many rivers and smaller streams.

Table 3-25 - Fish habitat - Black Warrior River Basin, 1977

Type	Basin Acres
Impoundments	
500 ac.	40,684
40-500 ac.	3,986
5-40 ac.	4,544
5 ac.	10,751
Natural	12,905
Rivers & smaller streams	4,775 (1,410 mi.)
TOTAL	77,645

Source: SCS estimate, 1978

Wetlands: Wetland is a term which encompasses a wide range of hydrologic, botanical, and physical variations. The main factor is an abundance of water but even this is greatly variable. Wetland variability is usually expressed in botanical features. Physical features including water diversions, tile lines, reverse berms, open ditches, land leveling, impoundments, road beds, and diking all contribute to controlling the water regime. Wetlands can be created or they can be destroyed by modification of these physical features. Wetlands are not static--they are continuously changing.

Wetlands have been recognized for their inherent values, and legislation has been enacted to protect them. Presidential Executive Order (11990) mandates protection of wetlands by all federal agencies. Guidelines for implementing a wetlands protection policy published in the Federal Register, Vol. 44-147, July 30, 1979 are consistent with and supportive of the President's Executive Order.

Present inventories of wetlands in Alabama are either fragmented, outdated, or incomplete. It is hoped that the Department of the Interior's present mapping will be completed by 1982 and that it will meet basic inventory needs.

Since wetland inventories and classification systems are currently in a state of flux, it was decided to present wetland data for the basin in a few general categories that, perhaps, can be related to future inventories.

Inventory data for wetlands are summarized in table 3-26. This information was generated from primary and secondary sources. The inventory of beaver ponds was conducted by an SCS biologist and by district conservationists. Additional data from the beaver pond survey are presented in table 3-27.

Table 3-26 - Wetlands of the Black Warrior River Basin, 1977

Wetland category	Acreage	Circular 39 types 4/
Flood plain (100 yr.) 1/	329,800	Primarily Type 1
Beaver ponds 1/	9,718	60% - Type 4 40% - Types 5, 6, 7
Other natural wetlands 2/	10,800	Primarily Type 7
Wet soils, Vw & wetter 3/	104,714	Types 1-7

1/ Source: SCS data.
2/ Source: Map Inventory Assembly and Display System (MIADS) summaries of USGS 1972-73, 1975-76 Land use maps.
3/ There is an additional 143,714 acres of IVw soil some of which may be classified as wetlands.
4/ U.S. Department of the Interior, Fish and Wildlife Service, Wetlands of the United States, Circular 39, 1956, p. 15.

Table 3-27 - Estimate of acreage inundated by beaver impoundments in the Black Warrior River Basin, 1977

County	Acreage in basin	Acreage in beaver ponds	Percent of total
Bibb	27,800	14	.05
Blount	392,600	78	.02
Cullman	449,800	220	.05
Etowah	60,900	53	.09
Fayette	137,000	1,028	.75
Greene	126,000	983	.78
Hale	420,800	2,230	.53
Jefferson	535,000	25	.01
Lawrence	82,300	35	.04
Marengo	25,000	17	.07
Marshall	63,000	19	.03
Perry	77,000	413	.54
Tuscaloosa	718,000	4,452	.62
Walker	509,000	70	.01
Winston	380,900	81	.02
TOTAL BASIN	4,005,100 1/	9,718	.24

Source: SCS field personnel

1/ Does not include Franklin and Morgan Counties

CHAPTER 4

ECONOMIC DEVELOPMENT AND TRENDS

GENERAL ECONOMIC GROWTH

The following is a brief examination of economic, agricultural, and forestry trends in the hydrologic area comprising the Black Warrior River Basin. More detailed analyses and projections for the state and nine central counties 1/ in the basin are presented in a separate report, Economic Development and Agricultural Land Use, published in April 1980.

Population and Residence

Nearly one fourth of Alabama's population resides in the Black Warrior River Basin. This share has changed little over the past 25 years (table 4-1). Historically, the basin's rate of population growth has been slightly less than that of the state's. Between 1960 and 1975, basin population increased by just 50,000 persons, reaching 862,000 in 1975, an annual increase of less than one-half of one percent. U.S. population, in comparison, increased at an annual rate of 1.1 percent over the same period.

Basin population is centered around Birmingham in heavily industrialized Jefferson County (figure 4-1). Two of every three persons in the basin reside in Jefferson County. In recent years, however, the county's growth has been extremely slow, actually declining between 1970 and 1976.

An increasing number of people are expressing a preference to reside in rural areas. This, coupled with the fact that employment opportunities are increasing in nonmetro communities, has resulted in net immigration of people into the rural sector since 1970. This is in sharp contrast to trends of a few years ago.

Total population of major cities in the area actually dropped 9 percent between 1960 and 1975 (table 4-2). Net out-migration from Birmingham totaled 19 percent during the period; Bessemer and Fairfield, both in Jefferson County, also lost population. Tuscaloosa, Cullman, Jasper, and several smaller communities surrounding Birmingham experienced moderate growth.

1/ Blount, Cullman, Fayette, Greene, Hale, Jefferson, Tuscaloosa, Walker, and Winston.

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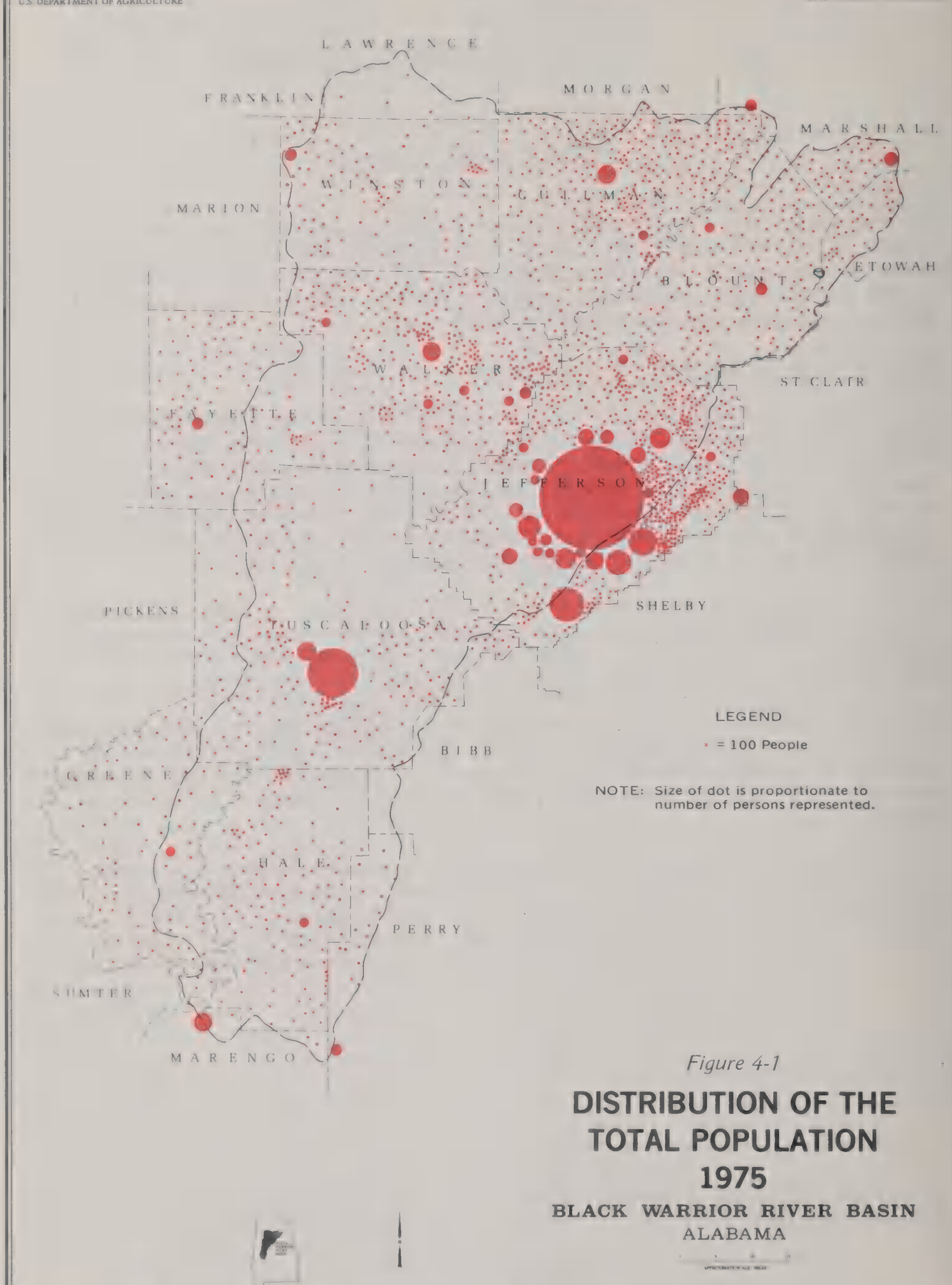

Figure 4-1

DISTRIBUTION OF THE TOTAL POPULATION 1975

BLACK WARRIOR RIVER BASIN
ALABAMA

U.S. Bureau of the Census, Current Population Reports and the Demography of Alabama, ADO, 1974.

SEPTEMBER 1978 4-R-36303

USDA-SCS-FORT WORTH, TEXAS 1978

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Table 4-1 - Population trends, Black Warrior River Basin, Alabama, and the United States, 1950 to 1975.

Area	Unit	1950	1960	1970	1975
		Persons			
Black Warrior Basin					
Total population:	Thou.	758	812	834	862
Urban	"	380	487	540	573
Rural	"	378	325	294	289
Alabama	"	3,062	3,267	3,444	3,616
United States	Mil.	152	181	205	214
		Percent			
State as a % of U. S. population	Pct.	2.0	1.8	1.7	1.7
Basin as a % of state population	Pct.	24.8	24.9	24.2	23.8

Source: U. S. Bureau of the Census, Census of Population, and the Bureau of Business Research, University of Alabama.

Table 4-2 - Growth of cities with population 10,000 and over, 1960-1975.

City	1960	1970	1975	1960-75
	Persons			% Change
Birmingham	340,900	305,900	276,200	-19
Tuscaloosa	63,400	69,400	69,400	+ 9
Bessemer	33,100	33,700	31,500	- 5
Cullman	10,900	12,600	14,800	+36
Gardendale	4,700	6,500	13,900	+196
Fairfield	15,800	14,400	13,000	-18
Hueytown	6,000	10,500	11,800	+97
Jasper	10,800	10,800	11,800	+ 9
Totals	485,600	463,800	442,400	- 9

Source: U. S. Bureau of the Census, Current Population Reports, and Census of Population, 1960 and 1970.

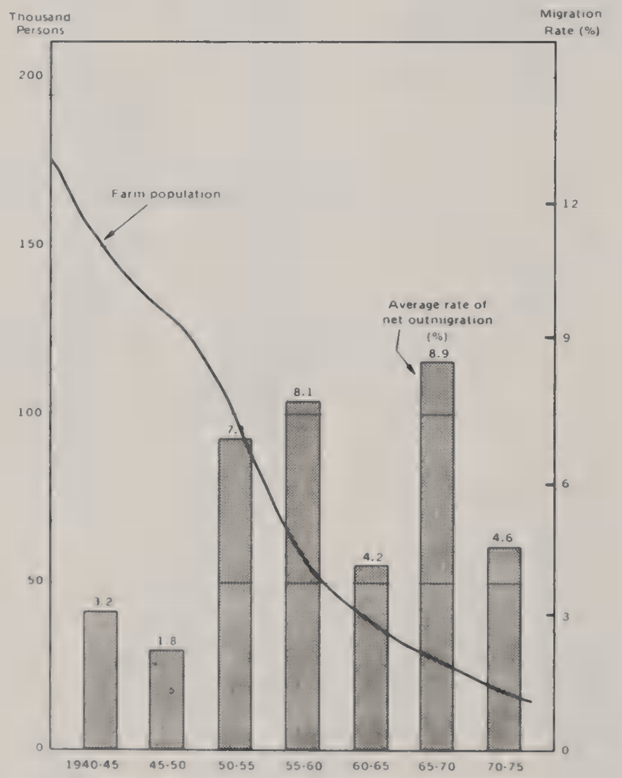
In 1940, farm families comprised one-fourth of the basin's population. Today, only 2 percent of the populace resides on farms (table 4-3). Only Cullman County, where farm families represent 13 percent of the total population, has managed to retain a substantial farm population.

Table 4-3 - Farm population, Black Warrior Basin, 1940-1975

Year	Farm population	Percent of total basin population
	Persons	Percent
1940	169,800	25.5
1945	142,500	19.5
1950	130,000	17.1
1955	83,900	10.6
1960	49,800	6.1
1965	39,500	4.8
1970	21,900	2.6
1975	16,900	2.0

Out-migration of the farm population has slowed somewhat in recent years as shown in figure 4-2. Average annual net loss of farm population is currently around 4.6 percent, compared to a record 8.9 percent annual loss for the 1965-1970 period.

In 1970, the population of the basin was about 73 percent white. Blacks accounted for 99 percent of all minorities. One-third of the population is under 18 years of age, and 10 percent is over 65. Median age in 1970 was a relatively young 28.7 years, compared to the U.S. average of 32 years of age.



SOURCE: U. S. Census of Population, Alabama, 1940-1970.

Figure 4-2

FARM POPULATION AND MIGRATION 1940 - 1975
BLACK WARRIOR RIVER BASIN

Employment

Employment opportunities in the Black Warrior River Basin have improved measurably in recent years. During the 1960's, employment gains in the basin badly trailed U. S. increases. From 1970 to 1977, however, the trend was reversed, as local employment rose 18 percent while national figures showed only a 14 percent increase (table 4-4).

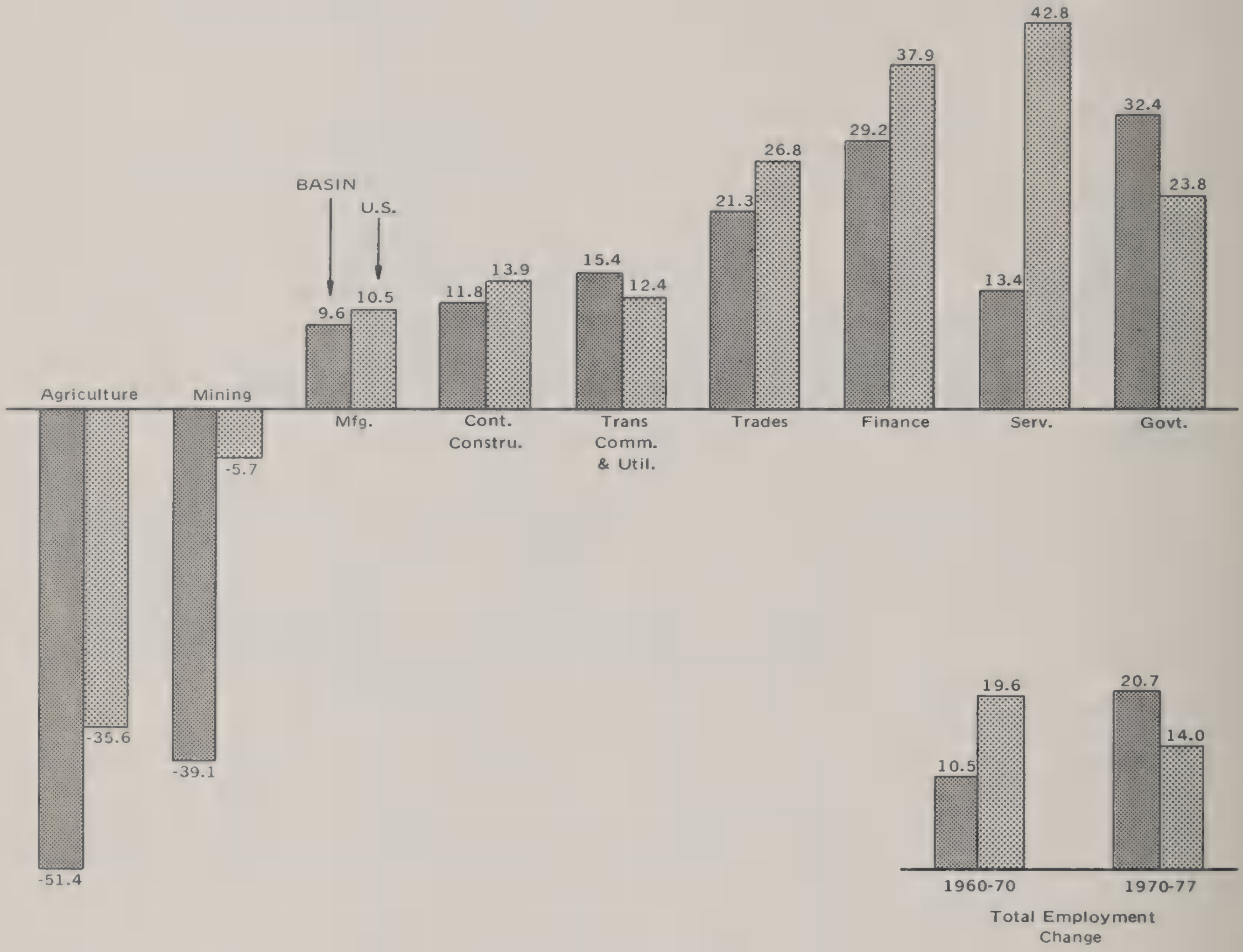
Countering the rise in employment, however, was a 22 percent increase in the labor force. The work force was expanded due to the increasing number of women entering the labor market for the first time, pushing unemployment to 7.6 percent in 1977, in contrast to the otherwise healthy employment picture.

Government, finance, and trade sectors increased employment most rapidly between 1960-70 (figure 4-3). In terms of actual jobs, however, three sectors trade, service, and manufacturing accounted for three-fourths of all employment in 1977. Table 4-5 shows a striking similarity in the composition of employment of the basin and U.S. Although the percentages are small, mining employment in the basin is twice that of the U.S., relative to the other areas of employment.

Table 4-4 - Trend in employment by industry, Black Warrior River Basin and the U. S., 1960, 1970, and 1977.

Industry	Black Warrior 1960	Black Warrior 1970	Black Warrior 1977	United States 1960	United States 1970	United States 1977
	Employees			Thousand employees		
Basic industry						
Agriculture, forestry & fishing	13,700	6,660	5,530	4,525	2,916	2,822
Mining	8,100	4,930	10,000	670	632	847
Manufacturing	69,500	76,100	80,150	18,206	20,120	20,320
Total basic	91,300	87,690	95,680	23,401	23,668	23,989
Service industry						
Contract construction	16,200	18,100	20,000	4,026	4,587	4,866
Trans., comm., & util.	19,100	22,050	22,700	4,625	5,197	5,150
Wholesale & retail trade	52,000	63.100	78,200	12,306	15,608	18,534
F.I.R.E.	11,500	14,850	20,230	2,790	3,848	4,570
Services	71,900	81,500	100,400	14,213	20,293	26,082
Government	9,000	11,900	15,000	5,012	6,207	7,309
Total service	179,700	211,500	256,530	42,972	55,740	66,502
All employment	271,000	299,190	352,210	66,373	79,408	90,500
% increase 1960-70	-	+10.4	-	-	+19.6	-
% increase 1970-77	-	-	+17.7	-	-	+14.0
Labor force	288,000	312,500	381,200	70,235	83,062	97,312
Unemployment rate (%)	5.9	4.3	7.6	5.5	4.4	7.0

Source: Census of Population, 1960 and 1970, Alabama Business, University of Alabama Center for Business and Economic Research, and World Almanac, 1979



SOURCE: U. S. Bureau of the Census, Census of Population, 1960 & 1970.

Figure 4-3

CHANGES IN EMPLOYMENT BY SECTOR
BLACK WARRIOR RIVER BASIN AND THE U. S.
1960 - 1970
(PERCENT CHANGE)

Table 4-5 - Composition of employment, Black Warrior River Basin, and the U. S., 1970.

Industry	Percent of total employment Black Warrior	U. S.
	----Percent----	
Service	27.2	25.6
Manufacturing	25.4	25.3
Trade	21.1	19.7
Trans. comm., utilities	7.4	6.5
Construction	6.1	5.8
Fin., ins., real estate	5.0	4.8
Government	4.0	7.8
Agri., forestry, fishing	2.2	3.7
Mining	1.6	0.8
Total	100.0	100.0

Source: Census of Population, 1970.

Income

A major limitation of using personal income as a measure of one's well-being is that most estimates represent current or actual income, rather than real income. Reflecting the purchasing power of the dollar, income in current dollars indicates nothing about changes in real purchasing power, that is, the amount of goods and services the income can buy. To correct for this limitation, the 1965 and 1970 income figures in table 4-6 have been adjusted to 1975 dollars to reflect the actual purchasing power of the dollar.

Table 4-6 - Total personal and per capita income, Black Warrior River Basin, Alabama, and the U. S., 1965 to 1975.

Income*	Unit	1965	1970	1975
Total personal:				
Black Warrior Basin	Mil. $	2,954	2,497	4,560
Alabama	Mil. $	11,660	14,100	16,799
U. S.	Bil. $	916	1,111	1,257
Per Capita:				
Black Warrior Basin	Dollars	3,589	4,192	5,289
Alabama	"	3,386	4,086	4,648
U. S.	"	4,714	5,424	5,832

*Expressed in 1975 dollars.

Source: Economic Report of the President, 1976, and Center for Business and Economic Research, University of Alabama.

The effect of the basin's recent employment gains is quite evident in table 4-6. Real personal income in the basin increased from $2,954 million in 1965 to $4,560 million in 1975, a 54 percent increase in 10 years. Over the same period, real personal income for the U. S. increased only 37 percent; for Alabama, it rose 44 percent.

Per capita income in the basin has historically been higher than in the remainder of the state due to the influence of employment around Birmingham. This was true in 1975, as basin income averaged $5,289 per individual, while Alabama as a whole averaged only $4,648. Only Jefferson County, with a per capita income higher than the national average, surpasses the basin average income giving an indication of the importance of the county relative to the remaining area (figure 4-4).

Indications of Well-Being

Degree of Poverty--

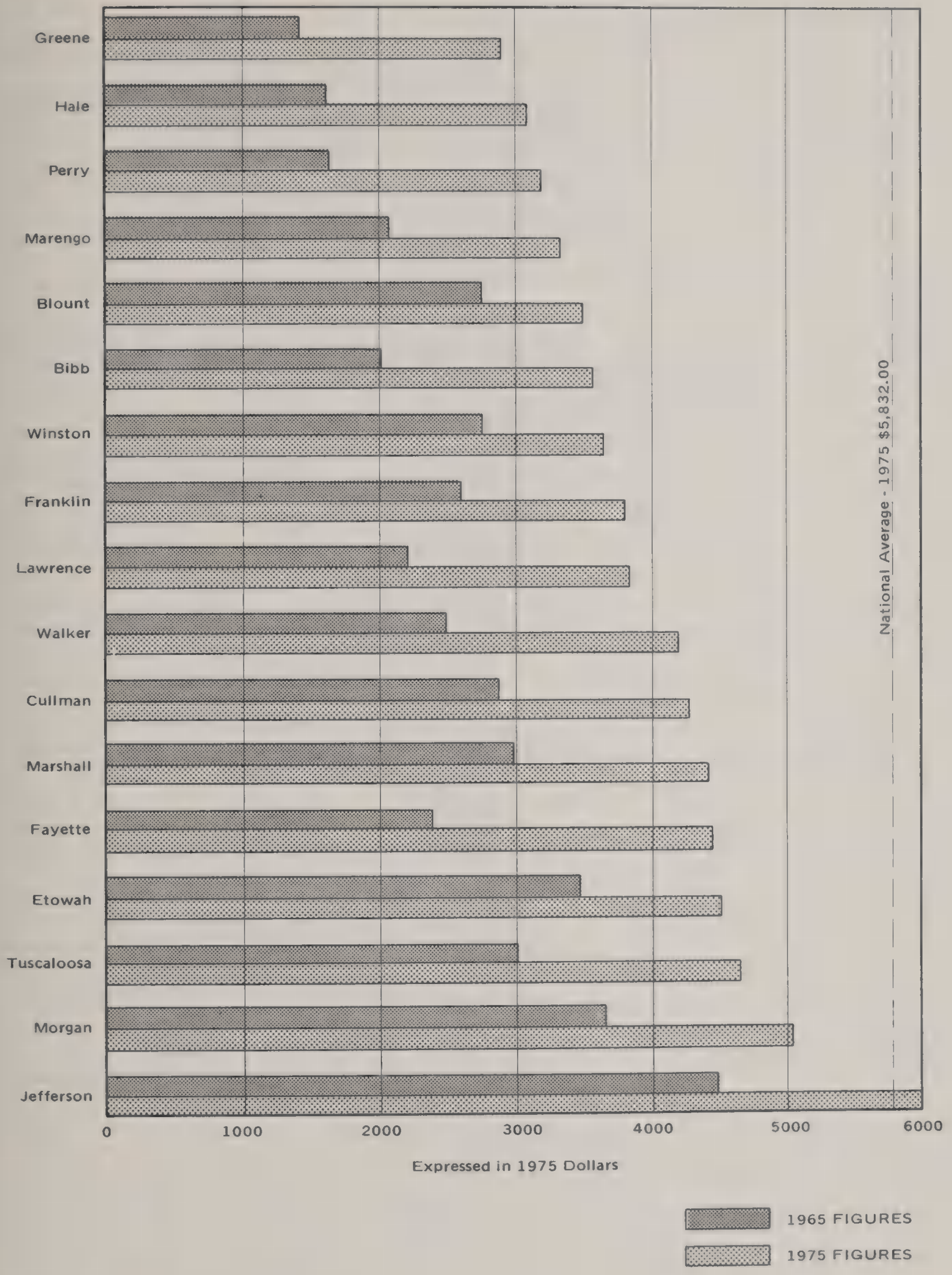
In 1970, 20 percent of the individuals residing in the Black Warrior River Basin received incomes which placed them below the poverty level, as defined by the Census Bureau. This percentage was considerably higher than the comparable U. S. figure of 13.3 percent, but below the state average of 25 percent. In terms of family units, only 17 percent of all basin families were considered as being in poverty, compared to 20.7 percent statewide.

Public Assistance--

One of every 15 basin residents received some form of public welfare payment in 1975. Two-thirds of the payments went to aid families with dependent children. This share was roughly comparable to the number getting public assistance nationwide. Payments to basin residents totaled $18.3 million in 1975, only $212 per year per individual receiving aid; consequently, the effect of public assistance was minimal in terms of alleviating substandard living conditions.

Educational Levels--

The median number of school years completed in 1970 was 11.1 years. This compares favorably with the state average of 10.8 years and an average for all southern states of 11.3 years. It remains well below the U. S. level of 12.1 years. Problems do exist, particularly in Greene, Hale, and Perry Counties. In 1970 in these three counties, 25 percent of all persons 25 years old and over reported having less than 5 years education. The more populous counties, Jefferson and Tuscaloosa, reported much lower rates, 8 percent and 11.8 percent respectively, while the basin average was only 9 percent with less than 5 years of education. The three counties were also the lowest in the state in median years of education - Greene, 8.3 years; Hale, 8.5 years, and Perry, 8.6 years.



SOURCE: Alabama Business, University of Alabama, August, 1977.

Figure 4-4

PER CAPITA INCOME BY COUNTIES

Housing--

In 1975, 23 percent of the occupied housing units in the basin were considered substandard, a slight improvement over the 27 percent reported in 1970. Again, as with education, Greene, Hale, and Perry Counties were exceptionally deficient in terms of adequate housing. In these three counties, nearly one-half of all occupied units were substandard in 1975.

AGRICULTURAL ECONOMY

Farm Structure

The number of farms in the Black Warrior River Basin is declining much more rapidly than in the U. S. as a whole. For the period 1959 to 1974, farm numbers in the basin declined by 48 percent while the U. S. was losing only 31 percent of all farms (table 4-7). Furthermore, while the rate of decline nationwide has slowed considerably, the rate of decline within the Black Warrior River Basin has actually increased with time. This has resulted in the basin losing nearly one of every four farms between 1969 and 1974, while the U. S. was losing only one of every twenty.

Table 4-7 - Farm characteristics, Black Warrior River Basin and Alabama, 1959-1974.

Item	1959	1964	1969	1974
Number of farms 1/:				
Black Warrior	15,425	12,790	10,435	8,075
Alabama	115,788	92,530	72,491	56,678
U. S.	4,105,000	3,457,000	2,999,000	2,830,000
Commercial farms 2/:				
Black Warrior	N.A.	5,045	4,230	3,835
Alabama	N.A.	31,711	28,557	28,317
Land in farms, acres:				
Black Warrior	1,588,800	1,458,000	1,335,700	1,115,200
Alabama	16,542,700	15,225,500	13,654,200	11,852,900
% in Basin	9.6	9.6	9.8	9.4
Ave. size, acres:				
Black Warrior	103	114	128	138
Alabama	143	165	188	209
U. S.	303	351	389	440

Source: U. S. Census of Agriculture, selected years.

1/ Not fully comparable because of change in farm definition.
2/ Sales of $2,500 and over.

Several factors have contributed to this abnormal rate of out-migration. Farms in the basin are small, averaging only 138 acres in 1974 compared to 440 acres for the U. S. Less than one-half of all farms are commercial operations, i.e., having sales of at least $2,500 annually. Between 1967 and 1977, farm production costs doubled without a comparable increase in prices received. This situation further aggrevated the problem, particularly for the marginal operator. Farmers began to look elsewhere for income. Some began commuting to nearby Birmingham, Tuscaloosa, or Gadsden for full-time employment. However, many retained ownership of their farmland; consequently, average farm size remains small relative to surrounding areas.

Farm types have changed also. Twenty years ago, field crop farms predominated with livestock included as a supplemental enterprise only. Today, just the opposite exists. Three-fourths of all basin commercial farms are livestock operations, with poultry farms accounting for 40 percent of the total. One reason for this could be that livestock operations usually require less operator labor, leaving more time for work off the farm.

Operator Characteristics

The typical Black Warrior River Basin farm operator is 52 years old, owns a family-type farm, probably a poultry or livestock operation, yet earns a substantial portion of his total income from non-farm employment (table 4-8). Almost eight of every ten basin farmers owned their own farm in 1974; in 1954 tenant farming was the predominant practice. Farming, however, is not the primary job of farm operators. Roughly 60 percent reported non-farm employment as their principal occupation in 1974.

Table 4-8 - Farm operator characteristics, Black Warrior River Basin, 1959-1974.

Item	1959	1964	1969	1974
Farm ownership:				
Full owner	8,850	8,220	8,110	6,295
Part owners & tenants	6,575	4,570	2,325	1,780
Total farms	15,425	12,790	10,435	8,075
% full ownership	57	64	78	78
Principal occupation of farm operators:				
Farming	N.A.	N.A.	N.A.	3,400
Other	N.A.	N.A.	N.A.	4,675
No. of operators with off-farm income exceeding farm income	N.A.	N.A.	N.A.	4,065
% of total	N.A.	N.A.	N.A.	50
Average age, years	51	52	52	52

Source: U. S. Census of Agriculture, selected years.

Table 4-9 - Principal crops: Acres harvested and production, Black Warrior River Basin, 1959, 1969, 1975, and 1977.

Crop	Unit of production	1959			1969		
		Acres	Production	Yield/ acre	Acres	Production	Yield/ acre
Soybeans	Bushels	1,000	16,000	16	49,000	1,029,000	21
Hay	Tons	49,000	53,900	1.1	58,000	98,600	1.7
Cotton	Bales	89,000	97,900	1.1	69,000	57,270	.83
Corn	Bushels	178,000	4,628,000	26	48,000	1,536,000	32
Wheat	Bushels	3,100	74,400	24	3,300	99,000	30
Minor crops	-	23,700	-	-	15,700	-	-
Acres harvested	-	343,800	-	-	243,000	-	-

Crop	Unit of production	1975			1977		
		Acres	Production	Yield/ acre	Acres	Production	Yield/ acre
Soybeans	Bushels	104,700	2,890,000	27.6	152,000	3,116,000	20.5
Hay	Tons	80,400	156,900	1.95	82,500	125,100	1.5
Cotton	Bales	29,400	26,400	.90	25,000	14,800	.59
Corn	Bushels	55,500	2,977,000	54	21,400	539,000	25*
Wheat	Bushels	3,700	88,800	24	7,100	219,000	31
Minor crops	-	16,400	-	-	16,000	-	-
Acres harvested	-	290,100	-	-	304,000	-	-

Source: U. S. Census of Agriculture, and Alabama Agricultural Statistics, selected years.

*Abnormally low yield due to severe drought.

Crop Production

In 1949, 1,215,000 acres of cropland were reported in the basin (figure 4-5). By 1975, cropland acreage was down to 527,000 acres. Slightly more than one-half of the cropland base (290,000 acres) was harvested in 1975, while another 200,000 acres were pastured. Only 37,000 acres were idle, fallow, or planted to crops which failed, in contrast to the one-half million acres idle or unproductive in 1949.

Cropland harvested declined steadily in both Alabama and the basin until about 1970 (figure 4-6). Since that time acreage harvested has increased slightly in response to favorable soybean prices, but still represents only 8.0 percent of Alabama's harvested acreage. Soybean acreage increased by 100,000 acres between 1970 and 1977, while acreage of corn and cotton dropped to almost insignificant levels. Hay acreage has remained fairly constant.

Average state yields have increased steadily since the early 1900's as shown in figure 4-7. Yield increases have ranged from an average 1 percent annual gain in hay yields to a high of 3 percent annual increase in peanut yields.

Acreage, production, and yield of major crops grown in the Black Warrior River Basin are shown in table 4-9. Soybeans accounted for one-half of all acres harvested in 1977 and 60 percent of all income from sale of crops. Corn and cotton sales combined contributed only 16 cents of every crop dollar. In 1959, basin farmers produced 14 percent of the state's cotton and 11 percent of the corn. Presently, the study area supplies only 5 percent of these once major cash crops (table 4-10).

Table 4-10 - Share of Alabama's production grown in the Black Warrior River Basin, 1959, 1969, 1975, and 1977.

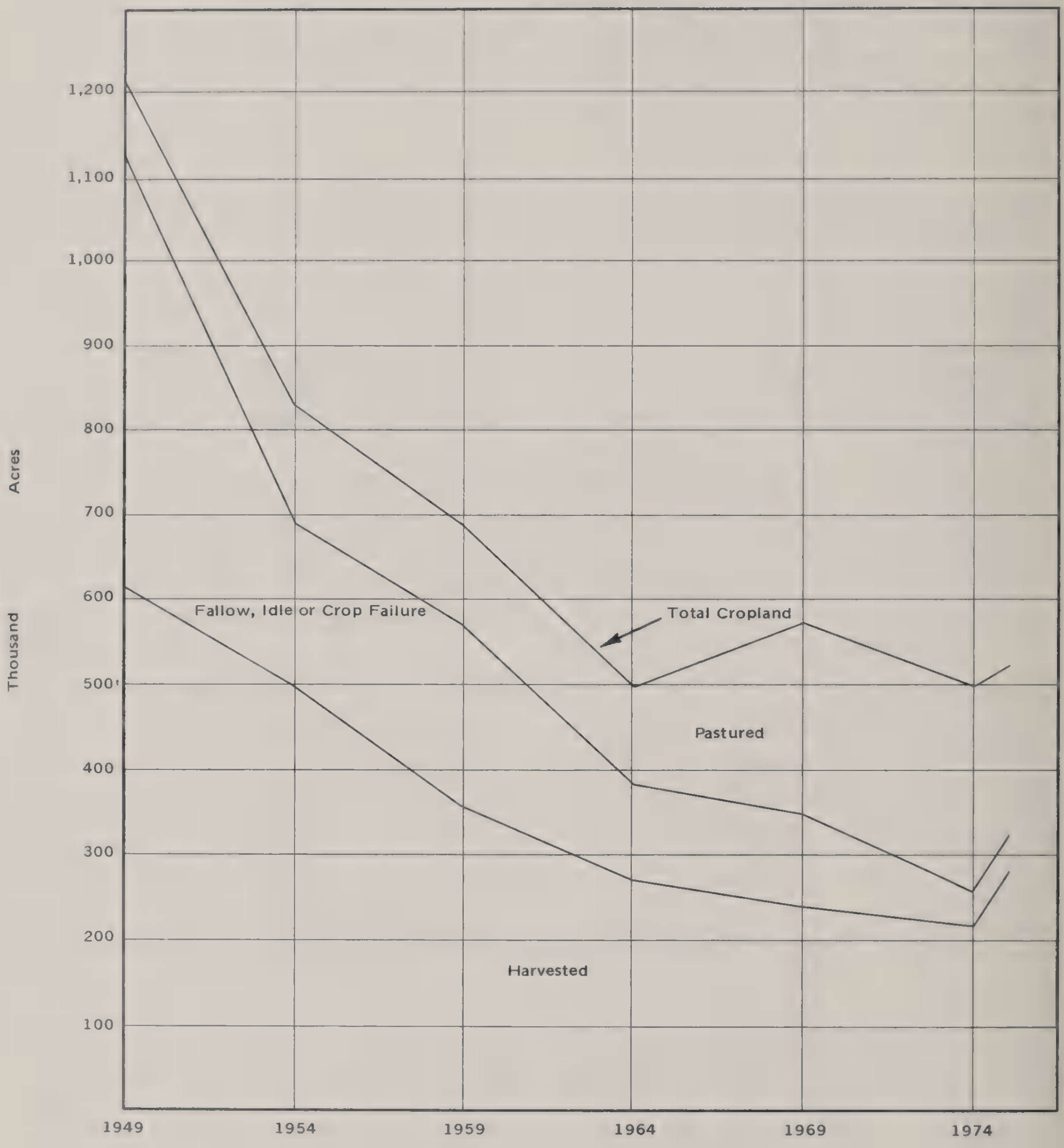
Crop	Share of Alabama production			
	1959	1969	1975	1977
	Percent			
Soybeans	1	8	9	9
Hay	13	12	14	12
Cotton	14	12	8	5
Corn	11	7	9	5
Wheat	7	4	3	9

Source: Alabama Agricultural Statistics and Census of Agriculture, selected years.

Crop production is concentrated in Hale, Cullman, and Blount Counties (figure 4-8). Together, the three counties account for about 70 percent of all crop sales within the basin.

Livestock and Poultry

Cattle numbers have increased steadily over the past 20 years (table 4-11). Currently, basin farms support about 10 percent of all cattle and calves in the state. The area's share of hogs has increased, although the number of animals on farms has dropped to the point where hog production represents only a small segment of the overall farm economy.



SOURCE: U. S. Census of Agriculture, 1949-1974.

Figure 4-5

MAJOR USES OF CROPLAND, BLACK WARRIOR RIVER BASIN

CROPLAND HARVESTED

	Alabama	Black Warrior Basin	% of Alabama
	Thousand Acres		
1950	5700	593	10.4
1955	4800	471	9.8
1960	3700	340	9.2
1965	3000	265	8.8
1970	2700	240	8.9
1975	3400	290	8.5
1976	3540	275	7.8
1977	3500	279	8.0

SOURCE: Alabama Agricultural Statistics, 1950-1977.

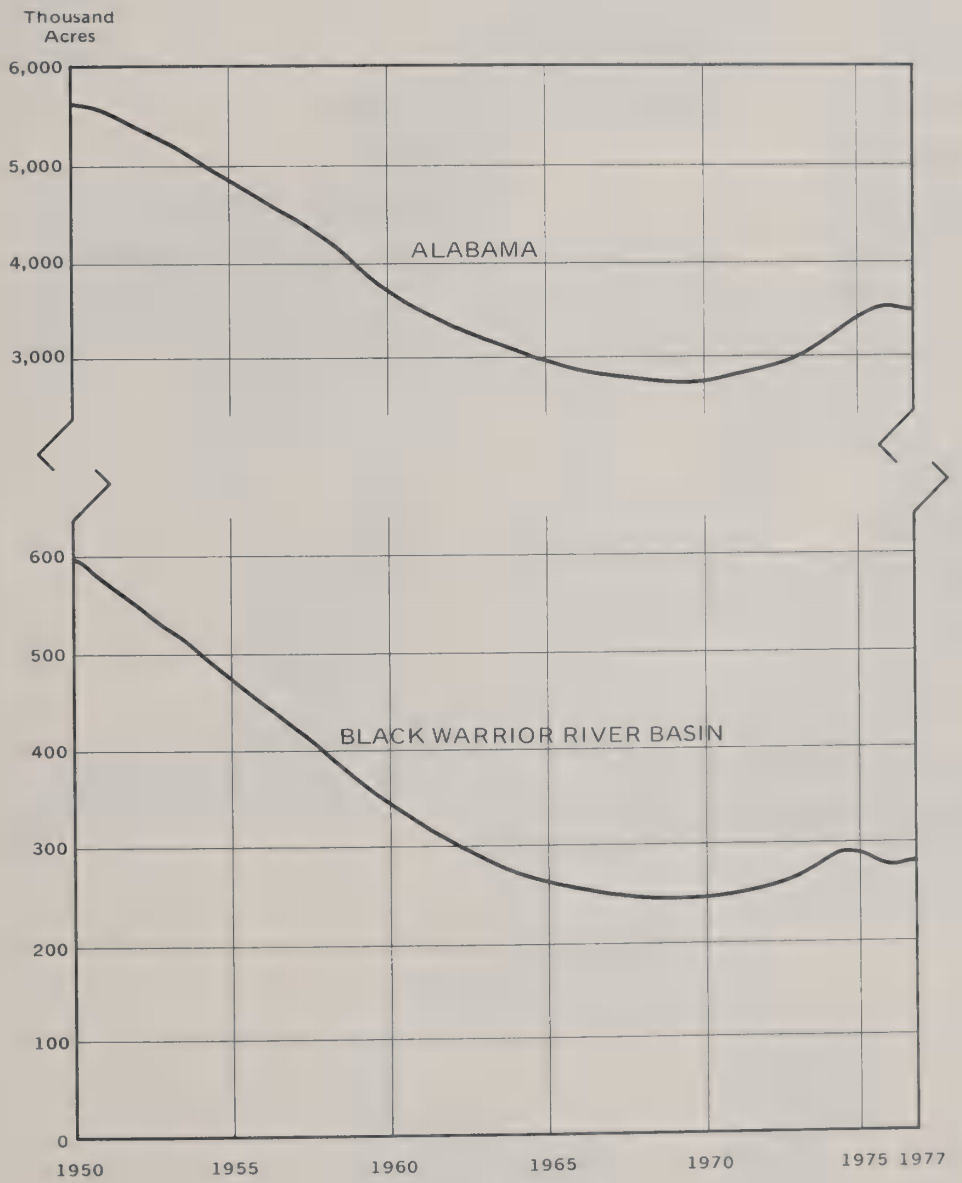
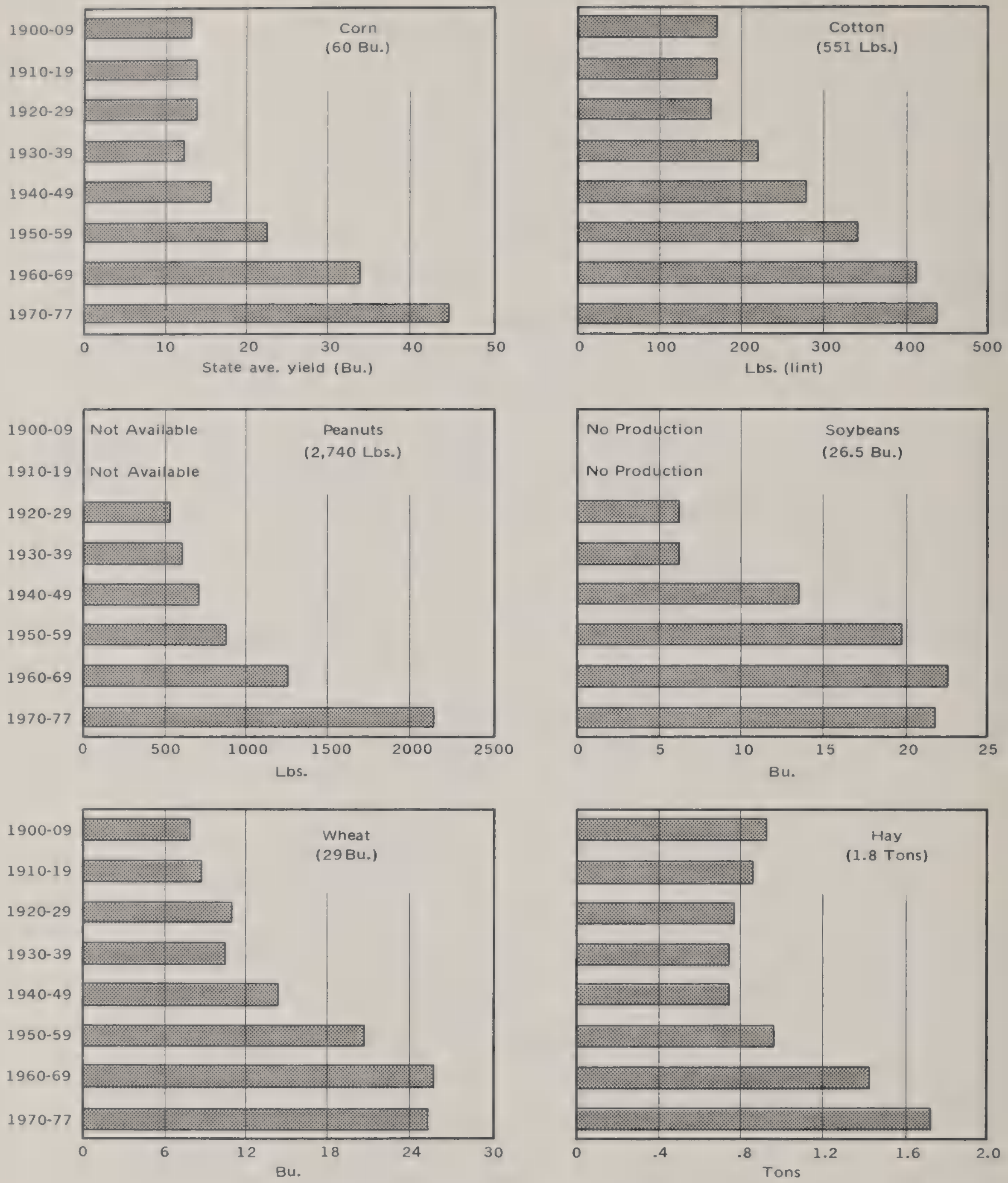


Figure 4-6

TREND IN CROPLAND HARVESTED
ALABAMA AND BLACK WARRIOR RIVER BASIN

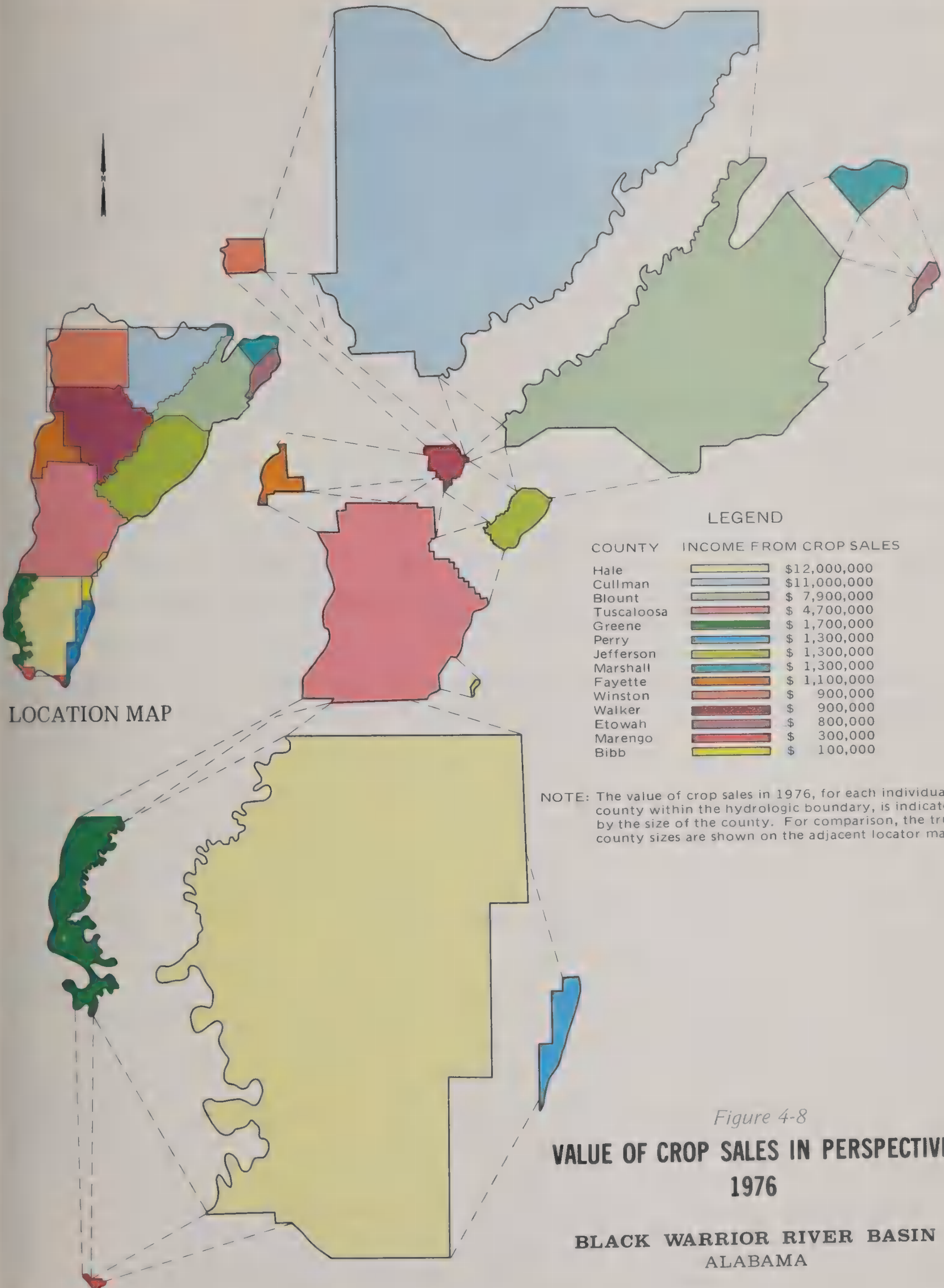


Record state average yield shown in ( ).

SOURCE: Alabama Agricultural Statistics, Selected Years.

Figure 4-7

TREND IN YIELD OF MAJOR CROPS
ALABAMA 1900 - 1977



NOTE: The value of crop sales in 1976, for each individual county within the hydrologic boundary, is indicated by the size of the county. For comparison, the true county sizes are shown on the adjacent locator map.

Figure 4-8

VALUE OF CROP SALES IN PERSPECTIVE
1976

BLACK WARRIOR RIVER BASIN
ALABAMA

SOURCE: Data compiled by River Basin Planning Staff.

AUGUST 1978 4-R-36287

USDA-SCS-FORT WORTH, TEXAS 1978

Table 4-11 - Livestock and poultry inventory, Black Warrior River Basin, 1959, 1964, 1969, 1974, and 1977.

Item	1959	1964	1969	1974	1977
			Thousand animals		
Number on farms					
Cattle and calves	143	181	198	253	282
Hogs and pigs	109	66	98	70	77
Broilers	N.A.	N.A.	24,725	21,425	26,800
Layers	N.A.	3,016	3,792	4,695	4,795
Share of state			Percent		
Cattle & calves	9.4	9.8	11.1	11.5	9.9
Hogs & pigs	8.9	9.2	11.4	12.3	11.8
Broilers	N.A.	N.A.	39.1	31.0	30.0
Layers	N.A.	27.3	29.4	35.7	33.7

Source: U. S. Census of Agriculture, Alabama, selected years.

The real strength of agriculture within the basin lies in the poultry industry. Approximately one-third of Alabama's broilers and eggs are produced on farms in the basin. Broiler production is nearing the one-half billion pounds mark, while egg production is approaching 100 million dozen per year (table 4-12).

Beef and veal production has peaked at about 65 million pounds over the past 5 years, while pork output has dropped about 20 percent during the same period.

Table 4-12 - Production of major livestock products, Black Warrior River Basin, 1959, 1964, 1969, 1974, and 1977.

Product	Unit	1959	1964	1969	1974	1977
Beef & veal	Mil.lbs.	41.5	44.0	58.0	64.9	63.4
Percent of Ala.	Percent	8.8	8.8	10.0	10.5	8.9
Pork	Mil.lbs.	33.9	23.7	38.7	36.6	29.0
Percent of Ala.	Percent	10.9	10.3	12.4	12.9	12.5
Broilers	Mil.lbs.	136	223	492	436	475
Percent of Ala.	Percent	26	27	39.8	30.4	30.0
Eggs	Mil.doz.	N.A.	50.1	69.8	87.6	93.1
Percent of Ala.	Percent	N.A.	27.3	29.4	35.7	35.1

Source: Alabama Agricultural Statistics, selected years.

Farm Income

As would be expected, livestock and poultry receipts provide the bulk of all farm income in the Black Warrior River Basin, accounting for 85 percent of total receipts in 1977 (table 4-13). Actually poultry is the dominant income producer, contributing $185 million of the total $278 million earned from sale of farm products in 1977, roughly two of every three dollars earned. Government farm payments and sale of farm forest products added $5.3 million to gross receipts, bringing the total for 1977 to $283 million.

Table 4-13 - Cash receipts from farm sales, Black Warrior River Basin, 1959, 1969, and 1977.

Item	1959 1/	1969 1/	1977
	Thousand dollars		
Livestock & poultry receipts	80,250	184,250	239,800
Crop receipts	44,900	22,980	38,300
Gov't farm payments	N.A.	10,410	1,215
Farm forest products	3,300	1,160	4,100
Total receipts from farming operations	128,450	218,800	283,415
Production costs	84,820	195,550	256,800
Net income	43,630	23,250	26,615
	Percent		
Profit margin	34	11	9
Gross income	Dollars		
Per farm	8,327	20,968	40,448
Per commercial farm	N.A.	51,725	80,975
Net income			
Basin:			
Per farm	2,828	2,228	3,800
Commercial farms	N.A.	5,496	7,600
U.S.			
Per farm	3,610	5,420	7,250
Commercial farm	N.A.	9,380	11,860

Source: U. S. Census of Agriculture, Alabama; Agricultural Statistics, U. S., 1976, Agricultural Outlook, and Alabama Agricultural Statistics, selected years.

1/ In 1977 dollars.

The increase in total receipts from farming, however, failed to keep pace with the rate of inflation. During the 1969-1977 period, the consumer price index jumped 65 percent while farm income rose only 29 percent. For gross farm income to have kept pace with inflation, 1977 receipts would have had to reach $361 million, well below the $283 million actually earned.

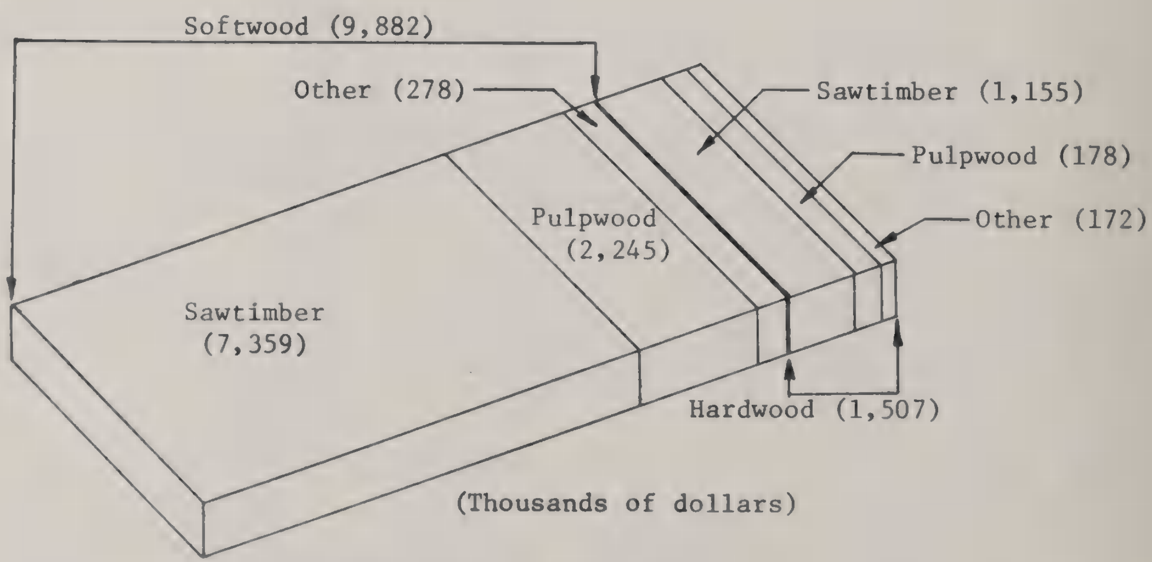
To further worsen the situation, farm production costs have risen dramatically in recent years cutting the farmer's profit margin to about 9 percent in 1977, compared to a 34 percent balance after costs in 1959. The sharp reduction in number of farms, however, has resulted in an increase in net farm income. Even so, net returns on commercial farms in the study area remained well below the national average of $11,860 per farm in 1977.

Forest Industry

The importance of the basin's forest resource is reflected in the variety of uses made of the resource--including the production of lumber, paper, and furniture; support of the recreational base for hunting, fishing and camping; and beef production through livestock grazing. The direct economic impact considered here is associated with the harvesting, manufacturing and remanufacturing of forest products.

The estimated stumpage value, the gross revenue from sales of roundwood products, for 1975 was $11.4 million. Figure 4-9 shows the relative importance of various species group and product combinations. Softwood sawtimber is the most important product, representing 65 percent of the total value of stumpage sold.

Figure 4-9 --Stumpage value by product and species, Black Warrior River Basin, 1975.



Source: Alabama Forestry Commission, Production of Forest Products by Counties, 1976.

Fifty-three percent of timber product revenues realized in the basin were earned by private forest landowners other than farmers. Farmer owners received 25 percent of total gross revenues, forest industry 15 percent, and government owners 7 percent (table 4-14). Stumpage values for the basin in 1975 represented 9 percent of the state total.

Table 4-14 - Gross revenue from sales of timber products by ownership category, Black Warrior River Basin, 1975.

Farm	Other private	Forest industry	Government	Total
Thousand dollars				
2,843.2	6,102.1	1,672.7	770.9	11,388.9
Percent				
25	53	15	7	100

Source: Alabama Forestry Commission, Production of Forest Products by Counties, 1976.

Current methods used for taking the agricultural census do not lend themselves to extracting information about forest management and harvest. Consequently, statistics concerning employment in forest management were not available for this report. Table 4-15 indicates that in 1972 there were an estimated 9,200 persons employed in forest products industries in the basin. Locations of forest industries are shown in figure 4-10. Together, the forest products industries supply 2.6 percent of the total employment and 12 percent of the manufacturing employment in the study area. This is somewhat higher than national averages, where forest products industries account for 2.3 percent of the total employment and 8.5 percent of the manufacturing employment. It is only slightly below the southeastern average, where forest products industries provide 14 percent of the manufacturing employment.

Forest products payrolls in the basin were an estimated $59.8 million in 1972. The average annual wage was $6,500 per employee, just 80 percent of the average manufacturing wage. Even the paper and allied products industry, traditionally a high wage sector, offered lower wages than the manufacturing average.

Other indications of the forest products industry's regional economic importance are its total value added and new capital expenditures. Value added is the difference between the cost of raw materials purchased by an enterprise and the value of its product. It represents the amount of money available for the payment of wages and salaries, interest, profit and taxes, and depreciation. Because value added measures the net contribution of a firm to the economy, it is the best value measure available for indicating the relative importance of manufacturing among industries and geographic areas.

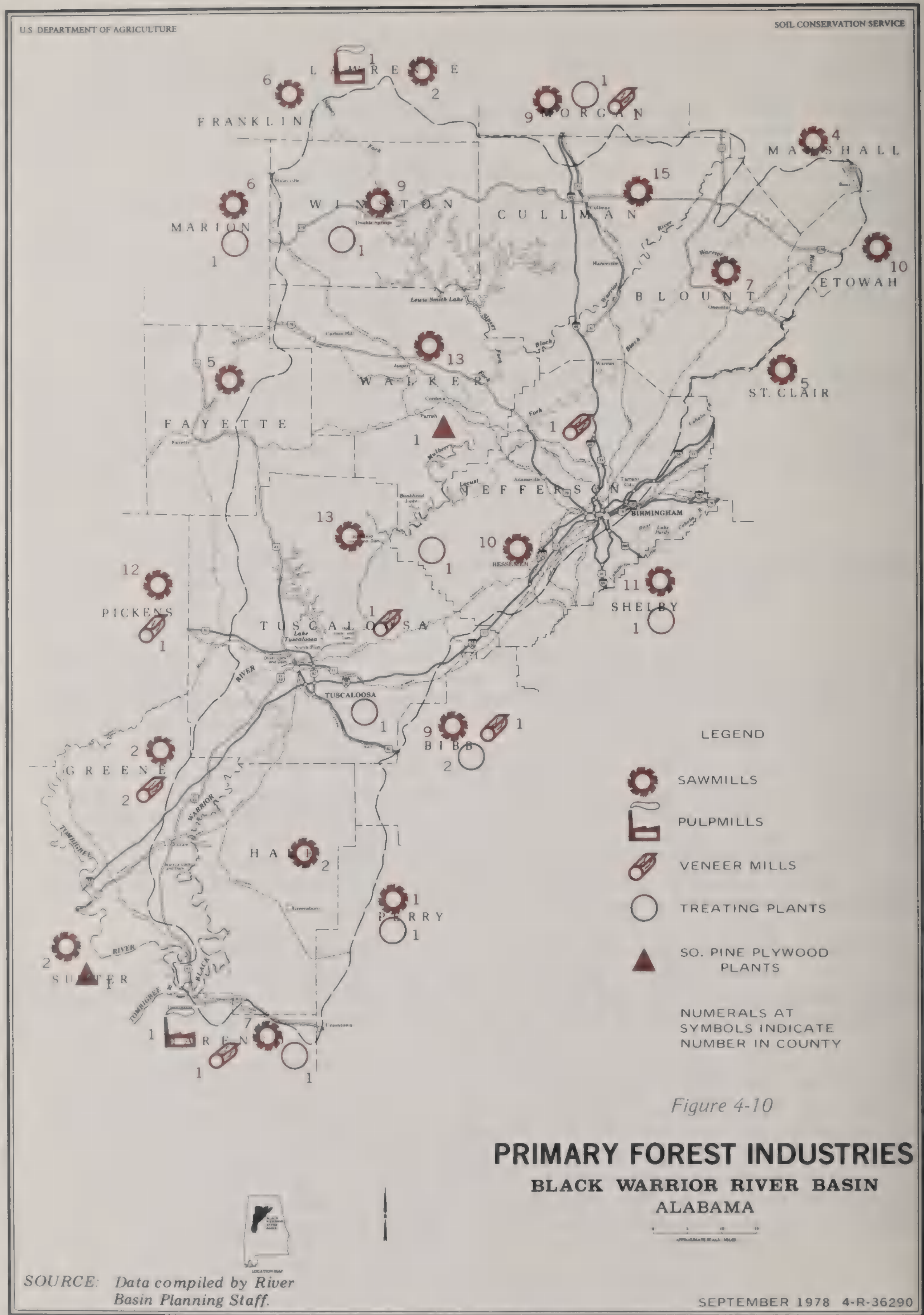


Figure 4-10

PRIMARY FOREST INDUSTRIES

BLACK WARRIOR RIVER BASIN

ALABAMA

USDA-SCS FORT WORTH TEXAS 1978

REVISED AUGUST 1978 BASE 4-R-35608

Table 4-15 - Estimated employment and earnings in forest product industries and all manufacturing, Black Warrior River Basin, 1972.

Industry	Employees	Payroll	Average annual wage
	1000	Million	Dollars
All manufacturing	76.9	623.4	8,106
Lumber & wood products	6.2	39.0	6,291
Wood furniture & fixtures	.9	3.8	4,200
Paper & allied products	2.2	17.5	7,962
Total forest products	9.2	59.8	6,500
Forest products as % of all manufacturing	12	10	10

Source: Unpublished data, Bureau of Census

Table 4-16 shows that forest products industries in the basin produced $109.6 million in value added in 1972, about 9 percent of the value added by all manufacturing. New capital expenditures reached $6.2 million for the forest products industry.

Table 4-16 - Estimated value added and new capital expenditures in all manufacturing and forest products industries, Black Warrior River Basin, 1972.

	Number of establishments	Value added	New capital expenditures
	No.	---Million dollars---	
All manufacturing	1,026	1,188.8	87.3
Lumber & wood products	192	74.0	4.4
Wood furniture & fixtures	26	8.9	0.3
Paper & allied products	15	26.7	1.6
Total forest products	233	109.6	6.2
Forest products industries as % of all manufacturing	23%	9%	7%

Source: Unpublished data, Bureau of Census

Forest Production and Utilization--

Sawlogs are the most important timber product, in proportion to total roundwood production, accounting for nearly 50 percent of the volume. Pulpwood is next in importance with a 40 percent share of roundwood production followed by veneer logs with 8 percent (table 4-17).

Seventy-four percent of total roundwood produced in the basin was derived from softwood species--mainly loblolly pine. Softwood supplied 67 percent of the sawlogs, 79 percent of the veneer logs, 81 percent of the pulpwood and 62 percent of all other products.

Table 4-17 - Estimated removals of roundwood products from growing stock by species group, Black Warrior River Basin, 1971.

	All species	Softwood	Hardwood
	Thousand cubic feet		
Product			
Sawlogs	35,932	24,180	11,752
Veneer logs	5,718	4,547	1,171
Pulpwood	29,631	24,045	5,586
All other	2,304	1,420	884
Total roundwood products	73,585	54,192	19,393
Logging residues	3,596	1,868	1,728
Cultural operations	2,719	940	1,779
Total removals from growing stock	79,900	57,000	22,900
% removed as products	92%	95%	85%

Source: USDA Forest Service, Southern Forest Experiment Station, Forest Statistics for Alabama Counties, 1973.

Ninety-two percent of the total removals from growing stock were utilized for timber products, mostly sawlogs and pulpwood. Logging residues and miscellaneous removals resulting from land clearing and other cultural operations amounted to 8 percent of the total removals. Utilization of growing stock was best for softwood species, with 95 percent of growing stock removals leaving the woods as roundwood products. In comparison, growing stock utilization was only 85 percent for hardwoods. Most of the removals from growing stock which are not utilized are currently unmarketable and remain in the woods as logging residue. Ninety-three percent of the roundwood produced in the basin in 1971 was derived from growing stock trees. The remainder was supplied by the salvable dead and the rough and rotten stand components, and from logging residues and other miscellaneous sources.

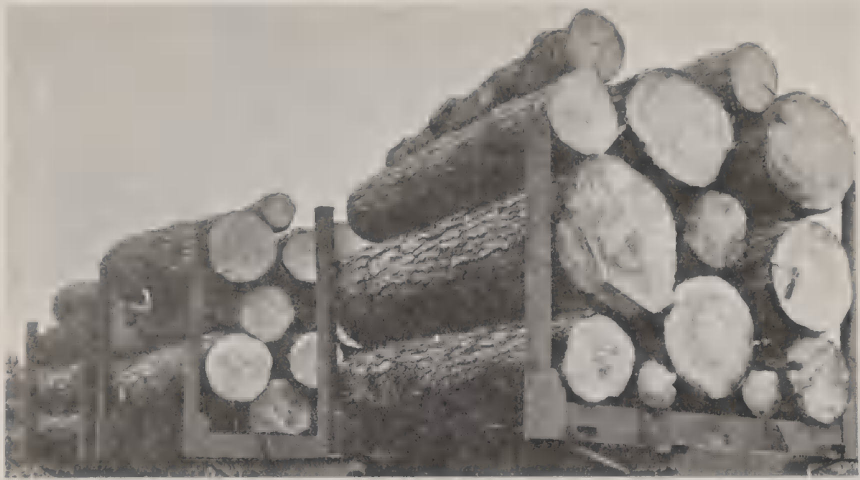
Harvest from the land may be as diverse as . . .

hay,

beef,

or timber.

Income and employment is realized from . . .



logging operations,

produce shipping,

and crop production.

CHAPTER 5

PROJECTIONS, PROBLEMS, AND NEEDS

PROJECTIONS

Introduction

This chapter discusses projected economic activity and land use for Alabama, the Black Warrior River Basin, and counties contingent to the Black Warrior Basin. Included are projections of population, personal income, employment, agricultural land use and output, timber production, mining, erosion and sedimentation, and water needs. The projections are for 1990, 2000, and 2020. Estimates for the state and basin are presented in the text of the report, while projections for individual counties are shown in appendix tables 11A through 11J. Estimates for the mining sector were prepared by the Geological Survey of Alabama.

Economic projections are based on the Census Bureau's 1972 Series E estimates for Alabama. This set of projections is utilized by the OSPFP for state planning purposes. A discussion of the assumptions underlying National OBERS analyses is presented in appendix 12.

Agricultural projections were developed utilizing a linear programming model for the state developed by the U. S. Department of Agriculture (see appendix 14). Adjustments were made as necessary to obtain a set of projections indicating the most likely course of events without accelerated agricultural development.

These projections are presented as baseline or reference series for the analysis of resource demands and development needs, and for evaluation of the costs, benefits, and impacts of development projects. They are in no way intended to restrict planning groups from full consideration of alternative patterns of economic growth.

In addition to the data presented in this report and appendix, the ESS, SCS, and FS have other materials which were generated in the measurement and projection of regional economic growth. These file data are available upon request. Attention is also called to a separate economic base report with projections for whole counties comprising the Black Warrior Study Area.[1/]

Population

Moderate population gains are projected for Alabama and the Warrior Basin between 1975 and 2020. The annual rate of population gain is expected to be slightly less than that forecast for the U. S.

Alabama is expected to gain one million residents over the next 45 years, reaching a population of about 4.1 million by 1990 and 4.65 million by 2020 (table 5-1). If the state was to grow at a rate comparable to the U. S.,

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1/ op. cit., page 4-1.

population would have to reach 4.2 million and 5.0 million persons in the two time periods.

Table 5-1 indicates that the basin will retain about 23 percent of the state's population through 2020, approaching a population of 1,150,000 (figure 5-1). The 283,000 additional residents represent a 33 percent increase over 1975, compared to a state increase of 31 percent.

Table 5-1 - Population projections, Black Warrior River Basin and Alabama, 1975 to 2020.

Year	Alabama	Black Warrior River Basin				
		Total population	Percent of state	Rural	Urban	Percent urban
	Thou. persons	Thou. persons	Percent	Thou. persons	Thou. persons	Percent
1975	3,616	862	23.8	289	572	66
1980	3,767 1/	888	23.6	292	596	67
1990	4,124	943	22.9	296	647	69
2000	4,333	1,015	23.4	296	719	71
2010	4,550	1,080	23.7	301	779	72
2020	4,750	1,146	24.1	305	841	73

1/ Estimated - The preliminary estimate from the U.S. Census for 1980 is 3,864.

Source: Water Resources Council OBERS Projections, Volume 4, Economic Activity By States, Series E, 1972.

SOURCE: Projections: Economic Activity in Alabama (OBERS) Series E.

Figure 5-1

POPULATION PROJECTIONS FOR ALABAMA AND THE BLACK WARRIOR RIVER BASIN

Almost all of the increase is projected for urban areas, however, "rurban" development, i.e., growth in the rural-urban fringe areas surrounding major cities can be expected to increase sharply, barring extreme fuel price increases. This is evident in table 5-2 where Walker, Blount, Tuscaloosa, and Cullman Counties, all adjacent to Jefferson County (Birmingham) are projected to have rapid growth in the next 15 years. Much of this projected growth could and probably will occur on prime agricultural land.

Table 5-2 - County growth rates, 1975 to 1990, Black Warrior River Basin.

Increasing population Co.	Percent increase 1975-1990 Percent	Declining population Co.	Percent decline 1975-1990 Percent
Blount	31	Hale	-7
Winston	27	Marengo	-6
Marshall	25	Greene	-5
Cullman	24	Perry	-2
Walker	23	Fayette	-1
Tuscaloosa	20		
Jefferson	6		
Etowah	3		
Bibb	3		
Alabama	14		

Source: Derived from OBERS estimates.

Employment

The employment projections by industry presented in table 5-3 were derived from data in the OBERS Series E report for economic areas of Alabama. A more extensive treatise supporting estimates can be found in the base report for the Black Warrior River Study Area referenced earlier.

A healthy employment picture is forecast throughout the projection period. It is anticipated that increasing numbers of women will continue to enter the labor market pushing the employment/population ratio to around 48 percent by the turn of the century. Unemployment rates should continue to fluctuate between 5 to 7 percent as a result of the increased female labor force.

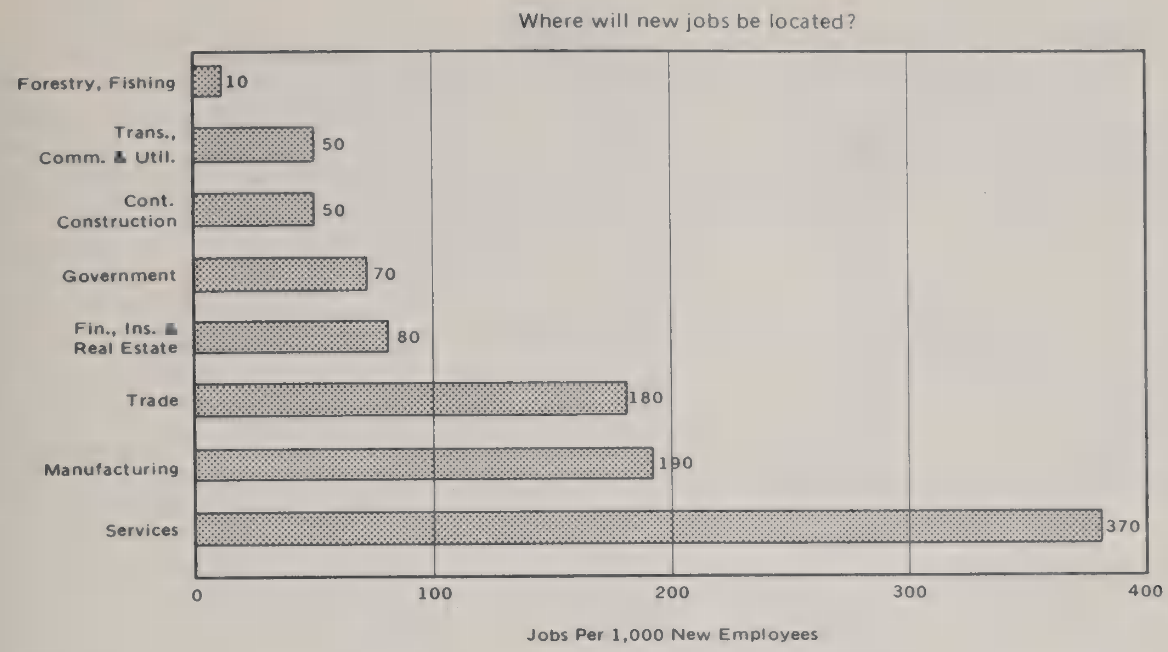
Table 5-3 - Projected employment by industry, Black Warrior River Basin, 1978 to 2020.

Industry	1978	1990	2000	2020
	Employees			
Basic or Export				
Agriculture, Forestry & fishing	5,950	4,700	4,000	3,000
Mining	10,300	9,300	8,900	8,400
Manufacturing	90,400	94,500	98,600	100,700
TOTAL BASIC	106,650	108,500	111,500	112,100
Service				
Contract construction	22,500	26,100	30,400	33,700
Trans., communication, & utilities	25,400	27,400	29,600	33,300
Wholesale & retail trade	87,900	96,300	101,000	101,200
Finance, ins., real estate	22,800	29,100	33,000	38,000
Services	113,000	137,800	161,500	198,900
Gov't	16,750	17,800	20,000	21,800
TOTAL SERVICE	288,350	334,500	375,500	426,900
ALL EMPLOYMENT	395,000	443,000	487,000	539,000
Employment/population ratio	.45	.47	.48	.47

Source: Water Resources Council, OBERS Projections, Volume 2, Series E, 1972

Service, manufacturing, and trade industries should provide three-fourths of the new jobs anticipated during the 1975 to 1990 period, figure 5-2. Agricultural and mining employment will continue to decline. Mining employment in the basin peaked at 10,300 employees in 1978. The industry, however, predicts a gradual decline in employee numbers and an increase in coal output as larger more efficient mining companies assume control of small labor extensive mining operations. This transition is already occurring.

Employment in the basic or exporting industries is increasing but at a much slower rate than service employment. By 2020, the service sector will account for 79 percent of all employment, up from 73 percent in 1970.



SOURCE: U. S. Dept. of Commerce, OBERS Series E projections for selected areas of Alabama.

Figure 5-2

PROJECTED EMPLOYMENT GROWTH IN MAJOR JOB CATEGORIES 1975 - 1990

Income

In order to use projected income as a welfare measure, the real rather than nominal or money income must be measured. Real income, as shown in table 5-4, removes the effect of inflation and measures the true purchasing power of the money supply in terms of constant dollars.

Real per capita income in the Warrior Basin is expected to increase by almost 50 percent between 1975 and 1990 (table 5-4). This would be in line with real increases experienced during the past 10 to 25 years. Basin per capita income will continue to be 10 to 12 percent higher than the state as a whole (figure 5-3).

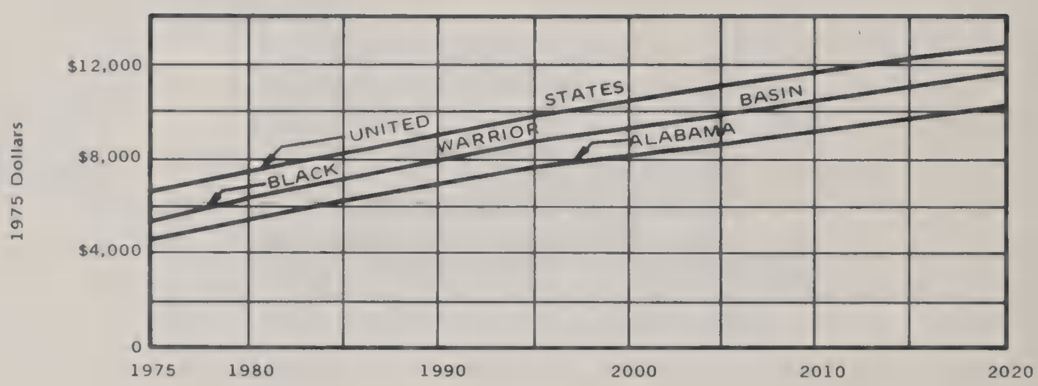
The rise in per capita income, coupled with a moderate population increase and expanding employment opportunities, should combine to double total personal income by the end of the century. The study area will continue to provide more than one-fourth of the state's personal income with Jefferson County generating 75 percent of the basin's total income.

Table 5-4 - Projected personal and per capita income, United States, Alabama and Black Warrior River Basin, 1975 to 2020.

Income[1/]	Unit	1975	1990	2000	2020
Total personal:					
Black Warrior	Mil $	4,560	7,385	9,230	13,330
Alabama	Mil $	16,799	28,500	34,830	48,640
U.S.	Bil $	1,320	2,228	2,715	3,700
Per capita:					
Black Warrior	Dol.	5,289	7,830	9,100	11,630
Alabama	Dol.	4,648	6,970	8,130	10,460
U.S.	Dol.	6,195	9,054	10,290	12,450

1/ Expressed in 1975 dollars.

Source ESS, USDA



SOURCE: OBERS Series E projections.

Figure 5-3

PER CAPITA INCOME, U. S., ALABAMA AND THE BLACK WARRIOR RIVER BASIN 1975 - 2020

General Land Use

In 1975 91 percent of the basin was utilized for agricultural purposes (table 5-5). Over the next 15 years, urban and water developments are expected to claim 50,000 additional acres, reducing agriculture's share to 90 percent by 1990. By 2020, another 100,000 acres could be lost to non-agricultural uses, dropping the share in agriculture to 88 percent.

Even though planted acres have increased in recent years, total cropland acreage has declined steadily for several decades. A continuation of this trend is anticipated within the basin, however, improved pasture gains should offset cropland losses. Two-thirds of the build-up of urban and water areas is expected to come from forest land. Of the 145,000 acres projected to shift from forest to other uses by 2020, 95,000 acres are projected to be utilized for urban and water development purposes.

Table 5-5 - Projected land use, Black Warrior River Basin, 1990, 2000 and 2020.

Land Use	1975	1990	2000	2020
	Thou. acres			
Total cropland	527	465	448	413
Total pasture	338	429	434	445
Misc. agriculture	107	107	105	101
Forest land	2,694	2,615	2,593	2,550
Total agri. land	3,666	3,616	3,580	3,509
Urban & built up	264	307	338	400
Water area	77	84	89	98
Total area	4,007	4,007	4,007	4,007

Source: ESS, USDA, and Black Warrior Land Use Advisory Committee.

Agricultural Land Use and Production

Future agricultural development in Alabama and the Black Warrior Basin is examined in this section. Each is discussed separately. Two sets of projections-- a baseline and an OBERS comparison -- are presented for each of the two areas.

The initial set or selected baseline estimate, describes projected agricultural land use and production without accelerated water and related land resource development. In this scenerio future state acreage of major crops harvested was specified by a land use committee consisting of appropriate SCS personnel prior to programming analyses. Crop production was the primary variable subject to cost minimization constraints on the acres involved. A statement regarding the basis for the land use committee's baseline estimates is given in appendix 13.

The second alternative focuses on OBERS Series E' high export production levels rather than acreage. State production of major crops is maintained at the OBERS Series E' high export levels projected for Alabama in 1990 and 2020. Crop and pasture acreages are the primary variables, again subject to cost minimization. Both the baseline and OBERS projections maintain livestock and resulting pasture needs at OBERS levels. Resource limitations and potentials, i.e. land and water availability, management levels, technology, and costs and yields by soil groups are assumed to be the same in both analyses.

A statewide-least cost linear programming model was used to estimate total land requirements, land use shifts, and costs and returns for both the selected baseline and OBERS Series E' scenerios. The model is discussed in appendix 14. Neither set of projections is intended to be a goal or constraint of any type. The use of OBERS estimates is intended for comparative purposes only.

Projections for the State--

Selected Baseline Estimate: Several indicators point to a continued increase in cropland harvested throughout the projection period (table 5-6). Worldwide damand for soybeans is increasing. Alabama farmers have adjusted their operations drastically in recent years to meet this demand. Completion of the Tennessee-Tombigbee Waterway and expansion of grain handling and export facilities through the Port of Mobile will certainly strengthen the competitive advantage of the state's farmers and lead to increased production of grain and oil crops. A portion of this increase will come from the Black Warrior Basin. The USDA land use committee chose to stabilize corn, cotton, and peanuts at near 1990 acreage levels through 2020, feeling that the expansion of soybeans would force a ceiling on other crops. Cotton acreage was arbitrarily held to a minimum of 400,000 acres over the long run, since it was felt that the state's cotton industry could not effectively operate with less than 400,000 acres harvested.

Beef production is projected to double by 2020 (table 5-7). With 60 percent of all beef coming from grazing, an additional 400,000 acres of pasture will be needed by 1990 to maintain anticipated herd size.

Much attention is being given statewide to improving farm management skills, particularly with the farmer facing a severe cost-price squeeze. The feeling is that management will continue to improve, as will technology and research efforts, resulting in increased yields even without accelerated water resource development.

OBERS Comparison: State baseline comparisons to OBERS projections are shown in tables 5-6 and 5-7. The differences are striking, particularly in 1990 crop acreage and production. For example, baseline estimates for 1990 would use 164 percent of the OBERS level of cropland. Major crop acreages are expected to be considerably higher than OBERS estimates and total land devoted to agriculture would exceed OBERS by about 2.2 million acres.

Recent experience, however, supports the higher acreage expectations. Total land in production has risen more than a million acres during the 1970's. Soybean production is increasing at the rate of 5 to 10 million bushels per

Table 5-6 - Agricultural land use Alabama, 1960 to 1978 with projections to 1990 and 2020.

Land Use	Average 1960-65	Average 1970-75	Average 1977-78	1990 Selected baseline	1990 OBERS E' high export	1990 Baseline as a % of OBERS	2020 Selected baseline	2020 OBERS E' high export	2020 Baseline as a % of OBERS
	Thousand acres					Percent	Thousand acres		Percent
Cropland harvested:	3,309	3,046	3,811	4,340	2,646	164	4,710	2,985	158
Corn	1,212	604	530	850	464	183	850	530	160
Cotton	856	523	358	430	242	178	400	100	400
Peanuts	191	198	215	215	176	122	215	145	148
Soybeans	182	868	1,775	2,000	1,268	158	2,500	1,750	143
Wheat	50	99	78	130	146	89	160	140	114
Hay	545	555	640	500	200	250	380	150	253
Minor crops	273	199	215	215	150	143	205	170	121
Associated cropland 1/	230	244	330	470	300	157	515	345	149
Pasture grazed:	3,000	3,490	3,600	4,045	3,726	109	4,010	3,913	102
Improved	1,030	2,015	2,400	3,075	3,100	99	3,565	3,510	
Unimproved	1,970	1,475	1,200	970	626	155	445	703	
Total acres utilized in production:	6,539	6,780	7,741	8,855	6,672	133	9,235	7,243	128
Cropland	3,539	3,290	4,141	4,810	2,946	163	5,225	3,330	157
Pasture	3,000	3,490	3,600	4,045	3,726	109	4,010	3,913	102

Source: Alabama Agricultural Statistics, 1960 to 1978, and projections by appropriate USDA personnel.

1/ Crop failure and acreage utilized for water disposal, i.e., waterways, diversions, field borders, and terrace channels.

Table 5-7 - Agricultural production, Alabama, 1960 to 1978 with projections to 1990 and 2020.

		Average production			1990			2020		
Commodity	Unit	1960-65	1970-75	1977-78	Projected baseline	OBERS E' high export	Baseline as a % of OBERS	Projected baseline	OBERS E' high export	Baseline as a % of OBERS
	Thou.						Percent			Percent
Major crops:										
Corn	Bu.	39,500	39,500	19,030	60,100	32,500	185	84,000	50,500	166
Cotton	Bales1/	780	500	283	528	300	176	675	171	395
Peanuts	Lbs.	220,000	415,000	576,000	633,000	530,000	119	940,000	650,000	145
Soybeans	Bu.	4,000	19,900	38,200	58,600	38,500	152	84,000	61,000	138
Wheat	Bu.	1,240	2,440	2,100	4,750	5,400	88	7,200	6,400	112
Hay	Tons.	700	970	1,025	2,090	850	246	1,900	870	218
Livestock:										
Beef & veal:	Lbs.	480,000	620,000	735,000	1,050,000	1,050,000	100	1,540,000	1,540,000	100
From grazing	Lbs.	290,000	370,000	445,000	635,000	635,000	100	950,000	950,000	100
Pork	Lbs.	250,000	295,000	235,000	315,000	315,000	100	343,000	343,000	100
Milk	Lbs.	875,000	775,000	680,000	600,000	457,000	131	600,000	226,000	266
Broilers	Lbs.	750,000	1,400,000	1,590,000	2,425,000	2,425,000	100	3,600,000	3,600,000	100
Eggs	Doz.	155,000	240,000	275,000	345,000	345,000	100	490,000	490,000	100

1/ 480 pound bales

Source: Alabama Agricultural Statistics, 1960 to 1978, and projections by appropriate USDA personnel.

year, and in 1978 the 43 million bushel crop exceeded the 1990 OBERS estimate for the state. Likewise, peanut and hay crops are increasing and currently exceed 1990 OBERS levels. Cotton is the only crop exhibiting a steady decline in line with the OBERS projections.

Projections for the Basin--

Selected baseline estimate: Moderate gains in cropland harvested can be expected through 1990 with corn and soybeans providing most of the increase (table 5-8).

Gains in the basin are not expected to keep pace with the remainder of the state. Consequently, the 307,000 acres projected to be harvested in 1990 represent only 7 percent of the state acreage, down from 8 percent in 1977-78. A further reduction to 6 percent is forecast for 2020.

An additional 60,000 acres will be utilized for grazing by 1990, pushing total pasture to near 400,000 acres. Pasture needs increase only slightly beyond 1990.

Overall, the basin will utilize 100,000 additional acres for agricultural purposes over the next 20 to 40 years (figure 5-4). Roughly one-half of this land will result from woodland clearing; the remaining acreage will come from previously idle openland which can be expected to be only marginally productive.

Land shortages are not anticipated. In 1975, the basin contained 865,000 acres of openland, i.e., cropland and pasture. Of this amount, 650,000 acres were utilized, leaving 215,000 acres idle or fallow. By 1990, openland is projected to increase to 900,000 acres with 730,000 in production, leaving 170,000 acres idle.

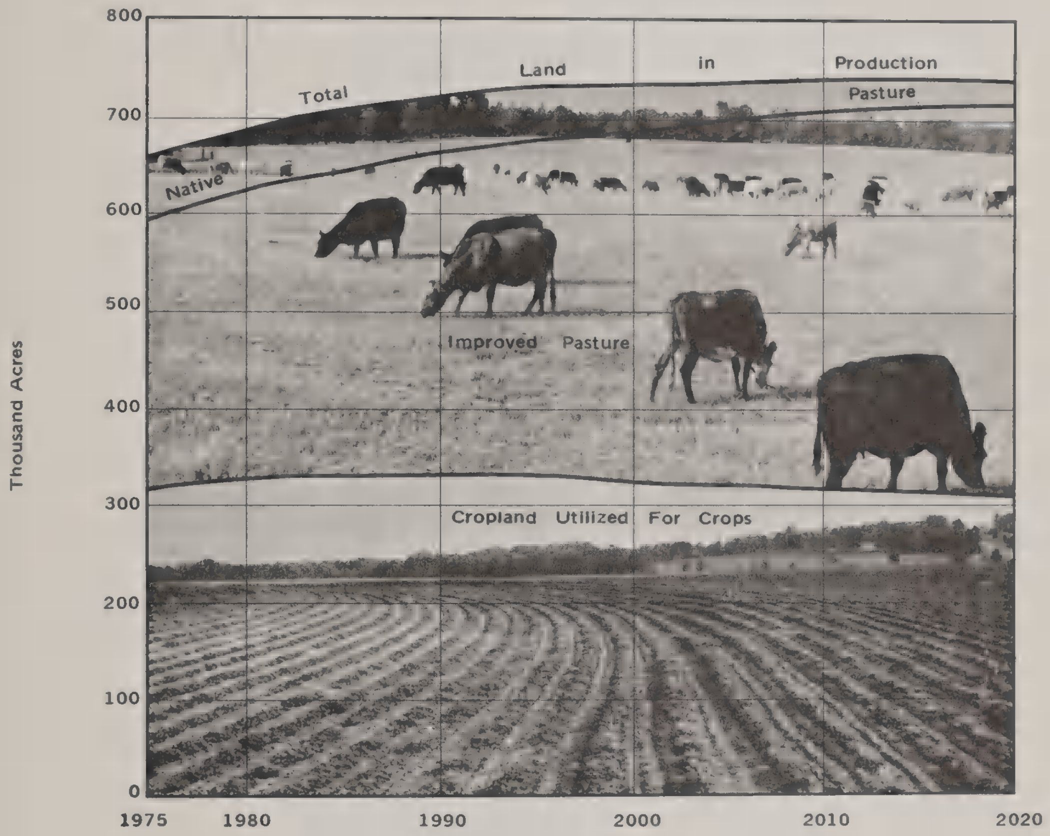
With the exception of cotton, production of all crops should be up substantially by 1990 (table 5-9). Crop receipts, which totaled $38.3 million in 1977 will double by 1990, yet still account for only 15 percent of all basin farm income. Poultry and poultry products are expected to continue to produce 75 percent of total farm income in the basin.

OBERS Comparison: As would be expected, baseline projections for the basin are much higher than levels anticipated using OBERS E'. Projected 1990 baseline cropland requirements would be about double the OBERS estimate of land needs (table 5-8). Baseline soybean acreage should reach 126,000 acres, cotton 17,000 acres, and corn 71,000 acres by 1990. Pasture should increase by about 60,000 acres, roughly double the rate associated with OBERS E'. The study indicates that 1990 baseline crop and pasture use should total 731,000 acres, about 211,000 acres more than would be utilized assuming about 70 percent of the land expected to be utilized under OBERS E' conditions. This difference would gradually diminish over time because of higher OBERS production levels and the increasing need to bring less productive agricultural land into production. By 2020 baseline land use would exceed OBERS by only 133,000 acres, roughly 22 percent, compared to 41 percent in 1990.

Table 5-8 - Agricultural land use, Black Warrior River Basin, 1975-77, with projections for 1990 and 2020.

Land Use	Average 1975-77	1990 Projected baseline	1990 OBERS E' high export	1990 Baseline as a % of OBERS	2020 Projected baseline	2020 OBERS E' high export	2020 Baseline as a % of OBERS
	acres	acres	acres	percent	acres	acres	Percent
Cropland harvested:	279,400	307,200	151,900	202	290,500	195,300	149
Corn	38,500	71,200	33,000	216	64,000	52,500	122
Cotton	27,200	17,100	11,100	154	12,000	6,400	188
Soybeans	110,000	126,000	73,000	173	147,000	107,000	137
Wheat	5,400	7,800	2,200	354	6,800	4,600	148
Hay	81,500	64,300	24,000	268	43,900	11,400	385
Minor crops	16,800	20,800	8,600	242	16,800	13,400	125
Associated cropland	25,300	31,500	15,600	202	26,400	17,800	148
Pasture grazed:	331,500	392,700	352,100	112	416,900	385,200	108
Improved	372,500	345,300	328,100	105	395,300	364,900	108
Unimproved	59,000	47,400	24,100	197	21,600	20,300	106
Total acres utilized in production:	636,200	731,400	519,600	141	733,800	598,300	123
Cropland	304,700	338,700	167,500	202	316,900	213,100	149
Pasture	331,500	392,700	352,100	112	416,900	385,200	108

Source: Alabama Agricultural Statistics, 1960 to 1978, and projections by appropriate USDA personnel.



SOURCE: ESS, USDA

Figure 5-4

CROPLAND AND PASTURE IN PRODUCTION, CURRENT AND PROJECTED WITHOUT ACCELERATED RESOURCE DEVELOPMENT, BLACK WARRIOR RIVER BASIN, 1975-2020

Table 5-9 - Agricultural production, Black Warrior River Basin, 1975-1977 with projections for 1990 and 2020.

Commodity	Unit	Average 1975-77	1990 Projected baseline	1990 OBERS E' high export	1990 Baseline as a % of OBERS	2020 Projected baseline	2020 OBERS E' high export	2020 Baseline as a % of OBERS
	Thou.				Percent			Percent
Major crops:								
Corn	Bu.	1,760	5,510	2,610	211	6,800	5,500	124
Cotton	Bales1/	21.0	21.2	13.8	154	20.4	10.9	187
Soybeans	Bu.	2,620	3,570	2,215	161	4,700	3,650	129
Wheat	Bu.	154	270	80	338	315	220	143
Hay	Tons	141	220	102	216	200	58	345
Livestock:								
Beef & veal:	Lbs.	83,000	98,500	108,000	91	157,000	161,000	98
From grazing	Lbs.	50,000	59,000	64,700	91	94,000	97,000	97
Pork	Lbs.	29,000	38,000	38,000	100	41,000	41,000	100
Milk	Lbs.	136,000	120,000	90,000	133	120,000	45,000	267
Broilers	Lbs.	472,000	725,000	725,000	100	1,080,000	1,080,000	100
Eggs	Doz.	90,000	115,000	115,000	100	160,000	160,000	100

1/ 480 pound bales

Source: Alabama Agricultural Statistics, 1960 to 1978, and projections by appropriate USDA personnel.

Projected yields associated with baseline production would average about 5 percent less than OBERS yields. This is because the lower OBERS E' production levels could be produced largely on capability class I-III cropland, while the projected baseline land use assumes that a substantial amount of class IV land would remain in production.

Gross income from crops and beef on pasture assuming 1978 prices should total about $76 million in 1990, 50 percent above OBERS E' as shown in table 5-10. Net returns would vary in about the same proportions. Crop receipts in 1990 are projected to exceed 1977 sales by about 50 percent.

Table 5-10 - Income and cost comparisons, baseline and OBERS E' scenerios, Black Warrior River Basin, 1990 and 2020.

Item 1/	1990 Baseline	1990 OBERS E'	2020 Baseline	2020 OBERS E'
	Million dollars			
Gross income:	76.0	50.7	97.8	74.8
Crops	55.5	30.6	65.3	44.5
Beef & veal	20.5	20.1	32.5	30.3
Production costs	46.6	30.2	60.8	44.3
Net returns	29.4	20.5	38.0	30.5

1/ 1978 dollars

Water Use Projections

Projected water use for the basin indicates that 11.2 billion gallons of water will be withdrawn for use by other than hydroelectric plants during 2020. Hydroelectric plants are projected to use 13.5 billion gallons per day by 2020.

A total of 24.7 billion gallons of water will be used per day in the Black Warrior River Basin by 2020. Including evaporation losses of 170 million gallons per day, this will result in the consumption of 686 million gallons of water per day in 2020 (table 5-11). Appendix 2D gives whole county projected water use data for nine counties included in the Black Warrior River Basin Study Area.

The public water supply in 1990 is projected to be 1.2 times the amount used in 1975 and 1.6 times that amount in 2020 (table 5-12). The projections use the 1975 and 1977 water use rates as a base coupled with basin population projections. The residential per capita use rate is assumed to increase 1.0 percent per year. Increased water use efficiencies and reuse should result in very little change in industrial and commercial per capita use patterns. Future sources of supply were estimated in cooperation with the Alabama Public Water Supply Division, Alabama Department of Public Health. The supply from impoundments, streams, wells, and purchase arrangements was considered.

Table 5-11 - Estimated residential and industrial water requirements in the Black Warrior River Basin for 1990 and 2020 (based on 33 percent of estimated state requirements by Peirce, 1972).

County	1990 Estimated withdrawal needs Resi-dential	1990 Estimated withdrawal needs Indus-trial*	1990 Estimated consump-tion Total	2020 Estimated withdrawal needs Resi-dential	2020 Estimated withdrawal needs Indus-trial*	2020 Estimated consump-tion Total	2020 Estimated available supply Total
	Million gallons per day						
Bibb	.1	0	.01	.2	0.1	.03	35
Blount	2.6	8.4	.8	6.3	20.7	1.9	515
Cullman	8.3	9.0	1.37	20.5	22.5	3.4	531
Etowah	.2	12.6	.8	.4	31.1	1.9	101
Fayette	1.3	5.3	.4	2.9	12.9	1.1	140
Franklin	0	0	0	0	0	0	1
Greene	.5	876.9	52.7	1.2	2,173.5	130.5	139
Hale	3.0	2.7	.5	7.2	6.4	1.1	492
Jefferson	122.0	334.7	32.28	301.5	831.7	80.1	623
Lawrence	.1	0	.01	.2	0	.02	119
Marengo	.3	4.7	.3	.9	11.7	.8	26
Marshall	1.4	2.7	.3	3.4	6.4	.7	76
Morgan	.1	.1	.02	.2	.1	.03	2.3
Perry	.8	1.2	.15	1.7	2.6	.3	89
Tuscaloosa	23.9	127.6	10.05	58.7	316.9	24.9	796
Walker	5.9	4,567.9	274.7	14.5	7,297.1	438.7	591
Winston	1.3	1.1	.2	2.9	2.6	.4	411
Total	171.8	5,954.3	374.59	421.7	10,736.3	685.88	4,637.3

*Includes themoelectric plant requirements for Greene and Walker Counties.

TABLE 5-12 - Public Water Supply Present and Projected Peak Use by Communities and Counties in the Black Warrior River Basin, 1990-2020

Communities Water System 1/	Source of Supply 2/ 1975	Maximum Capacity of Source of Supply 1975	Population Served 1975 1977*	Present Use 1975 MGD	PROJECTIONS 1990 Projected Use MGD	PROJECTIONS 2000 Projected Use MGD	PROJECTIONS 2020 Projected Use MGD	Future 2/ Source of Supply
County Systems								
Blount								
Allgood	3 - SP	0.26	800*	0.050	0.060	0.066	0.080	W-P
Blountsville	2 - W	0.936	2,000*	0.750	0.930	1.040	1.380	W
Cleveland	1 - W	0.65	1,200*	0.288	0.300	0.300	0.300	W
Hayden	2 - W	0.288	500*	0.050	0.100	0.140	0.270	P
Oneonta	1 - W, S-C		5,000*	0.832	0.940	1.020	1.200	S
Snead	2 - W	0.432	1,000*	0.250	0.300	0.340	0.450	W
Smokerise	2 - W	0.288	1,200*	0.120	0.240	0.340	0.780	W-P
Pine Bluff (Locust Fork)	1 - W	1.008	1,600*	0.160	0.310	0.430	0.970	W
Cullman								
Cullman	I	12.00	14,000*	7.00	7.650	8.840	11.830	S-I
Cullman Co.	P-Cullman		8,700*	0.750	1.000	1.170	2.700	P
East Cullman	P-Cullman		6,000*	0.330	0.450	0.580	0.920	P
Garden City	P-Cullman		870*	0.060	0.160	0.210	0.310	P
Hanceville	1-W, P-Cullman	0.10	2,009*	0.200	0.470	0.600	0.780	P
Johnson Crossing	P-Cullman		1,500*	0.100	0.130	0.160	0.220	P
Joppa-Hulaco	P-Arab		1,500*	0.100	0.130	0.160	0.220	P
Southland	P-Cullman		1,500*	0.100	0.130	0.160	0.220	P
VAW (Vinemont-West Point)	P-Cullman		6,000*	0.330	0.460	0.550	0.780	P
Walter	P-Cullman		700*	0.040	0.050	0.060	0.090	P

TABLE 5-12 (Continued)

Communities Water System 1/	Source of Supply 2/ 1975	Maximum Capacity of Source of Supply 1975	Population Served 1975 1977*	Present Use 1975 MGD	PROJECTIONS 1990 Projected Use MGD	PROJECTIONS 2000 Projected Use MGD	PROJECTIONS 2020 Projected Use MGD	Future 2/ Source of Supply
County Systems								
Etowah								
Altoona	3 - W		900	0.160	0.200	0.220	0.250	W
CREMS (WC)	P-Boaz		3,500*	0.110	0.200	0.240	0.340	P
New Union (WA)	P-Boaz		1,250*	0.050	0.070	0.090	0.120	P
Walnut Grove	1 - W		425*	0.050	0.060	0.070	0.080	W-P
Fayette								
Belk	1 - W, S		350	0.054	0.080	0.090	0.130	P
Berry	I		1,000	0.075	0.160	0.200	0.310	S-I
Fayette	S - C, R		5,000	1.200	1.580	1.820	2.490	S
Glen Allen	1 - W		286	0.020	0.030	0.040	0.060	W-P
Greene								
Eutaw	2 - W		2,800	1.040	1.270	1.400	1.660	W
Boligee	1 - W		650*	0.021	0.030	0.050	0.060	W
Forkland	1 - W		1,000*	0.025	0.040	0.060	0.080	W
Union	1 - W		400*	0.014	0.020	0.030	0.040	W
William McKinley Hts.	1 - W		1,900*	0.060	0.080	0.100	0.110	W
Hale								
Akron	1 - W		700	0.035	0.050	0.060	0.070	P
Greensboro	3 - W		3,500	1.500	1.880	2.110	2.610	W
Hale Co.	P-Greensboro		11,000	0.239	0.250	0.250	0.250	P
Moundville	2 - W		1,119	0.130	0.200	0.260	0.410	W

TABLE 5-12 (Continued)

Communities Water System 1/	Source of Supply 2/ 1975	Maximum Capacity of Source of Supply 1975	Population Served 1975 1977*	Present Use 1975 MGD	PROJECTIONS 1990 Projected Use MGD	2000 Projected Use MGD	2020 Projected Use MGD	Future 2/ Source of Supply
County Systems								
Jefferson								
Birmingham								
BWWB	3 - S - I	150.000	476,000	120.000	127.400	137.700	159.500	S
Brookside	P-BWWB		1,400*	0.157	0.174	0.203	0.255	P
Graysville	P-BWWB		3,400*	1.400	1.470	1.634	1.845	P
West Jefferson	P-Graysville		2,200*	0.173	0.207	0.240	0.324	P
Mulga	P-BWWB		7,100*	0.550	0.693	0.860	1.212	P
Bessemer	P-BWWB		88,000	10.812	11.830	14.000	17.600	P
Pleasant Grove	P-BWWB		5,574*	0.423	0.545	0.680	0.960	P
Flat Creek-Praco-Black Diamond								
Irondale	4-W	1.764	9,600*	2.100	2.530	3.120	3.640	P
Leeds	3 - S - W	3.000	12,000*	2.100	2.470	2.800	3.300	P
New Castle-Ketona	S - W							
Roupes Valley	2 - W	1.400	6,800*	0.700	0.825	0.936	1.120	P
Trussville	5 - W	4.000	9,000*	3.600	4.100	4.620	5.280	P
Argo	P-Trussville		2,000*	0.150	0.198	0.260	0.360	P
Warrior Water Works	R	0.580	4,000*	0.400	0.484	0.576	0.700	P
Warrior River	R	0.700	9,000*	0.600	0.900	1.100	1.440	P

BWWB - Birmingham Water Works Board System.

Communities Water System 1/	Source of Supply 2/ 1975	Maximum Capacity of Source of Supply 1975	Population Served 1975 1977*	Present Use 1975 MGD	1990 Projected Use MGD	2000 Projected Use MGD	2020 Projected Use MGD	Future 2/ Source of Supply
Marengo								
Demopolis	4 - W		8,500	0.800	0.800	0.800	0.800	W
Faunsdale	1 - W		100	0.012	0.012	0.012	0.012	W
Marshall								
Albertville	R-Tennessee		15,000*	(8.000) 5.600	9.750	11.680	16.800	S-R
Arab	2 - W - R, Tennessee		22,000	1.250	1.700	1.900	2.000	S-R
Boaz	P-Albertville		5,500	(1.500) 0.900	1.910	2.620	4.030	P
Douglas	P-Albertville		7,500	0.300	0.480	0.670	1.240	P

TABLE 5-12 (Continued)

Communities Water System 1/	Source of Supply 2/ 1975	Maximum Capacity of Source of Supply 1975	Population Served 1975 1977*	Present Use 1975 MGD	PROJECTIONS 1990 Projected Use MGD	PROJECTIONS 2000 Projected Use MGD	PROJECTIONS 2020 Projected Use MGD	Future 2/ Source of Supply
County Systems								
Perry								
Uniontown	3 - W		3,500	1.500	1.600	1.700	1.900	W
Tuscaloosa								
Brookwood	P-Tuscaloosa P-West Blocton	0.45	3,600*	0.222	0.340	0.400	0.520	P
Coaling	P-Tuscaloosa		1,200*	0.100	0.140	0.160	0.200	P
Coker	2 - W	0.288	1,468*	0.123	0.170	0.200	0.250	W-P
Englewood-Hull	P-Tuscaloosa		1,544*	0.085	0.130	0.150	0.200	P
Fosters-Ralph			1,470*	0.050	0.090	0.110	0.160	P
Mitchell	P-Tuscaloosa		4,000*	0.186	0.233	0.300	0.400	P
Northport	P-Tuscaloosa		14,000	1.009	1.640	2.150	3.580	P
Peterson	P-Tuscaloosa		900*	0.103	0.140	0.150	0.190	P
Tuscaloosa	4 - W - 3 - I		73,000*	(23.190) 21.000	27.000	31.620	42.570	S-I-W
Sand Springs	P-Northport		3,000	0.140	0.170	0.180	0.200	P
Walker								
Carbon Hill	2 - W		2,700	0.138	0.280	0.420	0.900	W
Cordova	P-Jasper		2,750	0.216	0.290	0.360	0.520	P
Cordova (South)	P-Cordova		400	0.028	0.060	0.080	0.140	P
Dora	P-Sumiton		2,516*	0.200	0.250	0.270	0.330	P
Jasper	S - R		17,996	(4.000) 3.400	4.340	5.290	7.480	S
Kansas	1 - W		375	0.024	0.050	0.070	0.140	W-P
Navoo	1 - W		800	0.050	0.090	0.130	0.250	P
Oakman	P-Jasper		875	0.080	0.130	0.170	0.280	P
Parrish	P-Jasper		7,080	0.600	0.900	1.200	2.00	P
Sipsey	S - R		4,587*	0.280	0.440	0.570	0.900	W-P
Sumiton	S - R		5,304*	0.800	1.310	1.850	3.650	W-P
Townley	1 - W		500	0.060	0.090	0.120	0.190	P

TABLE 5-12 (Continued)

Communities Water System 1/	Source Supply 2/ 1975	Maximum Capacity of Source of Supply 1975	Population Served 1975 1977*	Present Use 1975 MGD	PROJECTIONS 1990 Projected Use MGD	PROJECTIONS 2000 Projected Use MGD	PROJECTIONS 2020 Projected Use MGD	Future 2/ Source of Supply
County Systems								
Winston								
Addison	3 - W		1,300*	0.130	0.180	0.230	0.360	W
Arley	3 - W		1,300*	0.237	0.300	0.340	0.460	W
Double Springs	I-P-Haleyville		1,600*	0.250	0.300	0.340	0.440	P
Grayson	1 - W		100*	0.030	0.010	0.010	0.020	P
Haleyville	I-P-Bear Creek		6,800*	1.300	1.790	2.160	3.310	S-I-P
Lynn	1 - W		500*	0.090	0.120	0.130	0.160	W

1/ Information Division of Public Water Supplies, Environmental Health Administration, Alabama Department of Public Health
2/ Sp - Spring, 3-W - Number of Wells, S - Surface, R - River, C - Creek, I - Impoundment, P - Purchase

The sources of public water supplies are expected to remain at about the same ratio of ground to surface water. More study will be required to locate additional reservoir sites that can be developed to store surface water for areas where ground water supplies are inadequate. Generally, the problem area is limited to the portion of the basin north of Tuscaloosa. Table 3-4 shows withdrawal use of water by sources and principal use.

Total rural and agricultural water withdrawal in 1975 was estimated to be 22 million gallons per day (table 3-4). Irrigation, livestock, and catfish are expected to increase slightly in the future. Due to the fast rate of expansion in rural water systems, private domestic water use is projected to remain about the same.

There are no serious shortages of water for livestock and rural domestic purposes in the basin. The sources of water for livestock are generally streams and farm ponds. Water supply is limited only during an extended drought period. Wells are the normal source of water for rural domestic use with few cases of water shortages having been noted. These are generally caused by faulty pumping equipment or wells that are too shallow.

Forestry

Timber Production-- The total demand for roundwood products is projected to increase from an estimated 78 million cubic feet in 1975 to 194 million cubic feet by the year 2020, (table 5-13). The demand for round pulpwood is increasing at a faster rate than for other forest products and is expected to surpass the demand for saw and veneer logs and other forest products within a few years. Statewide, the pulp and paper industries have grown more rapidly than any other major industrial group.

Table 5-13 - Projected roundwood production, Black Warrior River Basin, 1960-2020 1/.

	1960	1970	1975	1980	1990	2000	2020
	Million cubic feet						
Total roundwood	44	67	78	104	128	145	194
Round pulpwood	16	31	37	50	65	78	119
Saw logs, veneer logs and other forest products	28	36	41	54	63	67	75

1/ Estimates based on OBERS projections for Alabama.

Supply and Demand-- The projected growth (supply) and removals (demand) for the basin's growing stock tree volume are displayed in table 5-14. At the present time, there is a surplus of growth over removals. This surplus was estimated at 85 million cubic feet in 1975. However, removals as a result of the growing demand for roundwood products are increasing faster than growth of the timber resource. Removals are expected to exceed annual growth shortly after the year 2000. This projected deficit, 30 million cubic feet by the year 2020, amount to nearly 12 cubic feet per acre averaged over the forest land base. The projections of growth and removals assume present management trends will continue into the foreseeable future.

Table 5-14 - Growth and Demand for softwood and hardwood growing stock, Black Warrior River Basin, 1960-2020.

	Year						
	1960	1970	1975	1980	1990	2000	2020
	Million cubic feet						
Growth	125	174	180	187	191	195	196
Softwood	99	116	118	120	120	120	117
Hardwood	26	58	62	67	71	75	79
Demand	48	80	95	136	167	187	226
Softwood	28	57	65	89	107	117	136
Hardwood	20	23	30	47	60	70	90

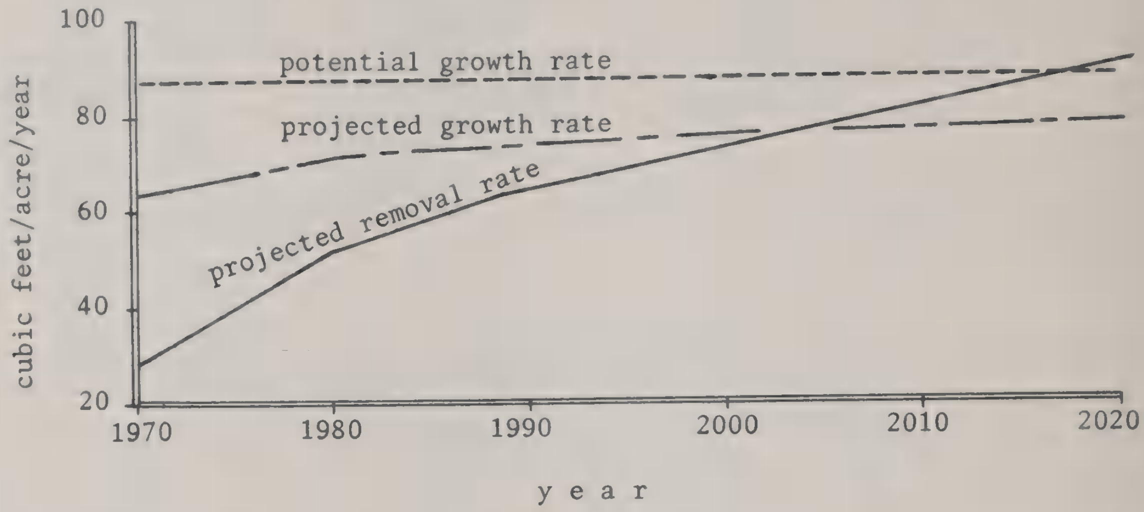
Source: USDA Forest Service, Southern Forest Experiment Station, Alabama Forests Trends and Prospects, 1973.

The situation is especially noteworthy where softwood species are concerned. While demand is expected to continue to increase significantly throughout the projection period, growth will begin to decline beyond the year 2020.

Demand for both hardwood and softwood products is expected to exceed the available supply soon after 2000, gradually forcing price levels upwards. As timber prices approach levels competitive with crop or livestock enterprises, additional land will be planted to trees, ultimately increasing timber supplies. Severe shortages and extreme prices could exist in the interim period, unless management acts to correct the problem between 1980 and 2000.

Growth Versus Removal-- Demands for timber are putting ever-increasing pressures on the basin's forest resource, figure 5-5. The growing stock growth rates have been increasing and will continue to do so but at a decreasing rate as the resource potential of 87 cubic feet per acre is approached. In 1975, the basin was producing about 67 cubic feet per acre annually or 77 percent of its potential. Growth rates under present management trends are expected to reach 73 and 77 cubic feet per acre per year respectively for the years 1990 and 2020. This projected increase in growth rates will help meet the projected demands for forest products from the basin. However, the effect of increased growth is somewhat offset by the expected declines in the commercial forest land base.

Figure 5-5 - Potential and projected growth rates and projected removal rates for growing stock, Black Warrior River Basin, 1970 - 2020.



The 1975 annual rate of removal, 35 cubic feet per acre, was 52 percent of the annual growth rate. Removals are expected to approach a rate of about 65 cubic feet per acre per year by 1990, representing about 85 percent of the growth rate. By the year 2020, projected growing stock removal rates of about 90 cubic feet per acre per year will not only exceed the projected growth rates, but will exceed the timber growing potential of the basin as well. This means that if present forestry trends continue, the commercial forest land would be unable to meet sustained demands even if every acre of forest land was producing at its potential, which is highly unlikely.

Forest Production Losses as a Result of Surface Mining-- Based on surface area disturbance projections for the study area, it is estimated that future levels of coal production will have a significant impact on the basin's forest growth potential (table 5-15). Most of the areas identified as having surface mining potential presently are supporting forest vegetation. Available information suggests that surface mining will result in an average three-year loss in forest productivity from the time surface mining activity begins until site rehabilitation is complete.

Table 5-15 - Total forest land out of production each year, Black Warrior River Basin, 1975 - 2020 1/

Projection period	Average area of forest land disturbed annually	Total forest land out of production each year	Annual loss of timber production
	------Acres-------	------Acres------	----Cubic feet---
1975-1990	3,930	11,800	840,000
1990-2020	6,630	19,900	1,497,500

1/ Assuming: Three-year clearing-mining-rehabilitation cycle, 85 percent of surface mined area is forest land, all disturbed forest land will be restored to forest vegetation without loss in productivity.

Source: Forest Service estimate.

A determination of the overall effect of surface mining on the basin's forest resources is beyond the scope of this study. Hence only general consequences of the severe land disturbances usually associated with surface mining can be speculated in table 5-15.

In the long term, it is likely that surface mining will result in a net loss of the total area of forest land as some of the reclaimed areas are converted to other uses such as pasture for livestock. It is also possible that forest soil productivity will be reduced in some areas and that revegetation efforts may not result in the reestablishment of well stocked stands of commercial quality trees.

Positive effects are also a possibility. Opportunities likely will occur to establish pine stands on sites previously occupied by low grade hardwoods prior to surface mining. Productivity potential of some poor sites may actually be improved following reclamation and the establishment of forest vegetation.

Future Mineral Production

The Black Warrior River Basin has sufficient reserves to meet future needs for clay, shale, sandstone, chalk, dolomite, red iron ore, limestone, and sand and gravel (figures 3-24 and 3-25). Only limited supplies can be expected from the small reserves of brown iron ore, manganese, and phosphate deposits.

The value of non-energy mineral production for the past few years in Alabama has increased rapidly (figure 5-6). This increase is apparently related to increased construction activity and rising energy costs. The Geological Survey of Alabama estimates that this trend will probably continue until the year 1985. The growth rate should then level out to approximately the same general trend as the increase from 1950 to 1970.

Construction materials, particularly those adjacent to population growth areas, will be in greater demand. Cement, lime, sand, gravel, clay, shale, and crushed stone will continue to be the primary construction materials. However, new applications and greater demand for expanded aggregate are expected.

Table 5-16 and appendix 15 give the projected tonnages and acres of disturbed land to be expected as a result of mining non-energy minerals from 1975 to 1990 and 1990 to 2020. Although for some commodities the acreage is large, most of the material will be mined from several widely scattered areas, and actual disturbed acreage for any one place will be relatively small.

Projections of coal mining activity shown in figure 3-27 indicate the areal distribution of probable areas to be strip-mined from 1975 to 1990 and 1990 to 2020. Table 5-17 gives the estimated production and probable amount of surface area to be disturbed during these periods.

The estimates for future strip-mine production are based on projections to the year 2000 of the cumulative change in annual production rates (tonnages) from 1966 through 1977. Beyond the year 2000, no annual increase in rate was applied because of anticipated competition of other energy sources with coal.

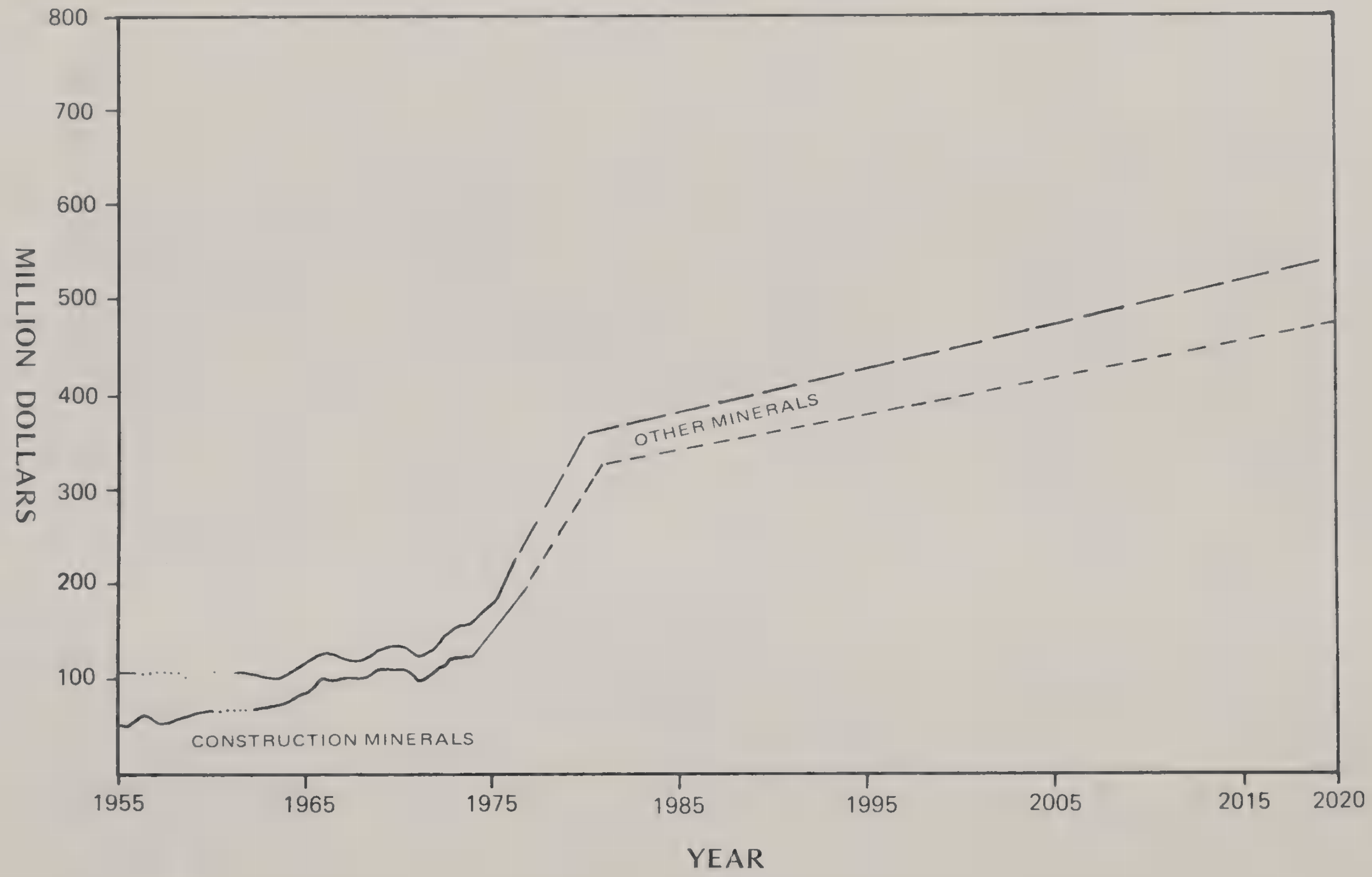


Figure 5-6

Value of raw mineral materials production, 1955-1977, with projection to 2020 (production values from U. S., Bureau of Mines Mineral Yearbook, 1955-1977).

Material prepared by Field Personnel — Reproduction only by SCS Cartographic Unit, Fort Worth, Texas.

Table 5-16 - Estimated non-energy mineral production and disturbed acreage in the Black Warrior River Basin by county and mineral for the periods 1975-90 and 1990-2020.

County and commodity	1975-90 Tonnage	1975-90 Disturbed acreage	1990-2020 Tonnage	1990-2020 Disturbed acreage
	Thou. tons	Acres	Thou. tons	Acres
Jefferson				
Clay & shale	10,000	100	24,000	500
Sand & gravel	890	50	3,800	230
Limestone aggregate	120,000	1,200	505,000	5,000
cement	16,000	160	70,000	700
Blount				
Sand & gravel	2,500	150	9,900	600
Dimension sandstone	18	1	80	4.5
Walker				
Clay & shale	130	*	300	*
Tuscaloosa				
Sand & gravel	5,000	330	20,000	1,200
Clay	5,000	125	30,000	3,000
Greene				
Sand & gravel	700	40	3,000	160
Hale				
Sand & gravel	500	45	2,000	120

*To be mined in conjunction with coal mining. No new disturbed acreage.

Source: Alabama Geological Survey

Table 5-17 - Estimated coal production and probable area to be disturbed by surface mining in each of the eight coal-producing counties of the Black Warrior River Basin for the periods 1975-1990 and 1990-2020.

County	Estimated production 1975-1990	Estimated production 1990-2020	Probable surface area to be disturbed 1975-1990	Probable surface area to be disturbed 1990-2020
	---Million tons-----		----Square mi.--------	
Blount	16.8	52.5	9.7	30.4
Cullman	19.3	66.6	10.1	34.8
Etowah	.05	0	.03	0
Fayette	6.2	17.2	3.5	10.9
Jefferson	74.6	240.6	25.9	83.5
Tuscaloosa	61.0	205.7	26.3	89.2
Walker	87.9	277.3	41.6	131.3
Winston	20.6	67.7	11.9	39.2

Source: Alabama Geological Survey

In computing the area that will probably be disturbed, an average thickness of strippable coal for each county was estimated and a tons-per-square mile factor was obtained. This factor was divided into the estimated production values for each county. Underground mining will generally produce only relatively insignificant areas of disturbance at the surface. Therefore, no estimated production rates or probable areal extent of future underground mining has been made for this report.

PROBLEMS AND NEEDS

Floodwater Damage

Basin floodwater damages, mostly urban, are projected to increase in the future. The increase in damages is expected to result primarily from inflated damageable values of major fixed improvements in urban areas. The increase in agricultural damages will come primarily from the increase in quality and associated value of agricultural products produced rather than from extensive land use changes. Damaging floods occur almost every year in urban areas throughout the basin, however, most damages occur in Birmingham and Tuscaloosa. Agricultural damages are most severe in Hale and Tuscaloosa Counties.

Flooding in the Black Warrior River Basin often damages

roads and bridges,

pastures and forests,

and crops.

Flooding results in . . .

damage to fixed improvements,

hazard to life and property,

and disruption of commerce.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

NOTE: This map is suitable for broad planning purposes only. For more detailed information, contact your Soil Conservation Service Field Office.

Figure 5-7

GENERAL FLOOD PRONE AREAS
BLACK WARRIOR RIVER BASIN STUDY AREA
ALABAMA

APPROXIMATE SCALE - MILES

SOURCE: Data compiled by SCS River Basin Planning Staff.

AUGUST 1978 4-R-36284

USDA—SCS—FORT WORTH TEXAS 1979

REVISED AUGUST 1978 BASE 4-R-35608

INDEX OF WATER RESOURCE DEVELOPMENT PROJECTS

Municipal and Industrial Water Supply Reservoirs

- △1 Lake Catoma (Cullman)
- △2 Lake George (Cullman)
- △3 Inland Lake (Birmingham)
- △4 Lake Purdy (Birmingham)
- △5 Lake Tuscaloosa (Tuscaloosa)
- △6 Lake Nicol (Tuscaloosa)
- △7 Harris Lake (Tuscaloosa)

U. S. Army Corps of Engineers Projects

- (1) Gainesville Lock and Dam
- (2) Warrior Lock and Dam
- (3) William Bacon Oliver Lock and Dam
- (4) Holt Lock and Dam
- (5) John Hollis Bankhead Lock and Dam

Soil Conservation Service

P. L. 566 Watershed Projects

- W-1 Big Prairie-French Creeks
- W-2 Bristow's Creek
- W-3 Canoe Creek
- W-4 Dodson-Langston Creeks
- W-5 Elliotts Creek
- W-6 Flint Creek
- W-7 Luxapallila Creek
- W-8 Mud Creek

Tombigbee RC&D Projects

- R-1 Greene County Recreation Area
- R-2 River Road Recreation Area
- R-3 Fayette City Lake (M&I Storage)

Alabama Department of Conservation & Natural Resources-- County Recreation Lakes

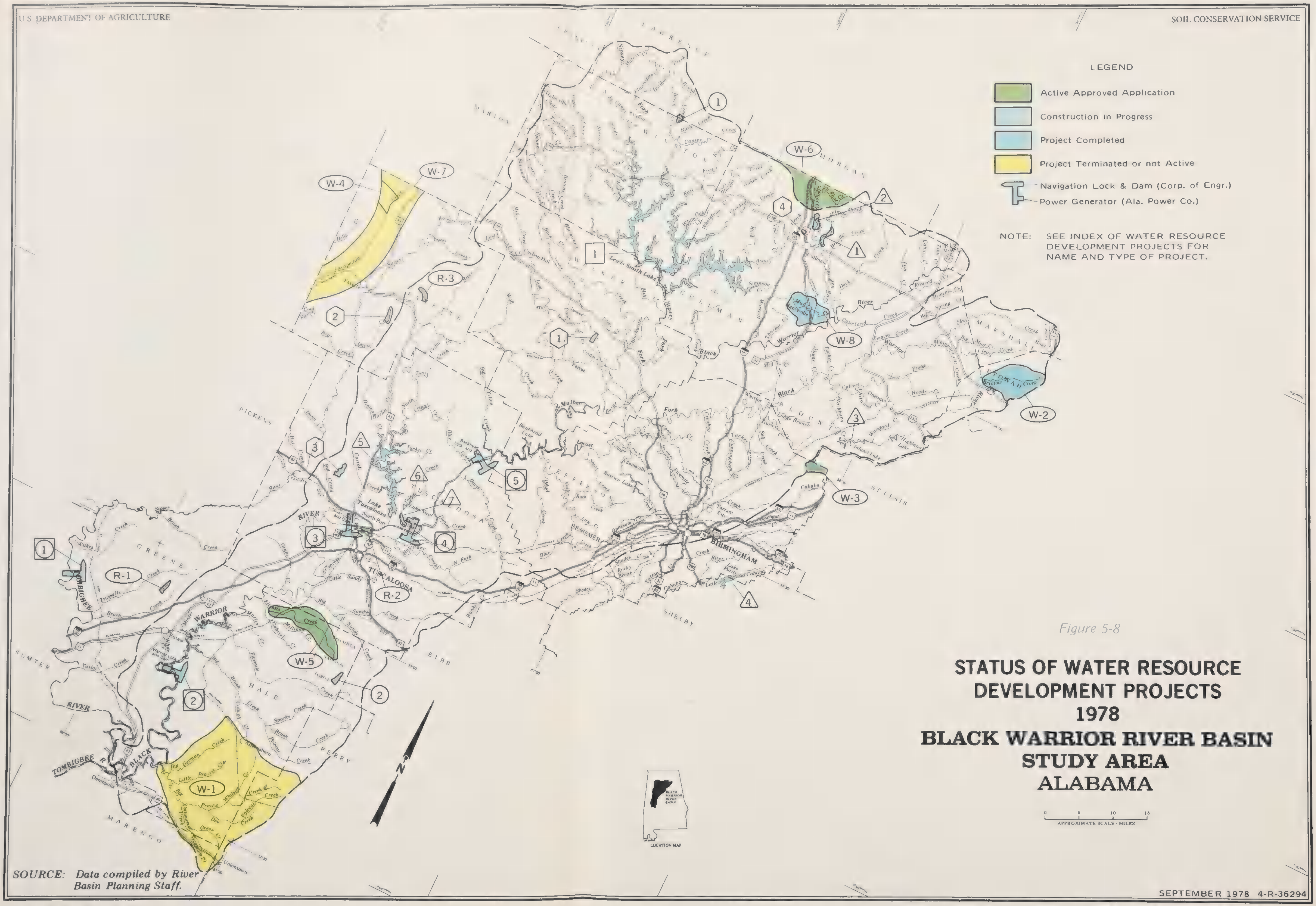
- 1 Walker County Lake
- 2 Fayette County Lake
- 3 Lake Lurleen (Tuscaloosa County)
- 4 Sportsman Lake (Owned by city of Cullman)

Alabama Power Company Project

- 1 Lewis M. Smith Lake and Power Dam

U. S. Forest Service Project

- (1) Brushy Lake
- (2) Payne Lake


U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LEGEND
Active Approved Application
Construction in Progress
Project Completed
Project Terminated or not Active
Navigation Lock & Dam (Corp. of Engr.)
Power Generator (Ala. Power Co.)
NOTE: SEE INDEX OF WATER RESOURCE DEVELOPMENT PROJECTS FOR NAME AND TYPE OF PROJECT.
W-1
W-2
W-3
W-4
W-5
W-6
W-7
W-8
R-1
R-2
R-3
Lewis Smith Lake
Lake Tuscaloosa
TUSCALOOSA
BIRMINGHAM
BESSEMER
Figure 5-8
STATUS OF WATER RESOURCE DEVELOPMENT PROJECTS
1978
BLACK WARRIOR RIVER BASIN STUDY AREA
ALABAMA
APPROXIMATE SCALE - MILES
LOCATION MAP
SOURCE: Data compiled by River Basin Planning Staff.
SEPTEMBER 1978 4-R-36294

Flood problems along the middle and lower reaches of the major streams are largely caused by comparatively infrequent general rains which cover large areas for prolonged periods of time. When such flood producing storms occur, they cause considerable urban and agricultural damages. On the tributaries, an average of about three to four floods occur annually.

The total flood plain in the basin area incurring damages is about 330,000 acres. The study assumes that this acreage will remain constant over time. Figure 5-7 shows general flood prone lands in the study area. Flood plain land use is shown in table 5-18 for each county in the basin. Annual flood damages for these counties are projected to increase from $1,076,000 in 1975 to $1,311,000 in 1990 and to $1,626,000 in 2020 (see table 5-19). These increased damages are based on projected increases in the value of urban properties and agricultural production for the years 1990 and 2020. Increased urban flood damages are based on increased real value of existing urban properties rather than future expansion into flood hazard areas. Rural floodwater damages based on agricultural production relate directly to the management of land used for crops and pasture and to a lesser degree to other rural values. Appendix 16 includes additional information on flood plain land use and damages by watersheds in 1975.

Some flood damages have been alleviated by structural and nonstructural measures included in water resource development projects within the basin. The status and location of these projects are shown in figure 5-8.

Sheet and Rill Erosion

Gross Erosion-- Acres of cropland and pastureland needing sheet and rill erosion control is shown in table 5-20. The magnitude of this problem is shown in table 5-21. In 1975, 80 percent of the cropland and 6 percent of the pastureland needed additional treatment measures to bring soil loss tolerance to an acceptable level for sustained productivity. A description of the methodology and assumptions supporting the analysis of erosion and treatment needs by county is shown in appendix 17. Whole county data are presented in appendix 17D. A more detailed accounting of the extent, location, and type of erosion treatment needed by county is presented in a seperate SCS report "Sheet and Rill Erosion, 1975, 1990, 2020 for Black Warrior River Basin and Nine Whole Counties Within the Basin Study Area", released in 1980.

It is projected that about 77 percent and 75 percent of the cropland will need conservation treatment to reduce sheet and rill erosion in 1990 and 2020 respectively. The 20 percent to 25 percent of the cropland shown in table 5-20 as needing only maintenance treatment may be more intensively cropped and still maintain soil loss at the acceptable "soil loss tolerance" ("T")*.

Projections in Table 5-21 indicate that 94 to 97 percent of the basin's pastureland will be treated for sheet and rill erosion to the acceptable soil loss tolerance by 1990. Soil resource group numbers 17, 22, 38, 44, 45, 49, 50 and 51 (appendix 14B) now in unimproved or idle pasture will make up the 3

* Soil loss tolerance ("T") is the estimated maximum average soil loss that can be tolerated and still achieve the degree of conservation needed for sustained, economical production in the foreseeable future. These rates are expressed in tons of soil loss per acre per year. Rates of 1 ton to 5 tons/acre are used in Alabama, depending upon soil properties, soil depth, and prior erosion.

Table 5-18 - Flood plain land use by counties, Black Warrior River Basin, 1975.

County	Flood plain location 1/	Flood plain land use: Cotton	Corn	Soybeans	Pasture	Other	Forest	Total flood plain
		Acres						
Bibb	Tributary	0	0	0	36	2	1,485	1,523
Blount	Tributary	38	175	590	2,736	220	7,276	11,035
	Riverine	27	0	111	1,247	38	5,123	6,546
Cullman	Tributary	0	0	0	2,955	48	5,747	8,750
	Riverine	0	0	0	1,390	0	2,629	4,019
Etowah	Tributary	0	0	105	1,266	12	1,796	3,179
	Riverine	0	0	0	550	0	1,844	2,394
Fayette	Tributary	38	162	900	801	155	3,892	5,948
Greene	Tributary	15	0	100	402	375	798	1,690
	Riverine	181	50	540	393	315	42,179	43,658
Hale	Tributary	0	80	3,625	6,389	523	8,313	18,930
	Riverine	268	698	4,114	5,537	723	45,386	56,726
Jefferson	Tributary	0	38	0	1,020	7,399	14,653	23,110
	Riverine	0	81	0	340	500	7,146	8,067
Lawrence	Tributary	0	0	9	61	0	771	841
	Riverine	0	0	0	0	0	60	60
Marengo	Tributary	0	0	554	1,347	136	333	2,370
	Riverine	158	0	291	151	122	1,048	1,770
Marshall	Tributary	0	0	0	338	0	1,170	1,558
	Riverine	0	0	0	0	0	28	28
Perry	Tributary	0	0	340	1,045	0	868	2,253
Tuscaloosa	Tributary	590	39	427	2,005	1,999	19,232	24,292
	Riverine	7,170	620	8,657	4,774	2,129	37,967	61,317
Walker	Tributary	0	476	0	2,506	764	21,813	25,559
	Riverine	0	607	0	188	235	6,517	7,547
Winston	Tributary	0	0	0	891	0	5,647	6,538
	Riverine	0	0	0	0	0	146	146
TOTAL	Tributary	681	970	6,650	24,158	11,323	93,794	137,576
	Riverine	7,804	2,056	13,713	11,570	4,062	153,073	192,278
GRAND TOTAL		8,485	3,026	20,363	38,728	15,385	243,867	329,854

Source: Soil Conservation Service estimates

Table 5-19 - Estimated annual flood damages by counties, present and projected, Black Warrior River Basin, 1975.

County	Years	Average annual flood damage				
		Crops	Pasture	Urban	Other indirect	Total
		Dollars				
Bibb	1975	0	140	0	20	160
	1990	0	170	0	30	200
	2020	0	210	0	40	250
Blount	1975	7,990	16,360	4,550	3,480	32,380
	1990	9,750	19,960	5,550	4,250	39,510
	2020	12,090	24,750	6,880	5,270	48,990
Cullman	1975	0	17,380	2,400	2,370	22,150
	1990	0	21,200	2,930	2,890	27,020
	2020	0	26,290	3,630	3,580	33,500
Etowah	1975	890	7,260	0	960	9,110
	1990	1,090	8,860	0	1,170	11,120
	2020	1,350	10,990	0	1,450	13,790
Fayette	1975	9,380	3,190	11,100	2,830	26,500
	1990	11,440	3,890	13,540	3,450	32,320
	2020	14,190	4,820	16,790	4,280	40,080
Greene	1975	7,530	3,180	3,000	1,640	15,350
	1990	9,190	3,880	3,660	2,000	18,730
	2020	11,400	4,810	4,540	2,480	23,230
Hale	1975	74,680	35,700	0	13,250	123,630
	1990	91,110	43,550	0	16,170	150,830
	2020	112,980	54,000	0	20,050	187,030
Jefferson	1975	1,010	19,390	334,850	43,030	398,280
	1990	1,230	23,660	408,520	52,500	485,910
	2020	1,520	29,340	506,560	65,100	602,520
Lawrence	1975	0	210	0	20	230
	1990	0	260	0	30	290
	2020	0	320	0	40	360
Marengo	1975	8,530	5,990	0	1,740	16,260
	1990	10,410	7,310	0	2,120	19,840
	2020	12,910	9,060	0	2,630	24,600

Table 5-19 - Estimated annual flood damages by counties, present and projected, Black Warrior River Basin, 1975. (Continued)

County	Years	Average annual flood damage				
		Crops	Pasture	Urban	Other indirect	Total
		Dollars				
Marshall	1975	0	1,450	0	190	1,640
	1990	0	1,770	0	230	2,000
	2020	0	2,190	0	280	2,470
Perry	1975	2,890	4,180	0	850	7,920
	1990	3,530	5,100	0	1,040	9,670
	2020	4,380	6,320	0	1,290	11,990
Tuscaloosa	1975	148,790	27,140	141,350	38,010	355,290
	1990	181,520	33,110	172,450	46,370	433,450
	2020	225,080	41,060	213,840	57,500	537,480
Walker	1975	9,070	10,710	35,350	6,620	61,750
	1990	11,060	13,070	43,130	8,080	75,340
	2020	13,710	16,210	53,480	10,020	93,420
Winston	1975	0	3,560	0	430	3,990
	1990	0	4,340	0	520	4,860
	2020	0	5,380	0	640	6,020
Grand total	1975	270,760	155,840	532,600	115,440	1,074,640
	1990	330,330	190,130	649,780	140,850	1,311,090
	2020	409,610	235,750	805,720	174,650	1,625,730

Source: Soil Conservation Service estimates.

Table 5-20 Estimated sheet and rill erosion reduction needs, cropland and pasture land Black Warrior River Basin 1975 - 2020 1/.

Use	Acres not treated to "T"	% not treated to "T"	Tons soil erosion -total annually	Tons soil erosion per acre annually	Tons allowable erosion annually	Tons allowable erosion per acre	Tons soil loss above "T" annually	Tons soil loss above "T" per acre
1975								
Cropland	423,100	80.0	5,334,800	12.6	1,330,800	3.2	4,003,900	9.4
Pasture land	20,200	6.0	184,200	9.1	33,100	1.6	151,000	7.5
1990								
Cropland	355,500	76.5	4,079,800	11.4	1,146,700	3.2	2,933,200	8.2
Pasture land	13,600	3.0	112,600	8.3	40,600	3.0	72,000	5.3
2020								
Cropland	309,900	75.0	3,434,600	11.1	929,800	3.0	2.504.800	8.1
Pasture land	27,100	6.0	125,600	4.6	60,800	2.2	64,800	2.4

Source: Data compiled by SCS River Basin Staff with assistance from field, area, and state staffs.

1/ The term "soil loss tolerance" "T" denotes the maximun level of soil erosion that will permit a high level of crop productivity to be sustained economically and indefinitely.

Table 5-21 - Estimated sheet and rill erosion on cropland and pasture land treated to "T" or below, Black Warrior River Basin, 1975 - 2020

Use	Acres treated to "T" or less	% treated to "T" or less	Tons soil erosion-total annually	Tons soil erosion per acre	Tons allowable erosion annually	Tons allowable erosion per acre	Tons soil saved below "T"	Tons soil saved below "T"-Ac
1975								
Cropland	103,500	20	215,600	2.08	455,200	4.40	239,500	2.32
Pasture land	317,800	94	130,100	0.41	1,082,400	3.41	952,300	3.00
1990								
Cropland	109,000	23	254,400	2.33	464,600	4.26	210,200	1.93
Pasture land	415,600	97	173,600	0.42	1,286,900	3.09	1,113,300	2.67
2020								
Cropland	102,900	25	249,400	2.40	426,500	4.20	187,100	1.80
Pasture land	417,900	94	131,000	0.31	1,314,100	3.14	1,183,100	2.83

Source: Data compiled by SCS River Basin Staff with assistance from field, area, and state staffs.

percent to 6 percent excessive sheet and rill erosion. Soil resource group 45 should be removed from crops and pasture and established to forest because of the excessive rate of sheet and rill erosion occurring on that land.

A forest land erosion inventory of the Black Warrior Basin was conducted by the USDA Forest Service during the summer of 1977. The erosion rates are relatively low when considering the entire forested area of the basin. The average surface erosion rate is 1.53 tons per acre per year, which gives an estimated erosion volume of 4.1 million tons of soil eroded per year (table 5-22).

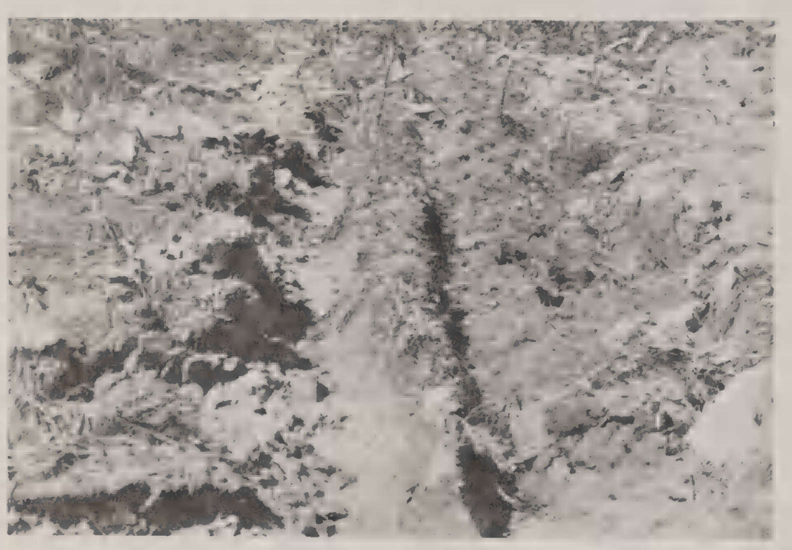
Table 5-22 - Annual on-site erosion commercial forest land, Black Warrior River Basin, 1975.

Source of erosion	Area	Erosion rate	Annual erosion
	1000 Acres	Tons/Acre/Year	1000 Tons
Undisturbed	2,385.9	0.06	148.9
Logging	85.2	0.22	19.0
Work roads	39.1	69.70	2,727.1
Skid trails	8.8	26.80	235.5
Fire	44.2	0.95	42.0
Grazing	90.5	4.24	384.0
Mechanical Site prep	41.0	13.90	570.1
Total	2,694.7	1.53	4,126.6

Source: USDA Forest Service, unpublished forest land erosion report, Black Warrior River Basin, 1978.

The highest erosion rates and the greatest amount of erosion losses are associated with the transportation system, work roads and skid trails, used to remove timber products from the harvest area and mechanical site preparation for timber regeneration. Collectively, these practices affected only a little over 3 percent of the basin's forest land in 1975, but they accounted for 86 percent of the total forest erosion. In contrast, undisturbed forest lands which are about 89 percent of the total forest lands, account for less than 4 percent of the total forest land erosion losses. Grazing disturbances occurred on about 3 percent of the forest land in the basin, but is blamed for over 9 percent of the erosion from the forest. Fire and logging are less serious causes of erosion, together disturbing about 5 percent of the total forest land area but producing less than 2 percent of the erosion losses (figure 5-9).

Poorly applied forest management practices, such as . . .



abusive logging operations,

or excessive site preparation for tree planting,

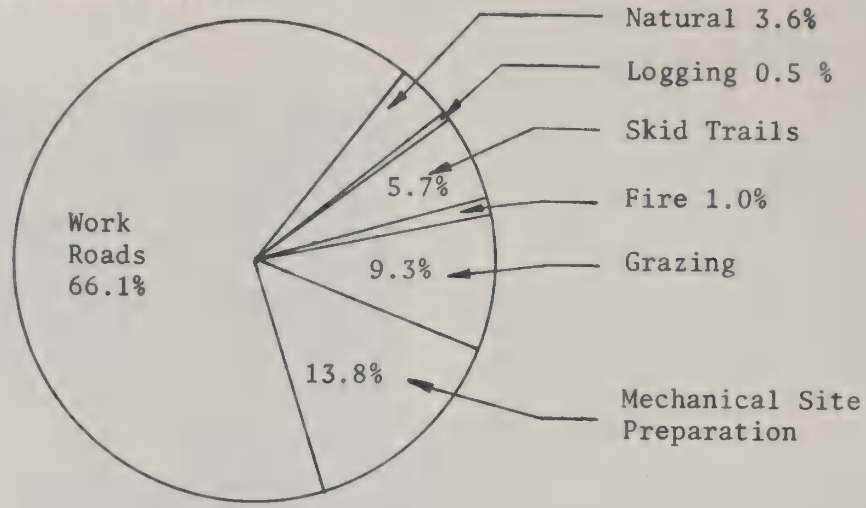
can result in . . .

soil erosion and
inadequate seedling
establishment,

gullied, unserviceable
logging roads,

and sediment deposits.

Figure 5-9 - Forest land erosion, percentage by source, Black Warrior River Basin, 1975.



Source: USDA Forest Service, unpublished forest land erosion report, Black Warrior River Basin, 1978.

In the Black Warrior River Basin, approximately 11.5 percent of the commercial forest land or about 308,800 acres had been disturbed by forest operations and were producing erosion at accelerated rates. These operations include harvesting, site preparation, and regeneration of both pine and hardwoods.

Table 5-23 shows total gross erosion from forest land projected to the year 2020. Erosion from disturbed forest land is expected to increase in the future as timber harvesting and management activities are intensified in response to greater demands for forest products, resulting in a larger proportion of disturbed forest land. Erosion from undisturbed forest land declines throughout the projection period because of the shrinking proportion of forest land unaffected by forest management activities.

Table 5-23 - Projected average annual gross erosion from commercial forest land, Black Warrior River Basin, 1975-2020.

Commercial forest land	1975	1980	1990	2000	2020
			Thousand tons		
Undisturbed	149	135	130	125	114
Disturbed	3,978	5,216	6,290	7,054	9,428
Total erosion	4,127	5,350	6,420	7,179	9,542

Source: Forest Service estimate.

Land Treatment Needs-- Future erosion reduction needs were projected based on capability class (erodibility) of the land, (figure 5-10), projected land use, (appendix figures 6-1 to 6-7), and projected rate of application of erosion reduction measures - assumed to continue at the current rate of increase. It was assumed that the level of forest management would remain at the same proportionate levels in projected years as for 1975. The total acreage disturbed by work roads, skid trails, and mechanical site preparation was included in the forest category. Existing programs will not significantly reduce erosion resulting from these soil disturbing timber management activities. The future erosion reduction acreage needs are the needs which will not be met through ongoing programs. Table 5-24 summarizes acreage where treatment through going programs is not providing adequate erosion reduction. For details supporting this table, the reader is referred to the separate erosion report (Appendix 17).

Table 5-24 - Land needing erosion reduction measures, Black Warrior River Basin, 1975 through 2020.

Land Use	1975	1990	2020
	Thousand acres		
Cropland	423	356	310
Pastureland	20	14	27
Forest	89	145	223
Total	532	515	560

Source: River Basin staff estimates.

Accelerated Erosion

Accelerated erosion is defined as erosion that is damaging to offsite or downstream areas. Accelerated erosion differs from sheet and rill erosion in magnitude; it is a more advanced stage of erosion after sheet wash and rills have enlarged. The areas are usually steep and devoid of protective vegetation.

About 121,000 acres, roughly 3 percent, of the area of the basin is considered to be eroding at an accelerated rate. However, about 56 percent of the total erosion and 69 percent of the total sediment yield comes from this 3 percent. Tonnage of erosion is shown in table 5-25. Roadside erosion and other accelerated erosion degrades the aesthetic quality of the landscape and damages costly roads and other structures.

Sheet and gully erosion damages . . .

the land and crops and

deposits sediment on lands and in waters of the basin.

Erosion is a problem on construction sites,

public lands,

unprotected rights-of-way,

and strip mines.

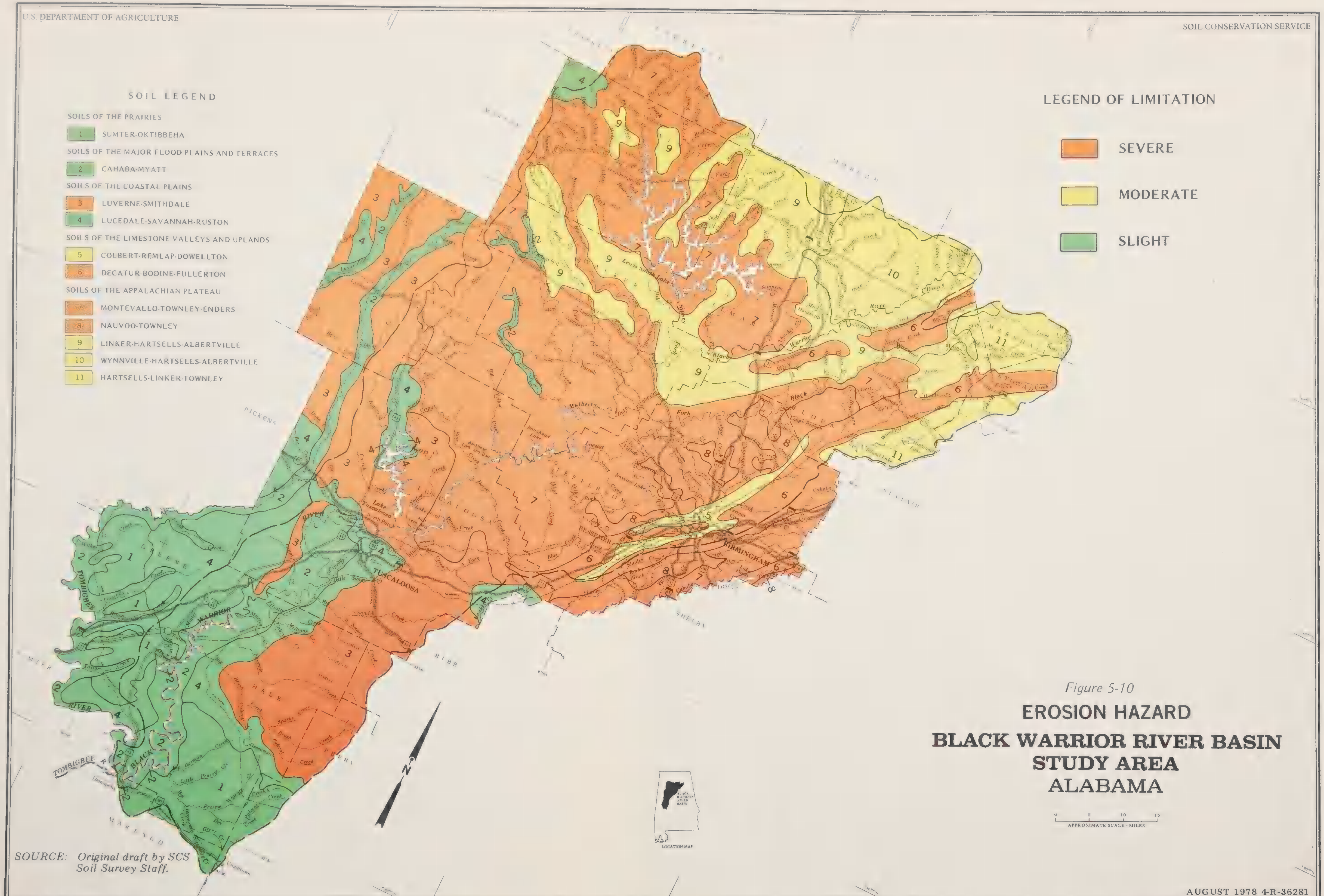


Figure 5-10
EROSION HAZARD
BLACK WARRIOR RIVER BASIN STUDY AREA ALABAMA

USDA—SCS—FORT WORTH TEXAS 1979

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Table 5-25 - Accelerated erosion, Black Warrior River Basin 1975-2020.

Source of erosion	1975	1990	2020
	1000's of tons eroded annually		
Mined land	9087.5	1594.1	2714.4
Accelerated areas, gullies and other similar areas	4400.4	4153.7	4958.7
Roadsides and road surfaces	2808.0	2667.6	2527.2
Streambanks and streambeds	646.2	648.2	751.1
Totals	16,942.1	9,063.6	10,951.4

Sediment

Sediment yield is defined as the total sediment outflow from a drainage area, measured at a cross section of reference, and in a specified period of time. Average annual sediment yield at selected stream points was estimated from projected erosion rates. Sediment is accounted from two major sources of erosion; sheet and rill, and channel or accelerated erosion. Not all of the eroded material from a watershed is sluiced through a stream system to the sea; normally less than 50 percent of the eroded material reaches a stream and there are continuous transit losses after sediment enters a stream, so that the larger the drainage area, the lower the ratio of sediment yield to erosion. Topography, shape of the watershed and other factors also affect the percentage of eroded material carried as sediment by a stream.

Estimates of sediment yield and sediment discharge, from the two major sources of erosion are shown for 1975, 1990, and 2020 (table 5-26). Sediment yield is directly proportional to erosion and is affected by land use changes, erosion control measures, and by the sediment trapping effect of slackwater reservoirs. The projected erosion/sediment yield tables reflect land use changes and erosion control measures that can be expected to be effective by 1990 and 2020. There are no major reservoirs planned for the basin that will affect sediment discharge.

Water quality records in the basin are inadequate for determining suspended sediment concentrations; therefore, sediment concentrations were extrapolated from erosion/sediment estimates (table 5-27). Suspended sediment concentrations on an average annual basis are only a very general indicator of water quality since most sediment will be carried by a few large storms and almost none moved by low flows. Table 5-27 shows estimated long-term average annual suspended sediment concentration at selected points (figure 5-11) along the major streams.

Table 5-26 - Summary Black Warrior River Basin Erosion/Sediment Routing 1975.

Sediment routing reach	W/S ID no. and name of reach	Drainage area W/S sq. mi.	Drainage area Accum. sq. mi.	Erosion by source: Sheet & rill 1000 tons	Sheet & rill Del. ratio 1/ %	Chan. & accel. 1000 tons	Chan. & accel. Del. ratio 1/ %	Sediment yield by source 2/: Sheet eros. 1000 tons	Accel. eros. 1000 tons	Total yield 1000 tons	Sediment discharge by source 3/: Sheet eros. 1000 tons	Accel. eros. 1000 tons	Total disch. 1000 tons	Remarks
		----------	----------	----------	----------	1975	----------	----------	----------	----------	----------	----------	----------	
	35a4(g)1 Sipsey Fk.													
1	Sipsey Fk @ Smith Lake	927.2	-	1,879	20.0	1,494	34.0	376	508	884	38	51	88	Smith Lake traps 90%
2	Sipsey dnstr. fm Smith Lake	76.1	76.1	237	25.0	332	42.5	59	141	200	59	141	200	Discharge from Sipsey Fork
	Mulberry Fk.													
3	Mulberry @ Sipsey	550.1	550.1	1,611	21.5	1,308	36.5	346	478	824	346	478	824	Discharge from Mulberry @ Sipsey Fk.
4	Mulberry @ Locust Fk.	798.2	1,424.4	4,290	20.0	4,634	34.0	858	1,576	2,434	858	1,576	2,434	Discharge from Mulberry Fk.
	35a4(g)(1)(a) Locust Fk.													
(1)	Highland Lake	28.7	-	92	28.0	77	47.5	26	37	63	3	4	7	Highland Lake traps 90%. Discharge to Inland Lake.
(2)	Inland Lake	40.1	40.1	131	27.0	111	46.0	35	51	86	4	5	9	Inland Lake traps 90%. Discharge to Locust Fk.
(3)	Bayview Lake	63.1	63.1	189	26.0	184	44.0	49	81	130	5	8	13	Bayview Lake traps 90%. Discharge to Locust Fork.
(4)	Locust Fk. @ Mulberry	970.8	1,074.0	3,589	20.0	953	34.0	718	324	1,042	718	324	1,042	Includes sediment discharge from Inland & Bayview Lakes
	35a4(g) Black Warrior													
6	Bankhead L&D	553.9	3052.3	9,170	13.5	6,857	23.0	1,238	1,577	2,815	188	237	425	Bankhead L&D traps 85%
7	Holt L&D	235.2	235.2	632	23.0	1,022	29.0	145	399	544	22	60	82	Holt L&D traps 85%
[illegible]	Lake Tuscaloosa	432.0	432.0	952	22.0	952	37.5	209	357	566	36	57	93	Lake Tuscaloosa traps 90%
9	Oliver L&D	167.0	167.0	359	24.0	653	41.0	86	268	354	13	40	53	Oliver L&D traps 85%
10	Warrior L&D	993.8	993.8	2114	20.0	1981	34.0	423	674	1097	63	101	164	Warrior L&D traps 85%
11	Mouth of Black Warrior	453.4	453.4	1050	22.0	479	37.5	231	180	411	35	27	62	Demopolis L&D traps 85%

1/ Percentage of eroded material that is expected to be delivered by the stream system, as sediment, to the point indicated.
2/ Amount of sediment, in tons, reaching the point indicated.
3/ Amount of sediment continuing downstream--accumulation in reservoirs is the difference between "Yield" and "Discharge".

Table 5-26 - Summary Black Warrior River Basin Erosion/Sediment Routing 1990 and 2020.

Sediment routing reach	W/S ID no. and name of reach	1990 Erosion by source: Sheet and rill	1990 Erosion by source: Chan. & accel.	1990 Sediment: Yield	1990 Sediment: Discharge 1/	2020 Erosion by source: Sheet and rill	2020 Erosion by source: Chan. & accel.	2020 Sediment: Yield	2020 Sediment: Discharge 1/
		Thou. tons							
	35a4(g)1 Sipsey Fk.								
1	Sipsey Fk @ Smith Lake	1,450	1,099	664	66	1,888	1,348	835	84
2	Sipsey dnstr. fm. Smith Lake	185	160	114	114	283	175	145	145
	Mulberry Fk.								
3	Mulberry @ Sipsey	1,154	890	573	573	1,429	934	648	648
4	Mulberry @ Locust Fk.	2,963	2,286	1,370	1,370	4,342	2,200	1,616	1,616
	35a4(g)(1)(a) Locust Fk.								
5(1)	Highland Lake	58	40	35	4	80	24	34	3
(2)	Inland Lake	82	58	49	5	125	35	50	5
(3)	Bayview Lake	96	93	66	7	279	129	130	13
(4)	Locust Fk. @ Mulberry	2,782	1,379	1,025	1,025	3,339	1,398	1,143	1,143
	35a4(g) Black Warrior								
6	Bankhead L&D	7,105	4,274	1,942	292	9,293	4,372	2,261	339
7	Holt L&D	858	434	366	55	592	473	320	48
8	Lake Tuscaloosa	702	598	378	37	855	427	348	35
9	Oliver L&D	233	252	159	24	327	272	190	29
10	Warrior L&D	1,567	1,046	669	100	1,015	1,097	776	117
11	Mouth of Black Warrior	863	459	362	55	1,063	450	401	60

1/ Amount of sediment continuing downstream--accumulation in reservoirs is the difference between "Yield" and "Discharge".
Source: SCS estimate

Table 5-27 - Estimates of average annual suspended sediment concentrations along the Black Warrior River System by major sediment source.

Sediment Reach No.			Source of sediment: Sheet erosion	Accelerated erosion	Total Sediment
			----------------	Mg/1	----------------
1	Smith Lake	1975	204	206	410
		1990	157	152	308
		2020	204	186	390
2	Sipsey Fork	1975	387	700	1088
		1990	305	338	643
		2020	470	363	833
3	Mulberry @ Sipsey	1975	316	327	643
		1990	226	222	448
		2020	280	234	514
4	Mulberry @ Locust	1975	316	436	752
		1990	219	215	434
		2020	320	207	527
5	Locust @ Mulberry	1975	351	119	470
		1990	272	172	444
		2020	327	174	501
6	Warrior @ Bankhead L&D	1975	190	182	372
		1990	147	113	260
		2020	193	116	309
7	Warrior @ Holt L&D	1975	378	779	1158
		1990	515	329	844
		2020	355	358	713
8	North River @ Lake Tuscaloosa	1975	296	380	676
		1990	218	238	456
		2020	266	170	436
9	Warrior @ Oliver L&D	1975	32	74	106
		1990	21	28	49
		2020	28	51	79
10	Warrior @ Warrior L&D	1975	330	394	724
		1990	244	209	453
		2020	314	219	533
11	Warrior @ Tombigbee	1975	402	235	637
		1990	330	224	554
		2020	406	217	623

Source: SCS, USDA

Figure 5-11

SEDIMENT ROUTING MAP
BLACK WARRIOR RIVER BASIN
STUDY AREA
ALABAMA

REVISED AUGUST 1978 BASE 4-R-35608

USDA—SCS—FORT WORTH, TEXAS 1979

The water quality problems related to sedimentation are those of reservoir storage capacity, degradation of aquatic habitat, and reduction of aesthetic quality. Silt and clay resulting from soil erosion cause turbid water. Turbidity is aesthetically objectionable as well as detrimental to the stream ecosystem.

Impaired Drainage

There are 468,900 acres of land with a wetness hazard in the basin. This includes about 86,500 acres of cropland and 90,900 acres of pasture. These are lands with a surface or internal drainage problem or both. They are usually lowlands or those having a constant or occasional high water table. Excess surface and/or subsurface water often interferes with utilization of land for crops. Growth and response to management and use is unpredictable. Where wetness occurs, reduced yields generally result. Late planting and the inability to cultivate, apply insect controls and harvest crops on a timely basis results in reduced yields as well as inefficient use of energy and labor. Table 5-28 shows this land by soil capability classes for the year 1975.

Table 5-28 - Use of Class IIw, IIIw, IVw, and Vw soils in the Black Warrior River Basin, 1975.

Land use	Soil Capability Class and Subclass				
	IIw	IIIW	IVw	Vw	Total
Cropland	51,700	18,600	14,300	1,900	86,500
Pasture	39,400	20,200	24,300	7,000	90,900
Forest	46,200	63,600	89,700	83,900	283,400
Other	4,200	1,800	1,800	300	8,100
TOTAL	141,500	104,200	130,000	93,100	468,900

Source: SCS analysis of land use by soil group utilizing 1975 SRS data.

Except for isolated instances, no drainage of woodland or land in "other" category is being done. Therefore, all drainage needs pertain only to the 177,400 acres of land in crops and pasture with excess wetness in the basin. Taking into consideration the acreage on which drainage has been installed and discounting the acreage that suffers primarily from overflow and flooding along streams and rivers, the net amount of cropland and pastureland needing drainage is 90,000 acres. Table 5-29 shows the drainage needs for crops and pasture by soil capability classes for each county in the basin for the year 1975. Land use projections indicate that crops and pasture grown on "wet" soils will increase to 195,000 acres in 1990 and drop slightly to 191,000 in 2020.

Table 5-29 - Drainage needs for crops and pasture by soil capability classes in the Black Warrior River Basin, 1975.

County	C-Cropland P-Pastureland	Soil Capability Class IIw	IIIw	IVw	Vw	Total
Blount	C	560	4,280	1,230	-	6,070
	P	310	3,440	130	-	3,880
Cullman	C	-	3,320	-	-	3,320
	P	520	5,050	-	-	5,570
Etowah	C	210	1,570	20	-	1,800
	P	60	430	20	-	510
Fayette	C	190	920	170	-	1,280
	P	60	810	120	-	990
Greene	C	2,840	190	760	40	3,830
	P	1,400	-	1,200	800	3,400
Hale	C	6,460	1,030	2,030	980	10,500
	P	6,680	570	7,180	3,660	18,090
Jefferson	C	140	540	-	-	680
	P	-	640	-	-	640
Marengo	C	2,160	-	-	-	2,160
	P	1,100	-	-	-	1,100
Marshall	C	-	630	-	-	630
	P	-	280	-	-	280
Perry	C	260	110	230	290	890
	P	740	50	420	410	1,620
Tuscaloosa	C	330	1,670	5,250	290	7,540
	P	410	770	2,940	1,070	5,190
Walker	C	180	850	-	-	1,030
	P	1,330	4,890	2,150	-	8,370
Winston	C	-	570	-	-	570
	P	150	-	-	-	150
TOTALS	C	13,330	15,680	9,690	1,600	40,300
	P	12,760	16,930	14,160	5,940	49,790
		26,090	32,610	23,850	7,540	90,090

Source: SCS analyses of land use by soil group utilizing 1975 SRS crop data.

The current application rate of drainage measures applied to projected use of "wet" soils for 1990 indicates net drainage needs of 90,000 acres. Accelerated installation of such measures after 1990 will reduce net needs to 78,000 acres for 2020.

Inadequate Water Supplies

The Berry, Fayette, and Oneonta water systems have been identified as needing additional supply of municipal and industrial water. The areas identified as not being able to meet future needs from present sources of supply were reviewed with local community officials and planning agencies. Those areas with limited supply and available water storage sites will be studied for feasibility. Many communities will develop available wells and streams through ongoing programs to supply projected needs except where surface storage would provide the best source of additional water supply.

Inadequate Forest Production

In 1971 there were approximately 2,729,000 acres of forest land in the basin capable of producing commercial roundwood products. Unfortunately, only a small percentage of these lands are sufficiently well stocked with commercially desirable tree species to achieve the optimum level of roundwood production without some type of stand treatment. Table 5-30 is a breakdown of the basin's forest lands by area condition.

Table 5-30 - Forest land area condition, Black Warrior River Basin, 1971.

Condition	Thousand acres	Percent of forest lands
No serious treatment needs		
Generally well stocked with desirable trees	91.3	3
Condition needing treatment		
Overstocked with desirable trees	27.3	1
Well stocked but containing a low percentage of desirable trees	1,811.5	66
Moderate stocking with desirable trees but site conditions inhibit full stocking	527.7	20
Poor stocking of all trees	271.4	10
Totals	2,729.2	100

Source: USDA Forest Service, Southern Forest Experiment Station, Alabama Forest Survey, 1972, Black Warrior River Basin Summary.

Stocking is a measure of the extent to which the growth potential of the site is utilized by trees or preempted by vegetative cover. For the purposes of this analysis, those areas less than 60 percent stocked were considered poorly stocked. Of the total commercial forest land in the basin 271,400 acres, roughly ten percent, were in the poorly stocked category in 1971. Seventy-five percent of those poorly stocked stands were on sites capable of producing commercial pine roundwood. Private ownership accounted for 84 percent of the poorly stocked stands. Sixty-one percent of the poorly stocked areas were considered prime forest lands.

When the quality of the timber was taken into account, only about 3 percent of the forest lands are adequately stocked with desirable trees and do not require stand improvements to achieve acceptable production levels. Desirable trees are growing stock trees that have no serious defects to limit present or prospective use, are of relatively high vigor, and contain no pathogens that may result in death or serious deterioration before rotation age. They comprise the type of trees that forest managers favor in silvicultural operations. The remaining 97 percent of the forest lands have stand conditions such that optimum stocking with desirable trees cannot be achieved without some type of silvicultural treatment. Treatment needs are variable depending on stand composition and other site conditions.

Insufficient Recreational Facilities

Demand for outdoor recreation in the Black Warrior River Basin is increasing faster than is the population. Several state agencies are concerned with this problem and are working to increase recreational opportunities in Alabama. Foremost is the Alabama Department of Conservation and Natural Resources, Division of Outdoor Recreation. Auburn University completed an extensive Statewide Comprehensive Outdoor Recreation Plan (SCORP) in 1975. Since planning regions in the comprehensive plan did not follow hydrologic boundaries, a separate recreational analysis for the basin study area was developed utilizing Alabama SCORP standards for recreation participation by the public and the capacity of individual facilities to satisfy these damands. These standards, reflected in table 5-31, were combined with population projections and inventories of available facilities to develop net recreational needs for future time periods.

Demand, Supply and Facility Needs -- Four land and water based activities-fishing, swimming, camping, and picnicking-were analyzed. These are the primary recreational activities that would possibly be affected by land and water development. It is realized that much of the land and water area required can be used to satisfy several needs, either concurrently or at different seasons of the year. Demand, supply and needs for four recreational activities are presented in table 5-31.

Swimming: Demand for swimming in impoundments should increase about 33 percent by the year 2020. To satisfy this demand will require the development of an additional 152 acres of beaches to supplement the 44 acres reported in 1975. Present demand of 2.65 million occasions already exceeds capacity.

Table 5-31 Demand, Supply and Needs for selected recreational activities in the Black Warrior River Basin - 1975, 1990, 2000, 2020.

		DEMAND			SUPPLY			NEEDS
Activity	Year	Population	Annual occasions per capita	Demand in activity occasions	No. of tables 1974	Act./Occ. table	Avail. capacity in act./occ.	
		Persons		Mil			Mil	Additional tables needed
Picnicking	1975	862,000	4.15	3.58	2,562	1,080	2.77	750
	1990	943,000	4.15	3.91		1,080	2.77	1,055
	2000	1,015,000	4.15	4.21		1,080	2.77	1,333
	2020	1,146,000	4.15	4.76		1,080	2.77	1,842
					All acres avail.	Act./Occ. acre	Avail a/o Mil	Add. acres needed
Fishing	1975	See Above	8.95	7.71	77,645	60	4.66	51,000
	1990	"	8.95	8.44		60	4.66	63,000
	2000	"	8.95	9.08		60	4.66	74,000
	2020	"	8.95	10.26		60	4.66	93,000
					No. of sites	Act./Occ per site	Capacity in Act. Occ. Mil.	Add. sites needed
Camping	1975	See Above	1.66	1.43	2,500	450	1.12	690
	1990	"	1.66	1.57		450	1.12	1,000
	2000	"	1.66	1.68		450	1.12	1,245
	2020	"	1.66	1.90		450	1.12	1,735
					Acres of water avail.	Act./Occ. acre	Existing Capacity* in Act./Occ.	Add. acres of water needed
Swimming	1975	862,000	3.08	2.65	44.0	18,000	0.8	103
	1990	943,000	3.08	2.90		18,000	0.8	117
	2000	1,015,000	3.08	3.13		18,000	0.8	129
	2020	1,146,000	3.08	3.53		18,000	0.8	152

*Includes beaches and swimming in ponds and lakes.

Recreation may be . . .

swimming,

scenic areas,

camping,

hunting,

fishing,

or hiking.

Camping: Demand for camping is usually satisfied in one of three ways--tent camping, trailer camping, or group camping in cabins or lodges. In 1975, there were 2,500 individual sites in the basin developed especially for tent camping, and trailer/tent camping. Combined, they had a capacity of 1.12 million activity occasions. Total demand is expected to rise from 1.43 million occasions in 1975 and to 1.90 million by 2020.

Picnicking: Picnicking demand by 2020 should be about 4.76 million occasions annually, 1,180,000 more occasions than in 1975. About 2,562 tables are available for picnicking in the basin. There is a deficit of 750 tables, and this deficit should increase to more than 1,800 tables by 2020.

Fishing: Fishing needs exhibit an exaggerated deficit because the demand was based on the resident population and the supply was assumed to be limited to resources within the basin. Consequently, the needs are not discounted for fishing trips satisfied by resources outside the basin. There is a resident demand for 7.7 million occasions of fishing. Although there is about 78,000 acres of aquatic habitat available to supply this demand, there would be a current deficit of about 51,000 acres of water for fishing if the needs were to be met within the basin. By 2020 this deficit will increase to 93,000 acres.

Loss of Wildlife Habitat

The principal concerns associated with fish and wildlife management are pollution, deficient wildlife populations where habitat is good, inadequate harvests because of limited access, lack of incentives for private landowners to emphasize wildlife management in their agricultural operations and either loss or modification of habitat. Other important problems with more localized impact include (1) habitat degradation associated with strip mining in Walker County; (2) beaver damage to farmland in Tuscaloosa and Hale Counties; and (3) intensive angling pressure in large impoundments, especially for bass.

Various segments of society place different values on fish and wildlife. The landowner may value these resources for the income he derives from hunting and fishing fees. To the sportsman, fish and wildlife represent the opportunity to enjoy nature while in pursuit of his quarry. Others believe that wildlife is important for its contribution to esthetics and for its value to natural ecosystems. Some believe that fish and wildlife resources are subservient to technological progress. Plans for solving fish and wildlife problems must include compromises and trade-offs by all segments of society.

Loss and modification of upland wildlife habitat can be attributed to technological advances of man. Land is cleared of woody vegetation to make way for more improved plant species. Wildlife may be severely affected if a monoculture results which furnishes little food and cover for wildlife.

Industrialization and subdivision of large rural tracts of land for country homesites have placed additional pressure on wildlife habitat. The mere presence of people forces the migration of some wildlife species to other areas. In many instances, homesites along streams and lakes are also preferred wildlife areas. Wildlife populations within the sphere of influence of these developments are also affected.

Pollution of water areas in the Black Warrior Basin has resulted in the degradation of the fishery resource. In volume, sediment is the prime pollutant in bodies of inland water. Industry, cities, and towns find it convenient to dump wastes into water areas. Excessive and improperly applied chemicals and fertilizers from agricultural operations also contribute to pollution problems.

Wildlife management on a broad scale is far from simple. Game laws are difficult to enforce in some areas. In other areas where enforcement is not a limiting constraint, proper hunting regulations and harvest methods have not produced expected results. A breakdown in communications between landowners and wildlife officials, in matters pertaining to management practices, harvest methods, and numbers to be harvested, have also decimated game populations in some locations. Multiple land use based on only immediate economic return results in wildlife's receiving the least emphasis in management. Intensive use of land for either crops, pasture, or range often degrades wildlife habitat.

Many fisheries administrators are constantly bombarded by anglers' claims that bass fishing is deteriorating. It has been shown that continued high rates of bass harvest over an extended period in certain waters may lead to significantly deminished bass reproduction because of changes in fish population structures.

Black bass populations seldom constitute more than 5 percent of the total biomass of natural fish communities, averaging less than 10 pounds per acre in unmanaged waters. Moreover, anglers tend to exert a disproportionate amount of the angling pressure specifically for bass (about 42 percent of all warm water anglers fished for bass in 1975). Consequently, bass populations are subject to intensive angling pressure.

Once fish populations become acutely imbalanced in large impoundments, remedies for the problem are costly, prolonged and often limited. It is understandable that resource managers are concerned over the concentrated bass angling pressure and consider it justifiable that either judiciously selected minimum size limits on bass be imposed or reservoir zoning be considered.

CHAPTER 6

COMPONENT NEEDS

SUMMARY OF COMPONENT NEEDS

While study results indicate projected demand for food, feed and fiber from agricultural land can be met without accelerated resource development, there is an urgent need to improve both land use and management so as to reduce erosion, sediment and agricultural-chemical runoff into streams. Such action could improve water quality and help to insure an adequate agricultural land base for future production. Component needs for improving use and management efficiencies of land and water resources, serve as the basis for alternative plan formulation.

Based on the comprehensive water and related land resources inventory of the basin presented in Chapter 3 and the problems and needs identified in Chapter 5, component needs were developed as shown in table 6-1.

Those component needs most likely to be applicable in achieving the national economic development objective have been identified as primarily NED and shown in table 6-1. Likewise, other component needs identified as being primarily EQ in table 6-1 are basic to achieving the environmental quality objective.

Flood Damage Reduction

Basic data on the extent of flood problems and conditions were obtained from published reports and by a reconnaissance survey of all watersheds within the basin. This information was supplemented by interviews with landowners, county and city officials and SCS personnel. Detailed information on the extent of the flooding problem can be found in appendix 16. The study revealed a flood problem on about 330,000 acres of flood plain. Public Law 83-566 and Resource Conservation and Development projects (RC&D) for flood control in place or expected to be installed by 1990 would provide protection on about 33,000 acres which were therefore deducted from the total. In addition, there are 244,000 acres of forest in the flood plain where flood damages are insignificant. This area was also deducted leaving a net of 53,000 acres (20,000 acres of cropland, 23,000 acres of pastureland, and 10,000 acres of other uses) needing flood damage reduction by 1990. No flood control projects were identified for installation under future without accelerated resource development after 1990; therefore, the 2020 needs would remain at 53,000 acres.

Forty-six communities within the basin have been identified as having a flood problem. Two flood control projects (Elliott Creek and Mud Creek) expected to be installed by 1990 would provide some protection for two of these communities. These were deducted from the total to obtain a net need of 44 in 1990. No other urban flood control projects were identified for installation under future without accelerated resource development conditions after 1990; therefore, the 2020 urban flood control needs would remain at 44 communities.

Table 6-1 -- Specific components of major objectives and component needs, present and projected, Black Warrior River Basin, 1975-2020.

SPECIFIC COMPONENTS	COMPONENT NEEDS	UNITS	QUANTITY PRESENT	1990	2020
PRIMARILY NED					
1. Increased or more efficient output of food and fiber.					
a. Improved efficiency of production and resulting agricultural income.	Flood reduction-agricultural land.	Thous. acres	83	53	53
	Sheet and rill erosion				
	Erosion damage reduction	Thous. acres	443	369	337
	Cropland and pastureland.	Thous. tons	4,155	3,007	2,570
	Increased drainage-on farm.	Thous. acres	90	90	78
b. Increased output of wood products from commercial forest land.	Improve efficiency of utilization and/or increased forest productivity.	Mil.cu.ft./yr.	0	0	30
2. Urban flood damage reduction.	Urban damage reduction.	No. of comm.	46	44	44
3. Increased and more efficient production of agricultural, municipal, and domestic water supply.	Create additional surface supply.	MGD	2	4	41
4. Increased output of outdoor recreation opportunities.	Increased recreation activities.				
	Fishing	Thou. ac. of water	51	63	93
	Swimming	No. of acres	103	117	152
	Camping	No. of sites	690	1,000	1,735
	Picnicking	No. of tables	750	1,055	1,842

Table 6-1 -- cont'd

SPECIFIC COMPONENTS	COMPONENT NEEDS	UNITS	QUANTITY PRESENT	1990	2020
PRIMARILY EQ					
5. Improved quality aspects of water, land and air.					
a. Reduction in sedimentation	Reduction in total sediment	Mil. tons/yr.	9.0	5.1	6.0
b. Reduction in non-point source erosion	Accelerated erosion reduction Streambanks	Thous. tons	646	648	751
	Roadside erosion	Thous. acres	19.3	18.4	17.4
		Thous. tons	2750.0	2612.5	2475.0
	Accelerated erosion	Thous. acres	11.8	11.1	13.3
		Thous. tons	4365.0	4120.3	4918.8
	Strip mine reclamation	Thous. acres	90.2	15.8	27.0
		Thous. tons	8816.8	1546.6	2633.5
	Reduce erosion resulting from forest management activities.	Thous. acres	89	145	223
		Thous. tons	2,100	464	714
6. Enhancement or preservation of biological resources.					
a. Improved quality and increased quantity of fish and wildlife habitat	Fish & wildlife habitat improvement Upland habitat-Improved Mgt	Thous. acres	167	167	167
	Aquatic habitat-regulation	Thous. acres	40.7	40.7	40.7
	Aquatic habitat-improved mgt.	Thous. acres	8.5	8.5	8.5
	Aquatic habitat-improved access	No. of sites	5	5	5
b. Protection of threatened and endangered species of flora and fauna	Protection of flora & fauna. Flora	No. of species	33	33	33
	Fauna	No. of species	16	16	16

Sheet and Rill Erosion Reduction

Needs for cropland and pastureland were projected for the years 1990 and 2020. These projections assumed a continuing trend toward efficient agricultural land use allocation throughout the state. In 1975, 865,000 acres of the basin were classified as cropland or pasture. Total projected acreage of these uses is estimated to be 894,000 in 1990 and 858,000 in 2020.

Treatment accomplishments to reduce sheet and rill erosion to the standard set by (SCS) Technical Guides for Alabama show going programs and planned projects can provide adequate treatment on 525,000 acres of cropland and pastureland by 1990. This acreage was deducted from 894,000 to obtain a net treatment need of 369,000 acres for 1990. Net needs for 2020 were determined in a similar manner.

Erosion damage reduction needs may be expressed in number of acres that are eroding at excessive rates or in tons of excessive erosion. Either expression is based on the concept that each soil has a tolerance ("T") for some erosion and erosion in excess of that tolerance will be mining 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 treated for erosion control in order to restore or maintain the resource base. Cropland and pastureland soils in the basin have "T" values ranging from 1 to 5 tons per acre per year.

Erosion reduction needs were quantified by expressing the amount of total erosion in excess of the tolerance of the land use base. Net erosion reduction needs were determined by comparing "T" erosion with the projected erosion; the excess being the reduction need.

Estimates for 1990 indicated that the projected 894,000 acres of cropland and pastureland can tolerate 2.9 million tons of erosion annually, but will be losing 4.7 million tons; 858,000 acres can tolerate 2.7 million tons but will be losing 3.9 million tons by 2020.

Eighty six percent of the erosion on the basin's commercial forest land is attributed to logging engineering. Excessive forest land erosion results in reduced site productivity and contributes to sedimentation. The key to solving the erosion problem related to forest management is the adoption of logging systems and roads designed to maintain site productivity and to minimize the potential for erosion and the transport of eroded materials to the stream systems.

The Alabama Forestry Commission published a preliminary set of "Recommended Forest Management Guidelines" to control non-point pollution from silvicultural practices in 1977. The commission is preparing a Silvicultural Runoff Management Plan for the state in accordance with section 208 of the Federal Water Pollution Control Act, Public Law 92-500. The plan will consist of a program designed to minimize non-point pollution resulting from forest management activities. Soil disturbance and movement will be controlled through the application of the recommended guidelines also known as best management

Forest resources are enhanced by good timber management practices such as . . .

good site preparation,

proper location and construction of logging roads and docking areas,

and adequate restocking of desirable species.

practices. The program will be implemented following its approval by the Environmental Protection Agency. Implementation of a system of best management practices basin wide could have a significant impact on erosion reduction on commercial forest land.

Reduction of Accelerated Erosion

Reconnaissance surveys by SCS field personnel and analysis of data developed for the National Resource Inventory (NRI) were used as a sample for expansion to estimate accelerated erosion in the basin. These estimates indicate that there are about 121,400 acres of land eroding at an accelerated rate in the basin. These areas include active gullies and other seriously eroding lands, such as unreclaimed mined lands and bare, eroding roadbanks. Three percent of the land produces 56 percent of the erosion and 69 percent of the sediment in the basin.

Existing conservation programs are expected to about keep pace with development of new gullies and accelerated erosion. Streambank erosion is expected to increase slightly. Mined land erosion is expected to drop markedly as mine operators reclaim most land mined annually and the Rural Abandoned Mine Program (RAMP) begins to have effect. Quantified needs for erosion reduction were arrived at by assuming the "desired future" condition that would produce a clean environment is 3 tons per acre per year erosion (table 6-1). Future needs were obtained by projecting the rate of development minus reclamation through ongoing programs then subtracting the remaining erosion (3 tons per acre base erosion).

Reduction in Sedimentation

The underlying needs behind the goal for reduction in sedimentation are improvement of general water quality, aesthetic quality, and fish habitat. Other efforts are aimed at reduced silting of streams and reservoirs, and reduced deposition on flood plains. All but one of these goals is qualitative. However, the fishery goal is quantified and is a good indicator of general stream cleanliness and quality.

The Environmental Protection Agency (EPA) states that freshwater streams, where there is a fish population, should normally have no more than 80 milligrams per liter (mg/l) of suspended solids, however, higher concentration can be tolerated for short periods without harm to the fishery (3,000 mg/l for no more than 10 days at a time). This level of suspended solids is approximately equal to the condition obtained if erosion is 3 tons per acre over the entire watershed. This "desired future" condition would result in sediment production of about 3.6 million tons annually. Projected annual sediment yield is expected to be 8.7 million tons by 1990 and 9.6 million tons by 2020. The "desired future" sediment subtracted from the "projected future condition without plan" is the sediment reduction need shown in table 6-1 as 5.1 million tons/year in 1990 and 6.0 million tons by 2020.

Parts of the basin, mostly pastures and forests, are already producing less sediment than the "desired future" maximum. These areas are considered to be contributing to the meeting of the goal of sediment reduction.

Improved Drainage

Land use projections indicate that crops and pasture grown on "wet" soils will increase from 177,000 acres in 1975 to 195,000 acres in 1990 and drop slightly to 191,000 acres in 2020. Figure 6-1 gives the relative amounts of cropland and pastureland expected to be grown on the various capability classes of "wet" soils in the basin. Also shown are the drainage needs for crops and pasture for 1975, 1990, and 2020.

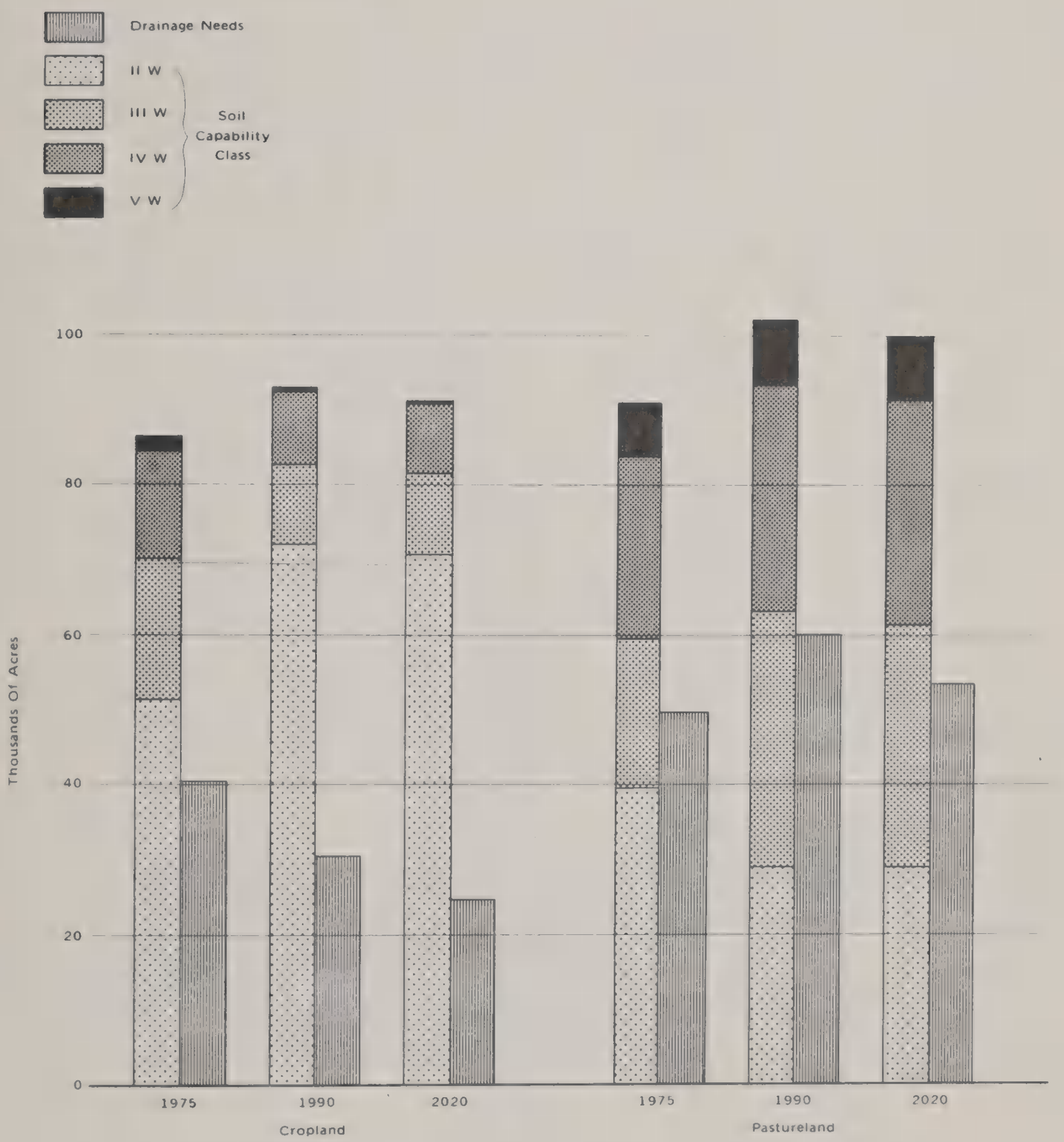


Figure 6-1

DRAINAGE NEEDS OF CROPS AND PASTURES ON "WET" SOILS, 1975, 1990 AND 2020 IN THE BLACK WARRIOR RIVER BASIN

Additional Water Supplies

A total of five public systems needing 4 million gallons per day (MGD) were identified for 1990; by 2020, 41 MGD will be needed. This includes Birmingham and Jasper, both increasing their use of water from the Warrior River.

Additional Recreation Facilities

An extensive survey of Alabama's recreational facilities in 1974 pinpointed the location and size of existing facilities. All recreation projects funded for construction were also assumed to be in place. The total of existing and funded facilities were deducted from anticipated needs, leaving a complement of facilities needed for development by 1990 and 2020. Component needs were addressed in Chapter 5 and are summarized in table 6-1. Fishing needs are overstated by perhaps 50 percent or more because existing surplus supplies adjacent to the basin boundaries was not considered. However, these areas can and currently do supply a significant portion of the resident demand for fishing.

Present needs for picnicking indicate a shortage of 750 tables. This appears to be a very realistic figure and may be slightly underestimated due to localized shortages. Camping needs reflect a deficit of about 700 sites and impoundment swimming is inadequate to meet 1975 demands by approximately 103 acres.

Increased Output of Wood Products from Commercial Forest Land

The projected demand for wood products from commercial forest land will likely result in a deficit of 30 million cubic feet per year if present trends in harvesting and management continue beyond the year 2000. However, the forest resource base can easily meet these future demands through more efficient utilization of the wood resource and/or by increasing forest productivity.

Improved utilization as used here includes all methods which result in conversion of a greater proportion of wood volume in a harvest area or timber stand into wood products. Examples include more complete utilization of harvest trees including stumps and limbs, increased use of salvable dead and cull trees and of less desirable species, and more complete utilization of stands through multi-product harvesting operations.

Increased forest productivity is meant to include all activities which will result in a greater overall production of commercial wood products from commercial forest land. Some examples include: (1) steps taken to reverse the trend of conversion of productive forest land to other uses, (2) establishment of commercial forest stands on suitable idle land, (3) increased stand productivity through the application of more intensive silvicultural management practices, and (4) measures taken to increase site productivity such as fertilization and use of superior planting stock. Specifically, the timber supply could be increased by:

1. Maintaining the commercial forest land base at the 1975 level. This would increase net annual growth by 11 million cubic feet by 2020.

2. Improving timber stand stocking and condition. This alone could potentially increase growth by 26 million cubic feet by 2020.

3. Reducing the mortality rate, which was about 15 million cubic feet per year in 1975.

4. Increasing the utilization of the huge volume of cull and salvable dead trees in the basin. These inventory components accounted for 242 million cubic feet in 1975 and will probably remain a sizable portion of the inventory in future years.

5. Improving the efficiency of utilization of timber volumes removed from growing stock. Ninety two percent of these removals were accounted for by round wood products in 1975. At present utilization rates, unused removals will total about 16 million cubic feet by the year 2020.

Improve the Quality and Quantity of Fish and Wildlife Habitat

Improvement in the quantity of fish habitat, based on consumptive demand, was discussed in the recreation section. Other qualitative aspects of fish habitat management have surfaced in this study including limiting minimum size of predator fish and intensifying management in small impoundments. A need to protect and improve fish population predator/prey relationships in large impoundments can be addressed by imposing judiciously selected minimum size limits on black bass. These large impoundments encompass about 40,700 acres in the basin. In addition, it is considered economically feasible to intensively manage small impoundments for fish production. Improved management is needed in about 8,500 acres of small impoundments. Accessibility to lakes and streams appears to limit utilization of the fishery in the basin. This is especially true around Smith Lake. It was determined that at least 5 additional public access points can be justified on Smith Lake.

Intensified wildlife management will be required on the existing wildlife management areas to satisfy the unmet needs for consumptive and non-consumptive purposes. This includes Black Warrior, Wolf Creek, and Oakmulgee Wildlife Management Areas with a total of about 167,000 acres. Intensified wildlife management on the Black Warrior area is important because of its proximity to large population centers.

Protection of Endangered Species of Flora and Fauna

A list of endangered plants and animals that occur in Alabama and are believed to occur in the basin was compiled from current state and federal listings. Presently about 40 plants and animals are classified as threatened or endangered on either the state or federal list. These organisms were assumed to be in need of protection even though an Endangered Species Act was passed by Congress in 1973 to conserve endangered and threatened organisms. Protection will be reinforced by accurately mapping the known range of each species and increasing public awareness and habitat requirements of each.

Potential Sources for Assistance in Meeting Problems and Needs

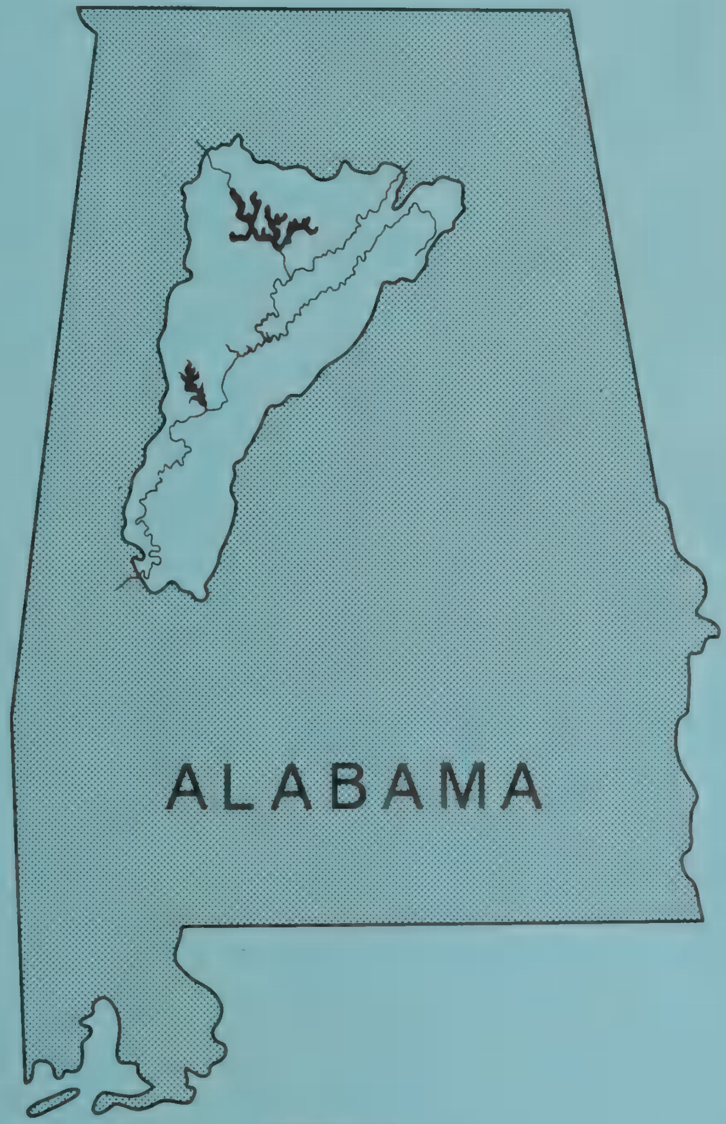
In response to the January 9, 1979 request from the Office of State Planning and Federal Programs for assistance in conducting a USDA Cooperative Alabama Statewide Land and Water Resources Study, the Black Warrior River Basin Field Advisory Committee agreed to delay all Phase II activities in the Black Warrior River Basin Study and conduct this work during the Statewide Study. For this reason, the development of alternative plans and a suggested plan for resource development will be developed as part of the Statewide Study. In the interim, table 6-2 identifies some means by which resource needs can be met.

Table 6-2 -- Summary of program and agency means through which identified needs may be achieved, Black Warrior River Basin

	Flood Damage Reduction	Sheet & Rill Erosion Reduction	Reduction of Accelerated Erosion	Reduction of Sedimentation	Improved Drainage	Additional Water Supply	Additional Recreational Facilities	Improved Stocking of Forest Land	Increased Output of Wood Products	Improved Quality & Quantity of Fish & Wildlife Habitat	Protection of Endangered Species of Flora and Fauna
USDA PROGRAMS & AGENCIES											
SCS Public Law 75-46		X	X	X	X		X	X	X	X	
SCS Public Law 83-566	X	X	X	X	X	X	X	X	X	X	
RC&D	X	X	X	X	X	X	X	X	X	X	X
FmHA	X			X	X	X	X	X	X	X	
ASCS		X	X		X			X	X	X	
U.S. Forest Service	X	X	X	X			X	X	X	X	
OTHER FEDERAL PROGRAMS & AGENCIES											
DOI-HCRS							X			X	
DOI-NWS	X										
DOI-NPS							X				
F&WL Service							X				X
ARC(OSPFP)	X	X	X	X							
C of E	X		X	X		X	X			X	X
FEMA	X										
EPA		X	X	X						X	X
USGS	X			X		X					
EDA						X					
Wild & Scenic Act										X	X
End. Species Act										X	X
Dingell-Johnson Act										X	
Pittman-Robertson Act										X	X
STATE AGENCIES & PROGRAMS, AND LOCAL GOVERNMENTS											
OSPFP	X	X	X	X		X	X				X
Geo. Sur. Ala.						X					
State Hwy. Dept.		X	X	X							
Ala. Dept. Public Health						X					
State Sur. Mining Comm.		X	X	X							
Ala. Forestry Comm.	X	X	X	X			X	X	X	X	
AWIC		X	X	X						X	
ADC & NR							X			X	X
Coop. Ext. Service	X	X	X	X	X	X	X	X	X	X	
Local Govts. & Org.	X	X	X	X	X	X	X	X	X	X	X
State Plan. Comm.	X	X	X	X	X	X	X	X	X	X	X

APPENDIX

BLACK WARRIOR
RIVER BASIN COOPERATIVE STUDY



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In cooperation with the

STATE OF ALABAMA,
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BLACK WARRIOR RIVER BASIN
COOPERATIVE STUDY APPENDIX

ALABAMA

Prepared by

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Soil Conservation Service
Economics and Statistics Service
Forest Service

In cooperation with the

STATE OF ALABAMA
OFFICE OF STATE PLANNING AND FEDERAL PROGRAMS

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Appendix 1
Scope and Objectives

The overall purpose of water and land resource planning is to promote the quality of life by reflecting society's preference for attainment of the objectives defined below:

A. Enhancement of national economic development (NED)

Through increases in the value of the nation's output of goods and services and improvement of national economic efficiency.

B. Enhancement of the quality of the environment (EQ)

Through the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

The two major planning objectives, components of these objectives, and specific components developed by the USDA agencies engaged in this study and the Office of State Planning and Federal Programs are listed on the following page. The scope of some phases of the study was limited as indicated by the footnotes to the specific components.

MAJOR OBJECTIVE	COMPONENTS OF OBJECTIVE	SPECIFIC COMPONENTS
National Economic Development (NED)	1. The value to the nation of increased goods and services resulting from a project. 2. External economies (externalities) - gains to individuals or groups other than direct users of project outputs. a. Technological externalities - external efficiency of firms economically related to direct and indirect users of project outputs. b. Pecuniary externalities - external economies reflected in increased income of firms economically related to direct and indirect users of project outputs.	1. Increased or more efficient output of food and fiber. a. Reduce unwise use, improper treatment, and inadequate management of forest and agricultural land. b. Improve agricultural income and develop forestry resources. c. Reduce floodwater damage on agricultural,1/ urban,2/ and built up areas. d. Reduce erosion and sediment damage. 2. Improve drainage on the agricultural bottom land with potential for high production. 3. Provide adequate supplemental irrigation water for agricultural lands where needed. 4. Provide water supply for current and projected municipal and rural needs. 5. Increase output of outdoor recreational opportunities.
Environmental Quality (EQ)	1. Management, protection, enhancement or creation of areas of natural beauty. 2. Management, preservation or enhancement of especially valuable biological resources and ecosystems. 3. Management, preservation or enhancement of especially valuable geological, archeological and historical resources. 4. Avoiding irreversible or irretrievable commitment of resources.	1. Improved quality aspects of water, land and air. a. Improved livestock waste disposal.3/ b. Improved stream water quality.3/ c. Reduction in sedimentation. d. Reduction in point source erosion. 2. Improvement, protection and/or preservation of areas of natural beauty for man's enjoyment. a. Protection of and increased access to scenic areas.2/

MAJOR OBJECTIVE	COMPONENTS OF OBJECTIVE	SPECIFIC COMPONENTS
		3. Enhancement or preservation of biological resources. a. Improved quality and increased quantity of fish and wildlife habitat. b. Protection of rare and endangered species of flora and fauna.2/

1/ The evaluation of agricultural flood damages in the basin and the potential for reducing these damages is included. Main stem flooding damages were evaluated along with tributary damages, however, the evaluation of the potential for reducing agricultural flood damages through structural measures installed on the major rivers of the basin was considered to be outside the scope of this study.

2/ The scope of the study was limited to the identification of needs and generalized approaches to meeting these needs.

3/ The inclusion of information relating to livestock waste disposal was in response to a request from the Alabama Water Improvement Commission. The identification of plan elements relating to water quality was limited in scope and included reduction in sediment and the potential for increasing low flow in the basin's streams in selected locations.

Appendix 1A
Relationship Between Study Objectives and State Goals

The development of goals for state government was initiated by the Alabama Development Office in 1972 under authority granted this agency by Legislative Act 657 of 1969. The state's preliminary goals were developed with input from local and state government agencies, regional planners, special interest groups, various organizations and private citizens.

The state's goals for ten functional areas of state government are presented below:

1. Strengthen the educational system in order to provide a quality education for all citizens including general, vocational, and technical-oriented programs; adult education; and pre-school programs.

2. Provide the means and opportunity for all citizens to meet their health needs through the expansion and the improvement of the quality and quantity of health services.

3. Encourage economic development in Alabama at greater than the national average, but at the same time protect and conserve natural and human resources to the best extent possible.

4. Provide for adequate shelter and living environments for all the citizens of Alabama, including an increase in quantity and quality of housing through the cooperation of government and private enterprise.

5. Develop a natural resources program which will enhance and protect the natural environment for the social and economic betterment of the entire state.

6. Develop an improved public safety and consumer protection system within the state.

7. Examine and reorganize state government to assure greater coordination and consolidation of governmental activities toward improving the quality of life in Alabama and insuring more efficient use of tax dollars.

8. Improve and extend social services to all citizens through increased government participation.

9. Promote the development of an improved, balanced transportation system (air, water, land) which emphasizes the use of existing facilities. Increase the quality and quantity of communications and utilization of facilities within Alabama.

10. Design and implement comprehensive recreational and cultural programs that provide indoor and outdoor recreational and leisuretime opportunities.

The data developed during the basin study will contribute most to the goals for three of these areas; Economic Development, Natural Resources and Conservation, and Recreation and Culture. These goals and subgoals are:

1. Economic Development

   Goal: Encourage economic development in Alabama at greater than the national average, but at the same time protect and conserve natural and human resources to the best extent possible.

   Subgoals:

   A. Upgrade the quality of the labor force through manpower development.

   B. Develop and enforce adequate controls on development to preserve economically productive lands and to prevent haphazard developments in unincorporated areas.

   C. Place major emphasis on the attracting of higher-wage industries which will diversify the industrial base of the economy.

   D. Develop state policy which will provide for the orderly and expanded economic growth of the state.

   E. Expand public financial support of economic planning and development activities.

2. Natural Resources and Conservation

   Goal: Develop natural resources programs which will enhance and protect the natural environment for the social and economic betterment of the entire state.

   Subgoals:

   A. Encourage the efficient use of existing resources and the protection of the natural, scenic environment.

   B. Develop plans for the reclamation of salvageable and recycleable materials from solid waste.

   C. Promote the wise use of environmental resources to meet the energy needs of the state, utilizing interstate cooperation and environmental education.

   D. Promote environmental quality through the adoption and enforcement of state standards to ensure proper land use and pollution control.

   E. Encourage public purchase of open space and beaches to preserve and ensure the best use of these resources for the public good.

F. Initiate programs to evaluate and review the environmental impact of existing and proposed development within the state.

G. Formulate and adopt differential tax structure legislation which will stimulate the development of energy resources while encouraging the efficient use of existing resources.

3. Recreation and Culture

Goal: Design and implement comprehensive recreational and cultural programs that provide indoor and outdoor recreational and leisure-time opportunities.

Subgoals:

A. Promote the improvement and development of parks and recreation centers.

B. Promote a system of complimentary recreational and cultural facilities.

C. Promote the development of varied, quality, outdoor recreation facilities.

D. Promote and advertise the scenic, recreational, and cultural facilities of Alabama.

The interrelationship between these state subgoals and Black Warrior Study Objectives is outlined in the following matrix:

Appendix Table 1

INTER-RELATIONSHIP BETWEEN SPECIFIC COMPONENTS OF MAJOR OBJECTIVES AND THE STATE'S PRELIMINARY SUBGOALS IN THREE FUNCTIONAL AREAS OF STATE GOVERNMENT.

STATE GOALS AND SUBGOALS

1. ECONOMIC DEVELOPMENT

GOAL: *Encourage economic development in Alabama at greater than the national average, but at the same time protect and conserve natural and human resources to the best extent possible.*

SUBGOALS:

A. Upgrade the quality of the labor force through manpower development.
B. Develop and enforce adequate controls on development to preserve economically productive lands and to prevent haphazard developments in unincorporated areas.
C. Place major emphasis on the attracting of high-wage industries which will diversify the industrial base of the economy.
D. Develop state policy which will provide for the orderly and expanded economic growth of the state.
E. Expand public financial support of economic planning and development activities.

2. NATURAL RESOURCES AND CONSERVATION

GOAL: *Develop natural resources programs which will enhance and protect the natural environment for the social and economic betterment of the entire state.*

SUBGOALS:

A. Encourage the efficient use of existing resources and the protection of the natural, scenic environment.
B. Develop plans for the reclamation of salvageable and recycleable materials from solid waste.
C. Promote the wide use of environmental resources to meet the energy needs of the state, utilizing interstate cooperation and environmental education.
D. Promote environmental quality through the adoption and enforcement of state standards to ensure proper land use and pollution control.
E. Encourage public purchase of open space and beaches to preserve and ensure the best use of these resources for the public good.
F. Initiate programs to evaluate and review the environmental impact of existing and proposed development within the state.
G. Formulate and adopt differential tax structure legislation which will stimulate the development of energy resources while encouraging the efficient use of existing resources.

3. RECREATION AND CULTURE

GOAL: *Design and implement comprehensive recreational and cultural programs that provide indoor and outdoor recreational and leisure-time opportunities.*

SUBGOALS:

A. Promote the improvement and development of parks and recreation centers.
B. Promote ■ system of complimentary recreational and cultural facilities and programs with emphasis on public library development.
C. Promote the development of varied, quality, outdoor recreation facilities.
D. Promote and advertise the scenic, recreational, and cultural facilities of Alabama.

MAJOR OBJECTIVE	NATIONAL ECONOMIC DEVELOPMENT (NED)					ENVIRONMENTAL QUALITY (EQ)							
COMPONENTS OF OBJECTIVE / STATE GOALS AND SUBGOALS	1. Increased or more efficient output of food and fiber. A. Improved efficiency of production and resulting agricultural income.	B. Increased forest production and utilization.	2. Urban flood damage reduction.	3. Increased and more efficient production of agricultural, municipal, and domestic water supply.	4. Increased output of outdoor recreational opportunities.	1. Improved quality aspects of water, land, and air.	A. Improved animal waste disposal.	B. Improved stream water quality.	C. Reduction in sedimentation.	D. Reduction in point source erosion.	2. Improvement, protection and/or preservation of areas of natural beauty for man's enjoyment. A. Protection of and increased access to scenic areas.	3. Enhancement of preservation of biological resources. A. Improved quality and increased quantity of fish and wildlife habitat.	B. Protection of rare and endangered species of flora and fauna.
1. ECONOMIC DEVELOPMENT													
A.													
B.	●	●	●	●	●								
C.				●									
D.	●	●	●		●								
E.													
2. NATURAL RESOURCES AND CONSERVATION													
A.	●	●	●	●	●		●	●	●	●	●	●	●
B.													
C.													
D.			●						●	●			
E.		●			●						●		
F.													
G.													
3. RECREATION AND CULTURE													
A.		●			●						●		
B.													
C.		●			●						●		
D.		●			●						●		

Appendix Table 2A--Maximum, minimum and average streamflow at selected gaging stations, Black Warrior River Basin

Location gaging station no.	Period of record	Drainage area	Streamflow Average			Maximum		Minimum	
		sq. mi.	cfs 1/	in./yr. 2/	csm 3/	cfs 1/	csm 3/	cfs 1/	csm 3/
Mulberry Fork near Garden City 02450000	48 1928-76	368	672	24.80	1.83	46,600	126.6	3.0	0.008
Sipsey Fork near Grayson 02450250	10 1966-76	91.3	173	25.73	1.89	20,300	222.3	1.8	0.020
Blackwater Creek Manchester 02453000	33 1938-71	188	300	21.67	1.60	10,600	56.4	1.3	0.007
Wolf Creek near Oakman 02454200	10 1959-69	89.1	134	20.42	1.50	9,820	110.2	0	0
Cove Spring near Walnut Grove 02454420	5 1969-74	spring	2.10			3.9		1.3	
Locust Fork near Cleveland 02455000	39 1936-76	309	524	23.03	1.69	47,000	152.1	2.3	0.007
Turkey Creek Morris 02456000	32 1944-76	81.5	132	21.99	1.62	15,600	191.4	8.5	0.104
Locust Fork Sayre 02456500	38 1928-31, 41-76	887	1,389	21.27	1.57	55,300	62.3	17	0.019
Village Creek near Adamsville 02460500	9 1953-58, 65, 73-76	84.1	169	22.26	2.01	19,700	234.2	0	0
Five Mile Creek Ketona 02457000	7 1953-58, 74-76	22.8	32.0	19.06	1.40	4,970	218.0	4.8	0.211
Davis Creek below Abernant 02462800	15 1956-70	45.2	68.7	20.64	1.52	5,800	128.3	0	0
Hurricane Creek near Holt 02463500	17 1952-69	108	146	18.36	1.35	16,800	155.6	1.7	0.015
North River near Samantha 02464000	23 1938-54, 68-76	219	378	23.44	1.73	25,500	116.4	0.1	0
North River near Tuscaloosa 02464500	17 1951-68	366	527	19.55	1.43	5,450	14.9	8.4	0.023

Appendix Table 2A--Maximum, minimum and average streamflow at selected gaging stations, Black Warrior River Basin (Continued)

Location gaging station no.	Period of record	Drainage area	Streamflow						
			Average			Maximum		Minimum	
		sq. mi.	cfs 1/	in./yr. 2/	csm 3/	cfs 1/	csm 3/	cfs 1/	csm 3/
Black Warrior River Northport 02465000	56 1894-02, 28-76	4,828	7,864	22.12	1.63	224,000	46.4	37	0.008
Lake Creek near Northport 02465200	14 1956-70	3.25	7.16	29.92	2.20	448	137.8	0.3	0.092
Five Mile Creek near Greensboro 02465500	17 1954-71	72.2	71.6	13.47	0.99	7,200	99.7	0.1	0.001
*Luxapallila Creek near Fayette 02442000	25 1945-70	127	207	22.13	1.63	12,300	96.9	21	0.165
*Shades Creek near Greenwood 02423630	10 1965, 1967-73, 1975-76	72.4	142	26.63	1.96	7,220	99.7	11	0.152

1/ cfs - Cubic feet per second is the rate of discharge representing a volume passing a given point during one second.

2/ In./yr. - Shows the depth to which the drainage area would be covered if all the flow for a given time period (1 yr.) were uniformly distributed on it.

3/ csm - Cubic Feet per second per square mile is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

*Study area outside hydrologic area.

Source: Water Resources Data for Alabama, various years, U. S. Geological Survey.

Appendix Table 2B - Water Area - 9 Whole Counties, Black Warrior River Basin, 1978.

County	Impoundments - Ac. Larger than 500 Ac.	40-500	5-40	Less than 5 Ac.	Natural	Subtotal Acres	Rivers & Streams Miles	Rivers & Streams Acres	Total acres
Blount	2,400	890	357	2,000	193	5,840	158	934	6,774
Cullman	8,640	404	275	3,940	276	13,535	145.5	574	14,109
Fayette	-	141	228	515	4,263	5,147	148.5	580	5,727
Greene	2,905	490	720	709	1,926	6,750	113	236	6,986
Hale	1,811	345	1,800	514	4,000	8,470	202	274	8,744
Jefferson	2,188	359	1,015	698	391	4,651	353	1,218	5,869
Tuscaloosa	11,138	1,278	912	1,282	6,130	20,740	203.5	802	21,542
Walker	2,800	163	125	1,000	540	4,628	167	983	5,611
Winston	10,400	42	97	538	251	11,328	139	307	11,635

Appendix Table 2C - Public water use by counties for 1975 1/

	Population served					Average water use (million gallons per day)					Per capita use (gallons per day)	
County	by ground water	by surface water	Total	No. of services	Persons per service	Ground water	Surface water	Resi-dential	Commer-cial and indus-trial	Total	Resi-dential	Total
Blount	8,425	821	9,246	3,779	2.4	.909	.260	1.014	.155	1.169	110	126
Cullman	350	33,300	33,650	10,756	3.1	.030	5.300	3.330	2.000	5.330	99	158
Fayette	1,580	4,400	5,980	2,268	2.6	.116	.570	.514	.172	.686	87	115
Greene	3,350	0	3,350	1,170	2.9	.276	0	.266	.010	.276	79	82
Hale	5,000	0	5,000	1,837	2.7	.995	0	.385	.610	.995	77	199
Jefferson	20,810	506,195	527,005	210,984	2.5	3.606	133.192	59.443	77.355	136.798	113	260
Tuscaloosa	20,550	69,330	89,880	34,492	2.6	2.838	18.175	12.656	8.357	21.013	141	234
Walker	1,675	27,748	29,423	11,857	2.5	.119	4.162	2.804	1.477	4.281	95	145
Winston	2,000	5,250	7,250	2,673	2.7	.162	.707	.694	.175	.869	96	120

1/ Whole county data for selected counties partially contained in the Black Warrior River Basin.

Appendix Table 2D - Residential and industrial water requirements by county for 1990 and 2020 (million gallons per day).

County	1990 Estimated withdrawal needs (mgd) 1/ Residential	1990 Estimated withdrawal needs (mgd) 1/ Industrial 2/	1990 Estimated consumption Total	2020 Estimated withdrawal needs (mgd) 1/ Residential	2020 Estimated withdrawal needs (mgd) 1/ Industrial 2/	2020 Estimated consumption Total
Blount	2.6	8.4	.8	6.3	20.7	1.9
Cullman	9.3	9.0	1.4	20.5	22.5	3.4
Fayette	3.6	15.1	1.3	7.0	32.6	2.8
Greene	.9	1,593.2	95.7	2.1	3,470.6	208.4
Hale	3.0	2.7	.5	7.2	6.4	1.1
Jefferson	172.3	421.9	42.5	374.2	921.5	92.7
Tuscaloosa	23.8	127.6	10.0	58.7	316.9	24.9
Walker	5.9	4,567.9	274.7	14.5	7,297.1	438.7
Winston	1.3	1.1	.2	2.9	2.6	.4

1/ MGD - millions of gallons per day
2/ Includes thermoelectric plant requirements for Greene and Walker Counties.

Appendix 3
Reservoir Site Availability Study, Black Warrior River Basin
Methodology of Potential Reservoir Site Study

This study is an inventory of available reservoir sites in the Black Warrior River Basin. Appendix table 3A presents some statistics of each site concerning location, size of drainage area and storage capability. No attempt was made to locate and identify every possible site but rather to select the better sites within an area.

Topographic quadrangle maps of a scale of 1:24,000 were used to locate potential reservoir sites. Copies of portions of the quadrangle maps showing the location of the potential site were transmitted to the local SCS district conservationist for his review. He determined whether the site had already been committed to other irreversible uses or contained strategic facilities such as major highways, utility lines, mining operations or other uses where the removal or relocation would be impractical. No on-site visits or engineering surveys were made. Therefore, some unknown features such as sinks, faults, roads, power lines, buildings and other improvements or obstacles could exist in the reservoir site.

Consideration of topography, land use, fixed improvements, known geographical features and proximity to urban or built-up areas was given during site selection. Location for a particular need was not a consideration.

The quadrangle maps were used to compute the drainage area and to develop a table of values of site storage and probable area flooded for each site. Curves were plotted depicting stage versus storage and corresponding area flooded for each site. A probable maximum storage pool elevation was selected based on a study of the quadrangle sheet and the characteristics of the stage versus storage curves for the particular site. The net beneficial storage pool elevation was determined by subtracting a flood storage volume from the maximum storage volume of each site. The flood storage volume was computed by the formula:

$$f = \frac{\text{runoff in inches from a 100-yr.-24-hr. storm X drainage area acres}}{12}$$

expressed in acre-feet using a Condition II Curve Number (CN) = 80 and the 100-yr.-24-hr. rainfall value for the county where the site is located.

The elevation of the top of dam was established by adding three feet to the maximum storage pool elevation. The beneficial storage pool volume also contains the submerged sediment volume. That is, the amount of sediment storage for each site has not been calculated. When a particular site is to be utilized for some use of water storage the volume of sediment would need to be calculated based on anticipated land use in the watershed during the lifetime of the proposed impoundment.

The reliability of the reservoir data depend upon the accuracy and scale of the quadrangle maps. In spite of this weakness, information derived from these maps is quite valuable. They offer the resource planner a significant advantage in terms of the level or plateau of information for a given area that otherwise would be quite costly to obtain by other means.

Appendix Table 3A - Statistics of Potential Reservoir Sites, by Counties, Black Warrior River Basin - 1975

Site no. 1/	Site location stream, township, range, section	Quadrangle sheet Name	Quadrangle sheet Size 2/	Drainage area Acres	Drainage area Sq. miles	STRUCTURAL DATA Storage capacity - Ac. Ft. Beneficial	Storage capacity - Ac. Ft. Floodwater 3/	Storage capacity - Ac. Ft. Total	Surface area ac. Beneficial pool	Surface area ac. Flood pool	Elevation - MSL 4/ Beneficial pool	Elevation - MSL 4/ Emergency spillway	Elevation - MSL 4/ Top of dam	Height of dam ft.
	Blount County													
1	Woodard Creek, T13S, R2E, Sec. 19	Oneonta	7½'	3,810	5.95	7,013	1,784	8,797	265	301	893	900	903	70
2	Brasher Creek, T13S, R2E, Sec. 23	Oneonta	7½'	3,686	5.76	5,854	1,726	7,580	160	190	1,051	1,060	1,063	83
	Cullman County													
3	Brindley Creek, T9S, R2W, Sec. 21	Cullman	7½'	6,020	9.41	7,383	2,819	10,202	282	338	811	820	823	65
4	Duck River, T10S, R1&2W, Sec. 7&12	Simcoe	7½'	23,645	36.95	7,862	11,073	18,935	280	546	692	720	723	113
5	Vest Creek, T10S, R4W, Sec. 23&24	West Point	7½'	5,707	8.92	6,527	2,673	9,200	225	275	710	720	723	81
	Fayette County													
6	Beaver Creek, T15S, R10W, Sec. 18	Berry	7½'	4,556	7.12	8,015	2,240	10,255	310	363	453	460	463	73
7	Clear Creek, T15S, R11W, Sec. 26	Bankston	7½'	4,225	14.41	13,843	4,535	18,378	560	675	452	460	463	71
[illegible]	Deadwater Creek, T16S, R11W, Sec. 10	Bankston	7½'	4,019	6.28	5,084	1,976	7,060	220	267	412	420	423	59
9	Bear Creek, T17S, R12W, Sec. 30	Newtonville	7½'	8,979	14.03	4,801	4,415	9,216	430	624	331	340	343	35
	Greene County													
10	Brush Creek, T22N, R1E, Sec. 11&12	Eutaw N.W.	7½'	3,736	5.84	6,405	2,045	8,450	550	643	198	200	203	43
11	Brush Creek, T22N, R2E, Sec. 7, 17&18	Eutaw N.W.	7½'	6,060	9.47	4,867	3,318	8,185	475	634	194	200	203	33
	Hale County													
12	Trib. of Big Prairie Cr., T29N, R5E, Sec. 22	Greensboro S.E.	7½'	2,304	3.60	1,759	1,261	2,010	280	388	176	180	183	23
13	Whitsitt Cr. T20N, R5E, Sec. 36	Greensboro N.E.	7½'	2,112	3.30	1,495	1,156	2,651	129	196	220	227	230	37
	Hale & Perry County													
14	Little Brush Cr., T21N, R6E, Sec. 28	Mertz S.W.	7½'	6,912	10.80	4,606	3,842	8,448	420	592	260	267	270	38
	Hale County													
15	Trib. of Five Mile Cr., T22N, R5E, Sec. 14	Powers N.E.	7½'	4,544	7.10	4,122	2,488	6,610	361	508	240	246	249	34
16	Five Mile Cr., T22N, R6E, Sec. 17	Mertz N.W.	7½'	4,992	7.80	2,575	2,733	5,308	243	448	240	251	254	36
17	Gabriel Cr. T23N, R5E, Sec. 31	Powers N.E.	7½'	5,568	8.70	3,408	3,048	6,456	296	475	200	208	211	39
18	Elliotts Cr., T23N, R5E, Sec. 2 & 11	Powers N.E.	7½'	14,413	22.52	10,360	7,891	18,251	562	850	240	252	255	55
	Jefferson County													
19	Crooked Cr., T15S, R3W, Sec. 17	Gardendale	7½'	8,831	13.80	14,724	4,416	19,140	685	716	398	400	403	65

Appendix Table 3A - Statistics of Potential Reservoir Sites, by Counties, Black Warrior River Basin - 1975 (con't)

Site no. 1/	Site location stream, township, range, section	Quadrangle sheet Name	Quadrangle sheet Size 2/	Drainage area Acres	Drainage area Sq. miles	Storage capacity - Ac. Ft. Beneficial	Storage capacity - Ac. Ft. Floodwater 3/	Storage capacity - Ac. Ft. Total	Surface area ac. Beneficial pool	Surface area ac. Flood pool	Elevation - MSL 4/ Beneficial pool	Elevation - MSL 4/ Emergency spillway	Elevation - MSL 4/ Top of dam	Height of dam ft.
	Marshall County													
20	Slab Cr., T9S, R3E, Sec. 32	Douglas	7½'	27,676	43.24	28,219	12,316	40,535	1,095	1,592	851	860	863	111
	Perry County													
21	Polecat Cr., T20N, R7E, Sec. 7	Marion N.W.	7½'	2,240	3.50	2,197	1,245	3,442	157	230	320	327	330	43
22	Brush Cr., T21N, R7E, Sec. 17 & 20	Mertz S.W.	7½'	9,728	15.20	6,115	5,407	11,522	560	727	293	300	303	38
	Tuscaloosa County													
23	Tyro Cr., T17S, R10W, Sec. 15	Berry S.E.	7½'	13,059	20.40	11,960	6,736	18,696	560	700	351	360	363	75
24	Dry Cr., T18S, R10W, Sec. 35	Samantha N.E.	7½'	4,859	7.59	8,142	2,506	10,648	257	308	320	331	334	87
25	Binion Cr., T18S, R11W, Sec. 8	New Lexington	7½'	5,165	8.07	4,240	2,664	6,904	335	468	330	336	339	39
26	Gin Cr., T19S, R11W, Sec. 11	Samantha N.W.	7½'	5,978	9.34	3,876	3,084	6,960	319	480	280	289	292	40
27	Yellow Cr., T20S, R9W, Sec. 3	Lake Nicol	7½'	10,224	15.98	8,061	5,274	13,335	310	434	344	360	363	73
28	Box Cr., T20S, R12W, Sec 21	Elrod	7½'	10,247	16.01	5,926	5,286	11,212	503	1,064	260	270	273	41
29	Hurricane Cr., T21S, R7W, Sec. 18	Coaling	7½'	18,484	28.88	12,541	9,535	22,076	350	904	381	400	403	68
30	McCracken Cr., T24N, R3E, Sec. 15	Ralph	7½'	2,144	3.35	1,330	1,106	2,436	123	230	180	185	188	33
31	Buck Cr., T24N, R3E, Sec. 16	Ralph	7½'	2,780	4.34	3,400	1,434	4,834	290	364	196	201	204	32
	Walker County													
32	Little Spring Cr., T13S, R7W, Sec. 3	Manchester	7½'	3,365	5.26	3,014	1,629	4,643	204	250	500	506	509	42
33	Spring Cr., T13S, R7W, Sec. 5	Manchester	7½'	4,535	7.09	3,960	2,196	6,156	259	385	500	506	509	42
	Winston County													
34	Beech Cr., T9S, R7W, Sec. 6	Grayson	7½'	6,723	10.50	6,592	3,149	9,741	354	445	660	670	673	50
35	Berry Cr., T10S, R9W, Sec. 5	Haleyville E	7½'	3,466	5.42	4,382	1,623	6,005	231	285	700	706	709	46
36	Tanyard Cr., T10S, R9W, Sec. 30	Haleyville E	7½'	3,599	5.62	4,146	1,686	5,832	207	256	700	710	713	61
37	Browns Cr., T11S, R9W, Sec. 17	Lynn	7½'	3,899	6.09	3,530	1,826	5,356	257	328	600	606	609	39
38	Splunge Cr., T11S, R10W, Sec. 25	Lynn	7½'	14,311	22.36	17,790	6,702	24,492	987	1,180	580	588	591	44
39	Browns Cr., T12S, R9W, Sec. 3	Poplar Spr	7½'	5,987	9.35	4,520	2,803	7,323	428	556	550	556	559	39

1/ Site numbers correspond to numbers on location map of potential reservoir sites, Volume 1.
2/ 7½' indicates 7½ minute quadrangle sheets prepared by USGS or TVA.
3/ Floodwater storage was computed by the formula $\frac{\text{100 yr.-24 hr. storm runoff in inches x drainage area acres}}{12}$

4/ MSL is approximate elevation in respects to mean sea level expressed in feet.

Appendix 4
Ground Water Aquifer Descriptions

Introduction

Aquifers of the Black Warrior River Basin are in the Conasauga Formation of Cambrian age; an undifferentiated sequence of limestone and dolomite of Cambrian and Ordovician ages; the Fort Payne Chert, Tuscumbia Limestone, Monteagle Limestone, Pride Mountain Formation, Hartselle Sandstone and Bangor Limestone of Mississippian age; the Pottsville Formation of Pennsylvanian age; and the Tuscaloosa Group and the Eutaw Formation of Cretaceous age. In some areas of the basin, additional aquifers may be utilized by wells drilled deeper than the shallowest aquifer.

Conasauga Formation

The Conasauga Formation is present in the Birmingham-Big Canoe Valley and consists of interbedded limestone and shale. Ground water exists in the formation in solution cavities formed along bedding planes, joints and faults in the limestone, and in interstices of the residual soils overlying the bedrock. The shales are impermeable and generally do not yield water to wells.

Yields of wells developed in the Conasauga vary significantly, depending on the size, extent and degree of interconnection of the water-filled openings. Most of the usable ground water in the formation occurs generally at depths of less than 300 feet, although in the Birmingham area some producing wells have been drilled to depths of 600 feet or more (table 4-A). Most of the wells developed in the Conasauga yield water supplies adequate for domestic or stock needs, and some are capable of yielding a few hundred gallons per minute, which should be adequate for many industrial or municipal needs (table 4-A). Springs discharging from the formation flow at a rate of a few gallons per minute to several thousand gallons per minute (table 4-A).

The water in the formation is of fairly good quality. Table 4-B lists the ranges of concentration of several chemical parameters and physical characteristics as determined for water samples collected from the Conasauga Formation at various locations in Jefferson County.

Limestone and Dolomite of Cambrian and Ordovician Ages

The Ketona, Copper Ridge, and Chepultepec Dolomites and the Longview, Newala, Odenville, Little Oak and Chickamauga Limestones have similar lithologic and water-bearing characteristics and are considered as a single aquifer in the Sequatchie, Birmingham-Big Canoe, Murphrees, Wills and Cahaba Valleys. Ground water in this aquifer exists in solution cavities formed along bedding planes, joints and faults and in interstices of the residual soils overlying the bedrock.

The residual soil has an average depth of about 75 feet and is usually a good source of water for dug wells. The average depth of the water table in areas underlain by this undifferentiated sequence is 45 feet, and usable quantities of water generally occur at depths of less than 300 feet (table 4-C).

Wells developed in this sequence yield from 3 to over 700 gallons per minute, and springs flow at a rate of from 10 to over 3,000 gallons per minute (table 4-C). The water is usually of good quality, although in some areas it may be very hard or have a high iron content (table 4-D).

Aquifers in Mississippian Rocks

The Mississippian rock units in the Black Warrior River Basin are the Fort Payne Chert, Tuscumbia Limestone, Monteagle Limestone, Pride Mountain Formation, Hartselle Sandstone, Bangor Limestone, Floyd Shale and Parkwood Formation. Ground water occurs in solution cavities formed along bedding planes, joints, and faults of the limestone in the Fort Payne Chert, Tuscumbia Limestone, Monteagle Limestone, Pride Mountain Formation and Bangor Limestone, and in the interstices of the Hartselle Sandstone and residual soils overlying bedrock. The shales of the Pride Mountain Formation, Parkwood Formation and Floyd Shale are impermeable and generally do not yield water to wells.

In the Birmingham-Big Canoe, Sequatchie, Wills, Murphrees, and Cahaba Valleys, the formations of Mississippian age are thin and of limited areal extent. They have been shown in figure 8 as Mississippian undifferentiated. The Fort Payne Chert and Tuscumbia Limestone are important aquifers in many areas of the valleys. Wells penetrating these two formations can produce as much as 500 gallons per minute. The Monteagle Limestone is a very productive aquifer that occurs only in a limited area of extreme northern Cullman County. The Hartselle Sandstone is a dependable aquifer where it is exposed, and drilled wells in the sandstone generally yield quantities of water sufficient for domestic needs. The water-bearing characteristics of the Bangor Limestone are often related to topography. Wells of large capacity are possible in low areas and along stream valleys. Also, in the northern extremity of the Warrior Basin district, the Bangor is a major aquifer where it underlies the Pottsville Formation at a depth of 300 feet or less.

Generally, wells in the aquifers of the formations of Mississippian age should be drilled to depths of 300 feet or less. Although water has been produced from greater depths, the chances for a successful well deeper than 300 feet are remote.

Discharge rates of up to 1,000 gallons per minute and flows of up to 3,600 gallons per minute have been measured for wells and springs that produce water from the aquifers in rocks of Mississippian age (tables 4-E and 4-F). The water is generally of good quality (tables 4-G and 4-H).

Pottsville Formation

The Pottsville Formation of Pennsylvanian age consists of interbedded coal, shale, siltstone, and sandstone and is present in the Warrior Basin, Blount Mountain, Sand Mountain and Cahaba Ridge districts. Ground water in the formation exists in interstices of the sandstone and residual soils, and in openings along joints, faults and bedding planes. Except where extensively fractured, the coal, shale, and siltstone are impermeable and usually do not yield water to wells.

The water table in the Pottsville ranges from 10 to 50 feet below the surface, and usable quantities of ground water, although generally occurring at depths of 200 feet or less, can be produced at some localities from depths of as much as 1,800 feet (table 4-I).

The overall quality of water from the Pottsville is good (table 4-J). However, in some areas the water may contain excessive quantities of iron, and, where the water is in contact with coal beds, the presence of hydrogen sulfide may cause the water to be corrosive.

The Pottsville generally yields small quantities of water. Yields to most wells are less than 10 gallons per minute, but some exceptional wells produce in excess of 100 gallons per minute (table 4-I).

Tuscaloosa Group

The Coker and Gordo Formations of the Tuscaloosa Group are present in the Fall Line Hills district. The formations contain beds of sand, sand and gravel, and clay. Ground water exists in the interstices of the sand, and sand and gravel beds. The clay is impermeable and generally does not yield water to wells.

In areas where the sand and sand and gravel beds are not confined by clay, the aquifer is under water-table conditions. During periods of extensive rainfall, the water table will rise to the surface and during periods of low rainfall the water table will decline to several feet below the surface. In down-dip area water is confined by the impermeable clay beds and gravity pressure produces artesian conditions. Under artesian conditions water will rise in wells above the level at which the aquifer was penetrated and may even rise to levels above the land surface, thereby producing a flowing well (table 4-K).

The quantity and chemical quality of water in the Tuscaloosa Group is generally good (tables 4-K and 4-L). The water is usually satisfactory for domestic and municipal use.

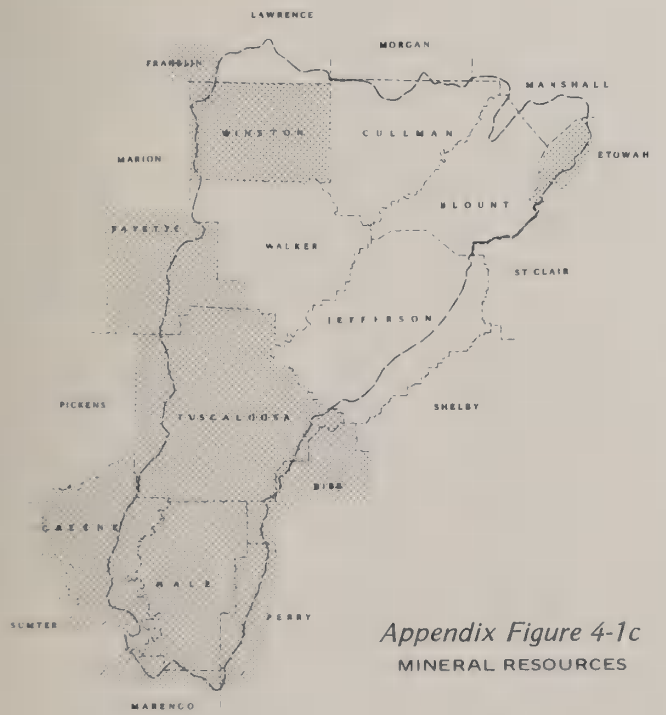
Eutaw Formation

The Eutaw Formation is present throughout the southern half of the Fall Line Hills and underlies the chalk beds of the Black Prairies district in the southern part of the Black Warrior River Basin. The Eutaw generally consists of silt, clay, and sand beds.

Ground water exists in the interstices of the sand beds, whereas the silt and clay beds and overlying chalk are impermeable and generally do not yield water to wells. The most important aquifer is a thick bed of sand in the basal part of the formation. Other, less productive, thin beds of sand are present throughout the formation. The water table fluctuates in response to variation in rainfall, and artesian conditions occur in the extreme southern areas of Greene and Hale Counties. Water from the Eutaw Formation is generally satisfactory for domestic, industrial, and agricultural uses (tables 4-M and 4-N).

Appendix Figure 4-1a
WATER RESOURCES

Appendix Figure 4-1b
GEOLOGY



Appendix Figure 4-1c
MINERAL RESOURCES

Appendix Figures
4-1a, 4-1b, 4-1c

PUBLISHED MAPS FOR COUNTIES IN THE BLACK WARRIOR RIVER BASIN ALABAMA

Publications may be ordered from:

Publication Sales
Geological Survey of Alabama
P. O. Drawer O
University, AL 35486

With order, please enclose check or money order payable to: Map Fund, Geological Survey of Alabama. Those publications out-of-print may be perused in the library of the Geological Survey.

Appendix table 4A -- Data for wells in, and springs discharging from the Conasauga Formation in Jefferson County 1/

Wells				Springs	
No. of wells	Range in depth (ft)	Range in water level (+ when above land surface)	Range in discharge (gpm) 2/	Number of springs	Range in flow (gpm) 2/
19	30-622	3-90	7-300	5	60-3,505

Appendix table 4B -- Data for wells in, and springs discharging from, the limestone and dolomite sequence of Cambrian and Ordovician ages in the Black Warrior River Basin area.

	Wells				Springs	
County	No. of wells	Range in depth (ft)	Range in water level (+ when above land surface)	Range in discharge (gpm) 2/	Number of springs	Range in flow (gpm) 2/
Bibb 3/	1	126	86	25	1	750
Blount 4/	6	31-353	20-130	30-320	6	15-370
Etowah 5/	23	23-260	2.1-103	-	-	-
Jefferson 1/	71	20-540	1.6-119.1	3-750	20	10-3,100

Appendix 4C -- Data for wells in, and springs discharging from, beds of Mississippian age in the Black Warrior River Basin area.

	Wells				Springs	
County	No. of wells	Range in depth (ft)	Range in water level (+ when above land surface)	Range in discharge (gpm) 2/	Number of springs	Range in flow (gpm) 2/
Blount 4/	12	53-300	10-100	1-1,080	5	5-3,670
Etowah 5/	8	39-170	4.5-41.9	-	1	250
Jefferson 1/	67	40-561	+2-94.2	4-1,100	4	30-800

1/ From Knight, 1976, and Moffett and Moser, 1978.
2/ gpm - gallons per minute.
3/ From Causey, Willmon and Ellard, 1978.
4/ From Faust, 1978.
5/ From Causey, 1961.

Appendix Table 4D -- Ranges of concentrations of several chemical parameters and other physical characteristics determined for water samples collected from the Conasauga Formation in Jefferson County from Knight, 1976, and Moffett and Moser, 1978).

	Milligrams per liter													Hardness as $CaCO_3$				
Number of wells and springs for which chemical analyses are available	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Total	Noncarbonate	Specific conductance in micromhos at 25°C	pH	Temperature °C
11	6.8-11	0-1.4	27-120	4.3-37	1.3-61	0.9-9	110-330	0	7.8-96	0-112	0-0.1	1.1-20	108-582	94-392	0-153	180-963	6.9-7.7	15-21.5

Appendix Table 4E -- Ranges of concentrations of several chemical parameters and other physical characteristics determined for water samples collected from the limestone and dolomite sequence of Cambrian and Ordovician ages in the Black Warrior River Basin area.

		Milligrams per liter																	
															Hardness as $CaCO_3$				
County	Number of wells and springs for which chemical analyses are available	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Total	Noncarbonate	Specific conductance in micromhos at 25°C	pH	Temperature °C
Bibb[1]	2	9.4	.02	34	9.7	1.2	-	150	0	1.2	1.6-9.6	0	1.3	131	125-148	2-23	237-315	8.2	-
Blount[2]	7	-	0.03-0.28	-	-	-	-	68-170	0	-	0.8-40	-	-	-	70-150	0-56	133-374	7.0-8.0	14-18
Etowah[3]	99										2-74				6-310				
	8	-	0.06-0.49	8-133	3.6-63	0.7-98	-	4-304	0	1.6-395		0.1-3.2	0-18	-		0-40	23-1420	7.1-7.5	16
Jefferson[4]	27	3.8-14	0-1.1	16-64	1.1-36	0.2-6.2	0.3-1.9	12.3-388	0	Tr-14	0.6-9.9	0-0.2	0.2-15	79-310	9-310	0-21	114-529	6.6-7.8	14-18

[1]From Causey, Willmon and Ellard, 1978.
[2]From Faust, 1978.
[3]From Causey, 1961.
[4]From Knight, 1976, and Moffett and Moser, 1978.

Appendix Table 4F -- Ranges of concentrations of several chemical parameters and other physical characteristics determined for water samples collected from beds of Mississippian age in the Black Warrior River basin area

County	Number of wells and springs for which chemical analyses are available	Milligrams per liter													Hardness as $CaCO_3$		Specific conductance in micromhos at 25°C	pH	Temperature °C
		Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Total	Noncarbonate			
Blount[1]	14	-	0.03-1.8	-	-	-	-	32-1[illegible]8	0	-	1.6-60	-	-	-	28-168	1-30	62-453	6.7-7.9	14-18
Etowah[2]	25	-	-	-	-	-	-	-	-	-	4-32	-	-	-	14-264	-	-	-	-
	2	-	0.04-2.6	12-35	2.1-8.3	1.9-30	-	109-142	0	1.6-8.4	-	0.1-0.3	0-0.9	-	-	0-6	197-250	7.2-7.3	15
Jefferson[3]	27	1.8-29	0-6.9	1.4-71	0.4-55	0.6-242	0.2-3.4	6-427	0-23	2.5-295	0-51	0-2	0-22	48-675	6-403	0-48	20-1,010	5.7-8.8	13-21

[1]From Faust, 1978.
[2]From Causey, 1961.
[3]From Harris and McMaster, 1965.

Appendix Table 4G -- Ranges of concentrations of several chemical parameters and other physical characteristics of water samples collected from the Bangor Limestone in the Black Warrior River basin area

County	Number of wells and springs for which chemical analyses are available	Milligrams per liter															Specific conductance in micromhos at 25°C	pH	Temperature °C
															Hardness as $CaCO_3$				
		Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Total	Noncarbonate			
Blount[1]	4		0.06-4.5					158-240	0		1.4-3.2				92-162	0-4	247-363	7.3-8.1	17
Jefferson[2]	4	6.2-11	0-0.33	30-90	1.1-6.5	1.8-11	0.4-1.5	84.6-220	0	3.2-17	2.2-11	0-0.27	0.8-16	97-263	80-250	2-70	167-500	6.9-7.6	16.5-17
Lawrence[3]	143	-	-	-	-	-	-	-	-	-	4-145	-	-	-	40-1,310	-	-	-	16.5-18.3
Marshall[4]	2	-	-	-	-	-	-	-	-	-	1-4	-	-	-	61-124	-	115-247	7.5-7.6	15-16.5
Winston[5]	2	19-25	0.4-0.83	36-	4.2-7.3	9.6-14	1.2-1.3	141-143	0	8.6-11	1.4-3.7	0.1-0.2	0-0.1	149-159	95-107	0	246-249	6.8-6.9	-

[1]From Faust, 1978.
[2]From Knight, 1976, and Moffett and Moser, 1978.
[3]From Harris and McMaster, 1965.
[4]From Sanford, 1966.
[5]From Wahl, Harris and Jefferson, 1971.

Appendix table 4H -- Data for wells in, and springs discharging from, the Pottsville Formation in the Black Warrior River Basin area.

County	Wells				Springs	
	No. of wells	Range in depth (ft)	Range in water level (+ when above land surface)	Range in discharge (gpm) 6/	Number of springs	Range in flow (gpm) 6/
Blount 1/	48	36-735	+20-184	3-150	3	6-30
Cullman 2/	156	22.4-600	1.6-180	1-200	-	-
Etowah 3/	73	27-252	+0.8-51.8	-	-	-
Fayette 4/	64	8-1,000	1-357	2-125	-	-
Jefferson 5/	14	51-1,862	0-77	1-165	-	-
Lawrence 6/	23	17.5-111	1.5-51	-	5	2.5
Marshall 7/	159	21-470	7-131	1-300	-	-
Tusca-loosa 8/	17	90-320	14.2-190	3-28	-	-
Walker 9/	73	63-700	2.5-175	1-50	-	-
Winston 10/	89	26-1,500	6-200	3-160	-	-

1/ From Faust, 1978.
2/ From Faust and Jefferson, 1978.
3/ From Causey, 1961.
4/ From Knight, 1972.
5/ From Knight, 1976, and Moffett and Moser 1978.
6/ From Harris and McMaster, 1965.
7/ From Sanford, 1966.
8/ From Paulson, Miller and Drennen, 1962.
9/ From O'Rear, Wahl, and Jefferson, 1972.
10/ From Wahl, Harris and Jefferson, 1971.
11/ gpm - gallons per minute.

Appendix Table 4I -- Ranges of concentrations of several chemical parameters and other physical characteristics determined for water samples collected from the Pottsville Formation in the Black Warrior River basin area

County	Number of wells and springs for which chemical analyses are available	Milligrams per liter															Specific conductance in micromhos at 25°C	pH	Temperature °C
															Hardness as $CaCO_3$				
		Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Total	Noncarbonate			
Blount[1]	46	-	0.05-44	-	-	-	-	2-368	0-30	-	1.2-23	-	-	-	10-265	0-34	29-698	5.7-8.7	15-19
Cullman[2]	156	5.2-21.6	0-19	13-47.5	1.5-65	7.6-177	0.7-11	0-356	0-16	0.2-166	1.0-212	0-0.2	-	117-807	8-374	0-151	36-1,180	3.9-8.6	16-18
Etowah[3]	113	-	-	-	-	-	-	-	-	-	2-78	-	-	-	10-214	-	-	-	-
	4	-	0-3.3	1.2-12	2.2-54	2.3-6.6	-	11-75	0	1.2-33	-	0.1-0.2	0-4.4	-	-	0-28	41-129	4.9-7	16
Fayette[4]	38	-	0.01-21	6-42	0.9-19	0.6-217	0.2-4.3	12-420	0-16	0.2-33	1.1-1,660	0.2-0.5	0-242	24-579	5-792	0-659	16-5,160	6.4-8.7	15-19
Jefferson[5]	10	9.8-33	0.19-2.9	2.8-45.2	1.9-14	3.6-100	0.9-3.2	14-287	0	4.2-37	2.4-50	0-0.4	0-1.1	37-311	15-157.8	0-32	69-510	5.6-8.2	16-19
Lawrence[6]	54	-	-	-	-	-	-	-	-	-	4-117	-	-	-	8-158	-	-	-	14.5 17.2
Marshall[7]	159	-	-	-	-	-	-	-	-	-	1-125	-	-	-	3-159	-	31-426	4.2-8.5	16.5-18.3

[1]From Faust, 1978.
[2]From Faust and Jefferson, 1978.
[3]From Causey, 1961.
[4]From Knight, 1972.
[5]From Knight, 1976, and Moffett and Moser, 1978.
[6]From Harris and McMaster, 1965.
[7]From Sanford, 1966.

Appendix table 4J -- Data for wells in, and springs discharging from, the Tuscaloosa Group in the Black Warrior River Basin Area.

	Wells				Springs	
County	No. of wells	Range in depth (ft)	Range in water level (+ when above land surface)	Range in discharge (gpm) 8/	Number of springs	Range in flow (gpm) 8/
Bibb 1/	6	82-210	121-281	-	-	-
Fayette 2/	61	15-250	2.9-123	0.06-40	19	0.06-5.0
Greene 3/	47	200-1300	+21-170	0.1-72	-	-
Hale 4/	66	28-1200	+4-117	0.5-33.5	2	0.5-1.33
Perry 5/	40	9.2-774	+40-115	3-240	-	-
Tuscaloosa 6/	84	54-598	+18-204	3-265	-	-
Winston 7/	-	-	-	-	1	83

1/ From Causey, Willmon and Ellard, 1978.
2/ From Knight, 1972.
3/ From Wahl, 1966.
4/ From Davis, Sanford and Jefferson, 1975.
5/ From Reed, Willmon, and Jefferson, 1972.
6/ From Paulson, Miller and Drennen, 1962.
7/ From Wahl, Harris, and Jefferson, 1971.
8/ gpm - gallons per minute.

Appendix Table 4K -- Ranges of concentrations of several chemical parameters and other physical characteristics determined for water samples collected from the Tuscaloosa Group in the Black Warrior River area

County	Number of wells and springs for which chemical analyses are available	Milligrams per liter															Specific conductance in micromhos at 25°C	pH	Temperature °C
		Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$: Total	Hardness as $CaCO_3$: Noncarbonate			
Bibb[1]	6	-	0.18-32	-	-	-	-	4-36	0	-	0.6-42	-	-	-	5-32	0-9	24-78	5.8-7.3	-
Fayette[2]	53	-	0.01-21	-	-	-	-	1-120	0	-	0.1-32	-	-	-	3-110	0-35	18-231	3.6-7.6	16-20
	10	6.6-31	-	0.9-2	0.7-45	1.5-18	1.2-7	-	-	0.4-61	-	0-0.4	0-6.3	28-119	-	-	-	-	-
Greene[3]	47	-	0.03-24	-	-	-	-	8-336	0-14	-	4-3,700	-	-	-	9-558	0-379	-	6.3-8.8	18-24
Hale[4]	66	-	0.06-9.5	-	-	-	-	4-138	0	-	2-500	-	-	-	8-308	0-260	45-457	5.7-8.4	17-21
	6	8.3-13	-	2-34	1.6-5.8	2.4-69	-	-	-	0.6-7.6	-	0.1	0-0.1	69-257	-	-	-	-	-

[1]From Causey, Willmon and Ellard, 1978.
[2]From Knight, 1972.
[3]From Wahl, 1966.
[4]From Davis, Sanford, and Jefferson, 1975

Appendix table 4L -- Data for wells in, and springs discharging from the Eutaw Formation in the Black Warrior Basin area.

County	Wells				Springs	
	No. of wells	Range in depth (ft)	Range in water level (+ when above land surface)	Range in discharge (gpm) 4/	Number of springs	Range in flow (gpm) 4/
Greene 1/	165	15-900	+36-140	1-60	-	-
Hale 2/	209	18-970	+146-131	1-28	-	-
Perry 3/	63	13.3-950	3.7-189	0.7-510	1	43

1/ From Wahl, 1966.
2/ From Davis, Sandford and Jefferson, 1975.
3/ From Reed, Willmon and Jefferson, 1972.
4/ gpm - gallons per minute.

Appendix Table 4M -- Ranges of concentrations of several chemical parameters and other physical characteristics determined for water samples collected from the Eutaw Formation in the Black Warrior River basin area

County	Number of wells and springs for which chemical analyses are available	Milligrams per liter													Hardness as $CaCO_3$		Specific conductance in micromhos at 25°C	pH	Temperature °C
		Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Total	Noncarbonate			
Greene[1]	165	-	0-11	-	-	-	-	10-656	0-100	-	3.8-3,530	-	-	-	8-482	0-346	-	6.1-9.6	18-23
Hale[2]	209		0-14					2-574	0-26		0-1,110				2-278	0-160	29-1,470	5.4-8.9	17-25.5
	5	4.8-36		0.4-22	0-14	1.3-299	1.2-3.5			0.8-10		0-0.3	0-0.1	93-775					
Perry[3]	64		0-4.6					7-491	0-20		0.2-76				4-188	0-33	27-936	5.8-8.8	16-27
	5	6-42		1-28	0.4-76	0.7-47	-			0-7.6		0-2	0-0.4	111-369					

[1]From Wahl, 1966.
[2]From Davis, Sanford and Jefferson, 1975.
[3]From Reed, Willmon and Jefferson, 1972.

Appendix 5

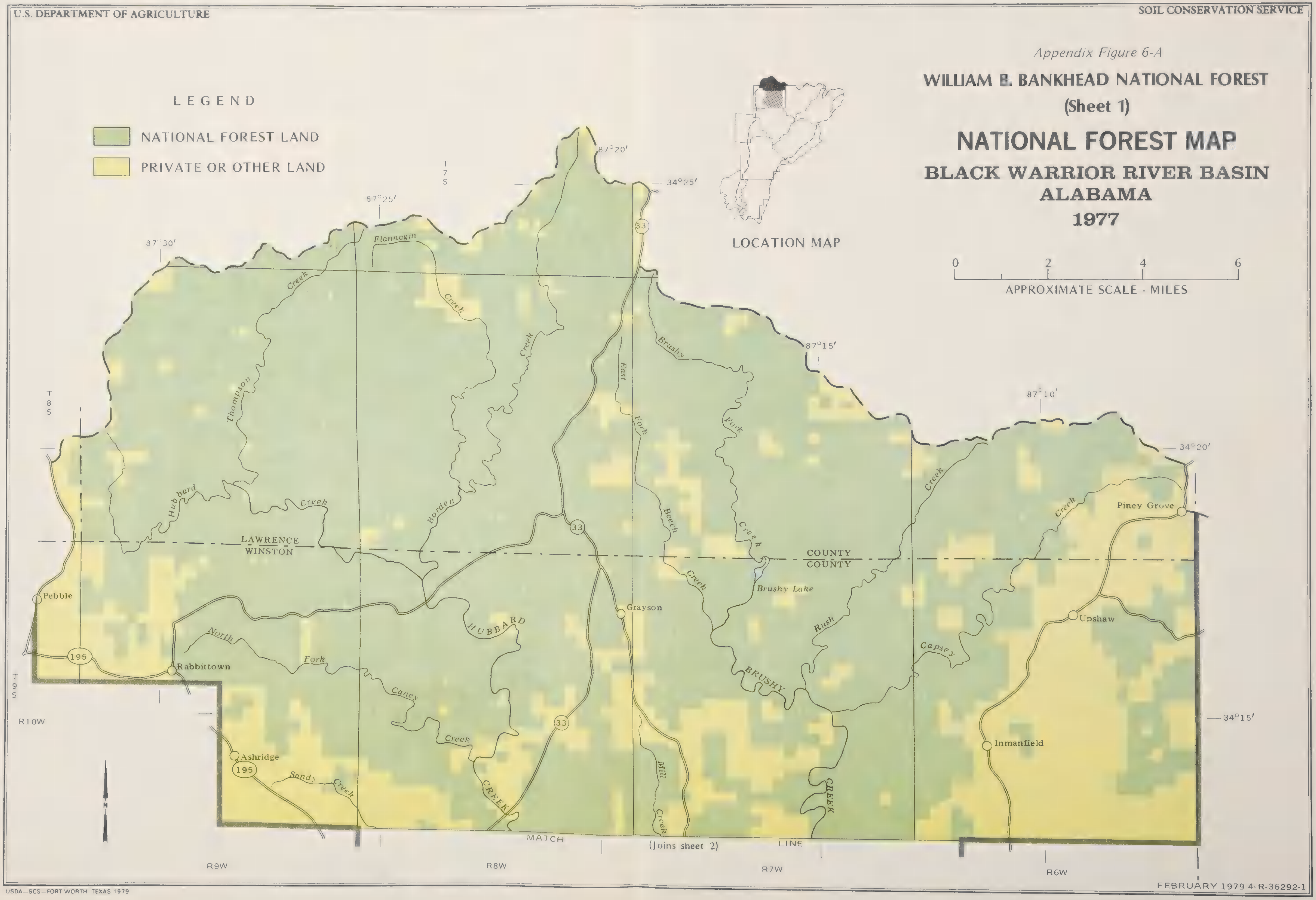
Specifications for Water-Use Classification

Item	Specification
Classification IA--Public Water Supply (A.W.I.C.)	
pH	No more than 1 unit from normal and must be in the range of 6 - 8.5
Temperature	90oF and the addition of artificial heat shall not raise temperature more than 5oF above natural temperature
Dissolved oxygen	5 mg/l, or 4 mg/l if other parameters are favorable
Fecal coliform	2000/100 ml (geometric mean) or 4000/100 ml in a sample
Turbidity	50 JTU's above background
Other substances	According to Public Health Service Drinking Water Standards
Classification IB--Swimming (A.W.I.C.)	
pH	No more than 1 unit from normal and must be in the range of 6 - 8.5
Temperature	90oF and the addition of artificial heat shall not raise temperature more than 5oF above natural temperature
Dissolved oxygen	5 mg/l, or 4 mg/l if other parameters are favorable
Fecal coliform	200/100 ml (geometric mean)
Turbidity	50 JTU's above background
Other substances	E.P.A. standards or suitable for swimming or other water-contact sports

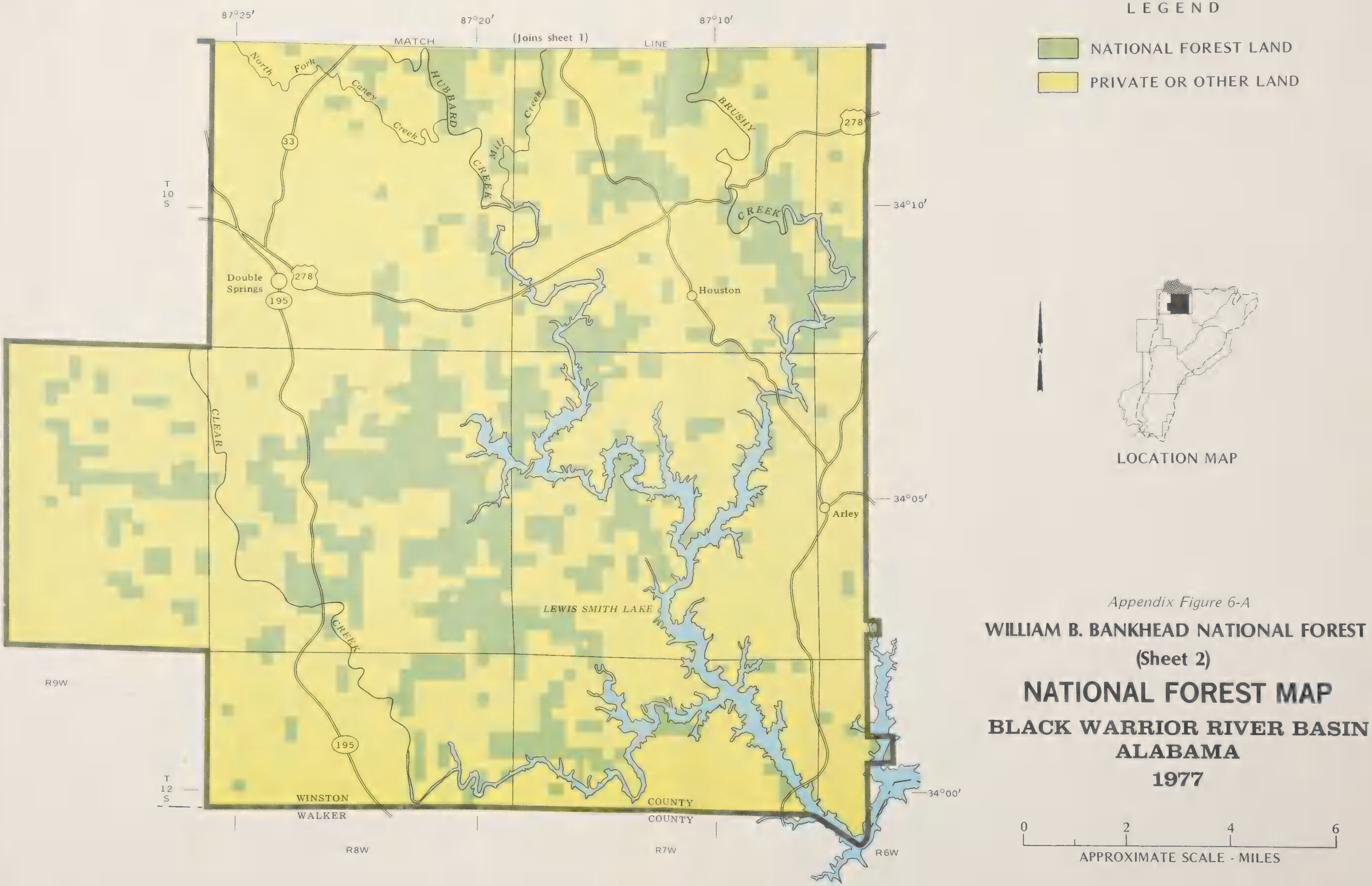
mg/l - milligrams per liter
ml - milliliter
JTU - Jackson Turbidity Unit
ppm - parts per million

Item	Specification
	Classification IC--Fish and Wildlife (A.W.I.C.)
pH	No more than 1 unit from normal and must be in the range of 6 - 8.5
Temperature	90oF and the addition of artificial heat shall not raise temperature more than 5oF above natural temperature
Dissolved oxygen	5 mg/l, or 4 mg/l if other parameters are favorable
Fecal coliform	1000/100 ml (geometric mean) on a monthly average value of 2000/100 ml in a sample
Turbidity	50 JTU's above background
Toxicity of other substances	Not to exceed 1/10 of the 96-hour median tolerance limit for aquatic life
Other substances	E.P.A. standards
	Classification ID--Agricultural and Industrial Water Supply (A.W.I.C.)
pH	No more than 1 unit from normal and must be in the range of 6 - 8.5
Temperature	90oF and the addition of artificial heat shall not raise temperature more than 5oF above natural temperature
Dissolved oxygen	3 mg/l
Turbidity	50 JTU's above background
Other substances	State Department of Public Health Standards or suitable for general industrial and agricultural use

Item	Specification
Classification IE--Industrial Operations	
pH	No more than 1 unit from normal and must be in the range of 6 - 8.5
Temperature	90oF and the addition of artificial heat shall not raise temperature more than 5oF above natural temperature
Dissolved oxygen	3 mg/l
Turbidity	50 JTU's above background
Other substances	State Department of Public Health Standards or suitable for industrial cooling
Classification IF--Navigation	
pH	No more than 1 unit from normal and must be in the range of 6 - 8.5
Temperature	90oF and the addition of artificial heat shall not raise temperature more than 5oF above natural temperature
Dissolved oxygen	2 mg/l
Turbidity	50 JTU's above background
Other substances	State Department of Public Health Standards



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Appendix Figure 6-A
WILLIAM B. BANKHEAD NATIONAL FOREST
(Sheet 1)
NATIONAL FOREST MAP
BLACK WARRIOR RIVER BASIN
ALABAMA
1977
LEGEND
NATIONAL FOREST LAND
PRIVATE OR OTHER LAND
LOCATION MAP
0 2 4 6
APPROXIMATE SCALE - MILES
87°30′
87°25′
87°20′
87°15′
87°10′
34°25′
34°20′
34°15′
T 7 S
T 8 S
T 9 S
R10W
R9W
R8W
R7W
R6W
Flannagin
Creek
Thompson
Hubbard
Borden
East Fork
Brushy Fork
Beech
Creek
LAWRENCE
WINSTON
COUNTY
COUNTY
Brushy Lake
Pebble
Rabbittown
Grayson
Upshaw
Piney Grove
Inmanfield
Ashridge
North Fork
Caney Creek
HUBBARD
CREEK
BRUSHY
CREEK
Rush
Capsey
Mill Creek
Sandy Creek
33
195
MATCH LINE
(Joins sheet 2)
USDA—SCS—FORT WORTH TEXAS 1979
FEBRUARY 1979 4-R-36292-1



Appendix Figure 6-A

WILLIAM B. BANKHEAD NATIONAL FOREST

(Sheet 2)

NATIONAL FOREST MAP

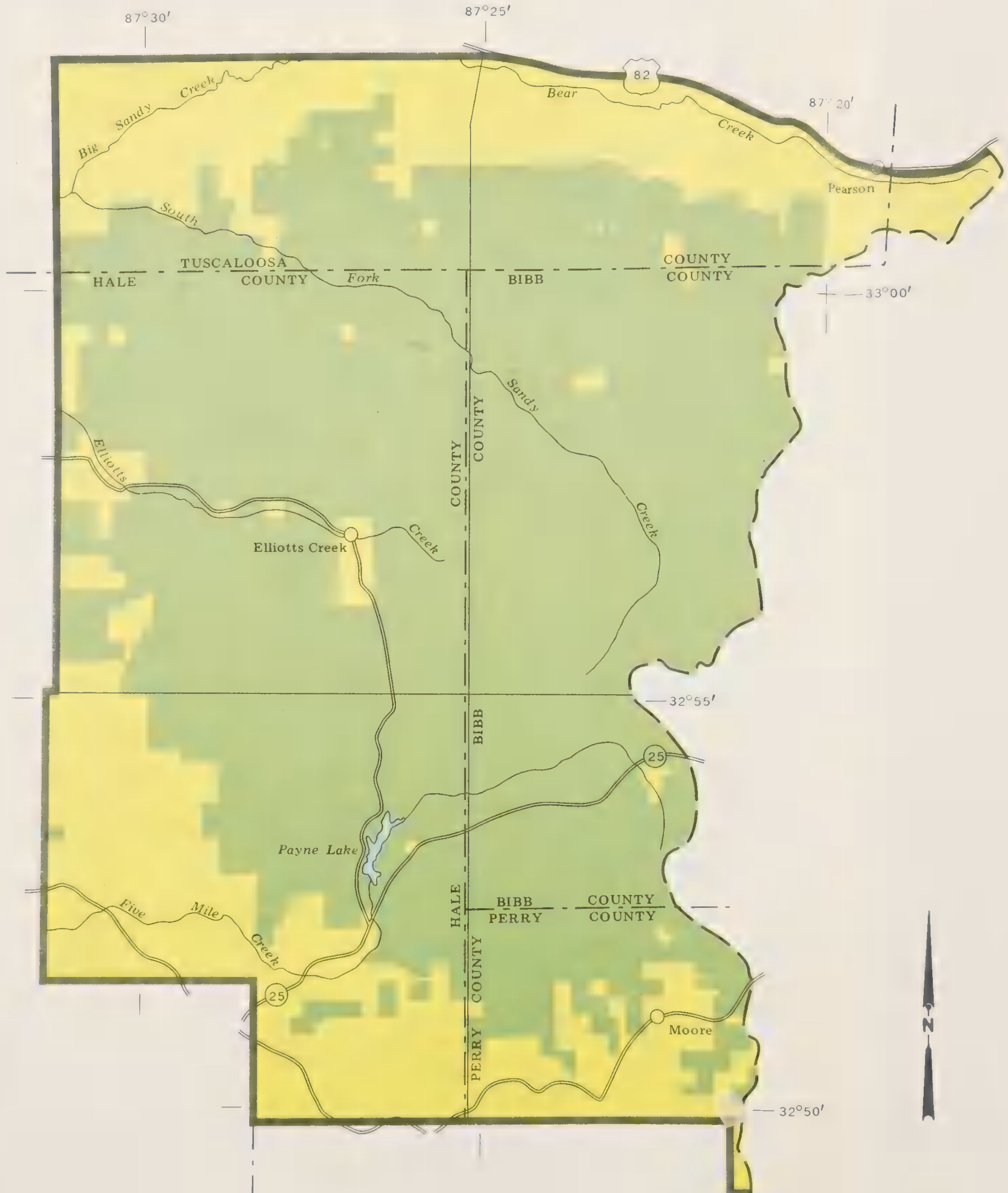
BLACK WARRIOR RIVER BASIN ALABAMA 1977

FEBRUARY 1979 4-R-36292-2

USDA—SCS—FORT WORTH, TEXAS 1979

U.S. DEPARTMENT OF AGRICULTURE

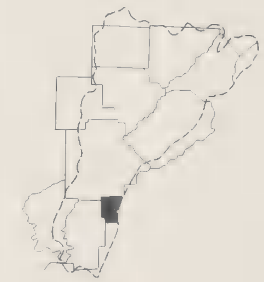
SOIL CONSERVATION SERVICE



LEGEND

NATIONAL FOREST LAND

PRIVATE OR OTHER LAND



LOCATION MAP

Appendix Figure 6-B

TALLADEGA NATIONAL FOREST
(Oakmulgee Division)

NATIONAL FOREST MAP

BLACK WARRIOR RIVER BASIN
ALABAMA
1977

0 2 4 6
APPROXIMATE SCALE - MILES

FEBRUARY 1979 4-R-36292-3

USDA–SCS–FORT WORTH TEXAS 1979

APPENDIX 7A
SOIL ASSOCIATION DESCRIPTIONS AND SUITABILITY 1/

Soils of the Prairies

1. Sumter-Oktibbeha

This association is one of gently rolling pastureland with scattered woodland. It consists of deep, well drained to somewhat poorly drained soils on uplands and flood plains. This association is well suited for pasture, and fairly suited for cropland or woodland. The suitability for most urban uses is poor.

Soils of the Major Flood Plains and Terraces

2. Cahaba-Myatt

This association is one mostly with level and nearly level cultivated fields and bottom land hardwood along streams. The soils of this association are deep, well drained and poorly drained, on low terraces and flood plains along major drainageways. Suitability for cropland, pasture, and woodland is good. Most urban uses are poorly suited.

Soils of the Coastal Plains

3. Luverne-Smithdale

This association is dominated by rolling to hilly, pine and hardwood woodland. Some cultivated fields are on the broader ridges. These soils are moderately deep to deep and well drained, and are on uplands. Cropland suitability is poor, pasture is fair, and woodland is well suited. Most urban uses are limited.

4. Lucedale-Savannah-Ruston

This association is one of nearly level cultivated fields and pasture with some areas of pine woodland. It consists of deep, well drained and moderately well drained soils on terraces and uplands. This association is well suited for cropland, pasture, and woodland. The suitability for most urban uses is moderate.

Soils of the Limestone Valley and Uplands

5. Colbert-Remlap-Dowellton

This association is mostly one with nearly level to gently sloping pastureland intermingled with wooded areas. It consists of deep, well drained to poorly drained soils on uplands. Suitability for cropland and woodland is fair, and the suitability for pasture in this association is good. Most urban uses are poorly suited.

1/ Associations used in the suitability and limitations maps, 7C-7I.

6. Decatur-Bodine-Fullerton

This association is mostly one with rolling pastureland alongside steep woodland. These soils are deep, well drained to somewhat excessively drained, and are on uplands. Cropland suitability is poor, pasture is fair, and the suitability for woodland is good. Most urban uses are poorly suited.

Soils of the Appalachian Plateau

7. Montevallo-Townley-Enders

This association is mainly steep mountainous wooded slopes with Virginia pine being dominant. It consists of shallow to deep, well drained soils on uplands. Cropland, pasture, and woodland are poorly suited for this association. Most urban uses are poorly suited.

8. Nauvoo-Townley

This association is mostly one with nearly level to gently sloping pastureland adjacent to sloping woodland. It consists of deep, well drained soils on uplands. These soils have fair suitability for cropland, but are well suited for pasture and woodland. The suitability for most urban uses is fair.

9. Linker-Hartsells-Albertville

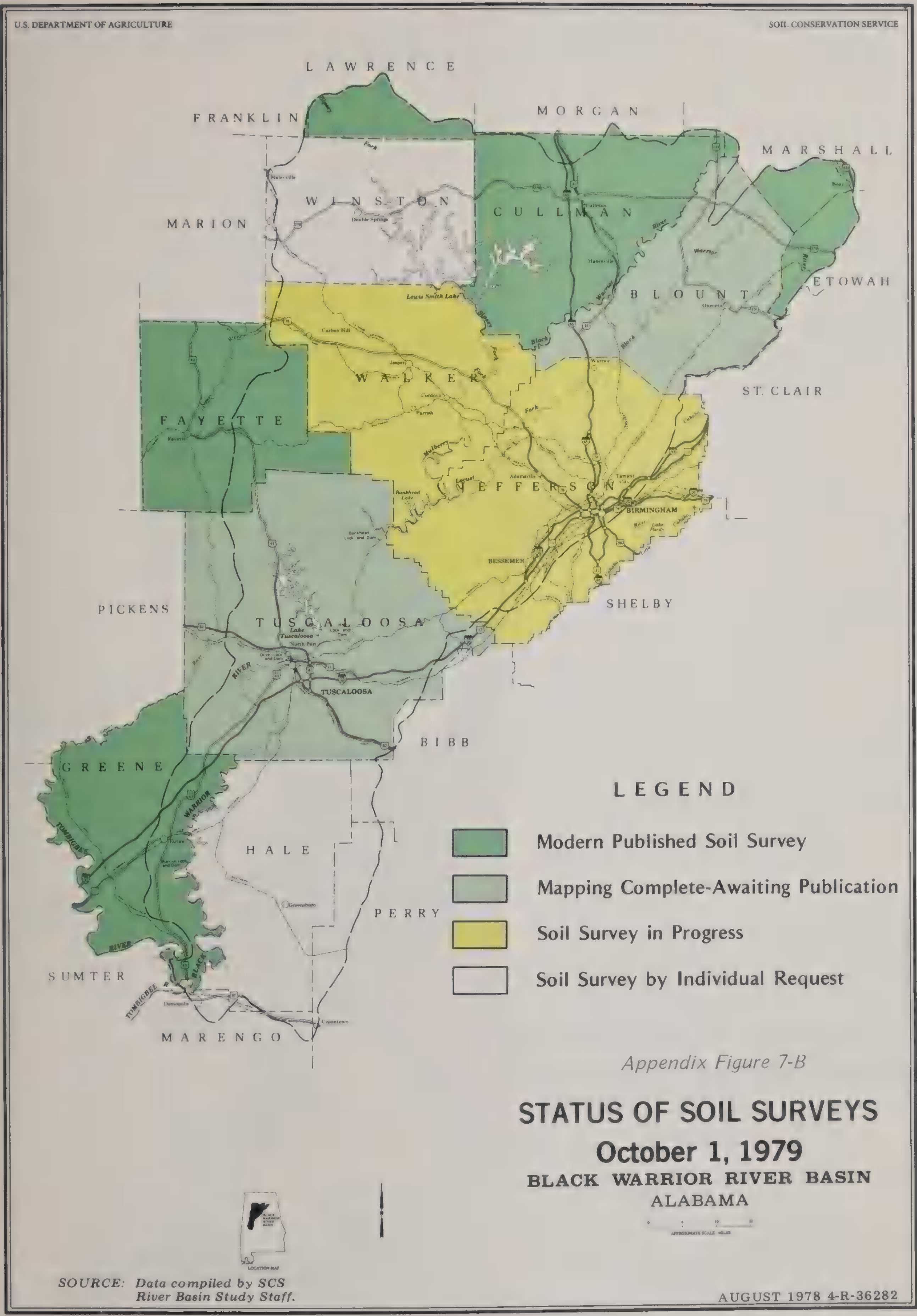
This association is mostly one of nearly level and gently rolling cultivated fields with hardwood timber along the drainageways. These soils are moderately deep to deep and well drained, and are on uplands. Cropland, pasture, and woodland suitability is good. The suitability for most urban uses is fair.

10. Wynnville-Hartsells-Albertville

This association is mostly one with nearly level and gently rolling cultivated fields. It consists of moderately deep to deep, moderately well drained to well drained soils on uplands. This association is well suited for cropland, pasture, and woodland. Most urban uses are fairly suited.

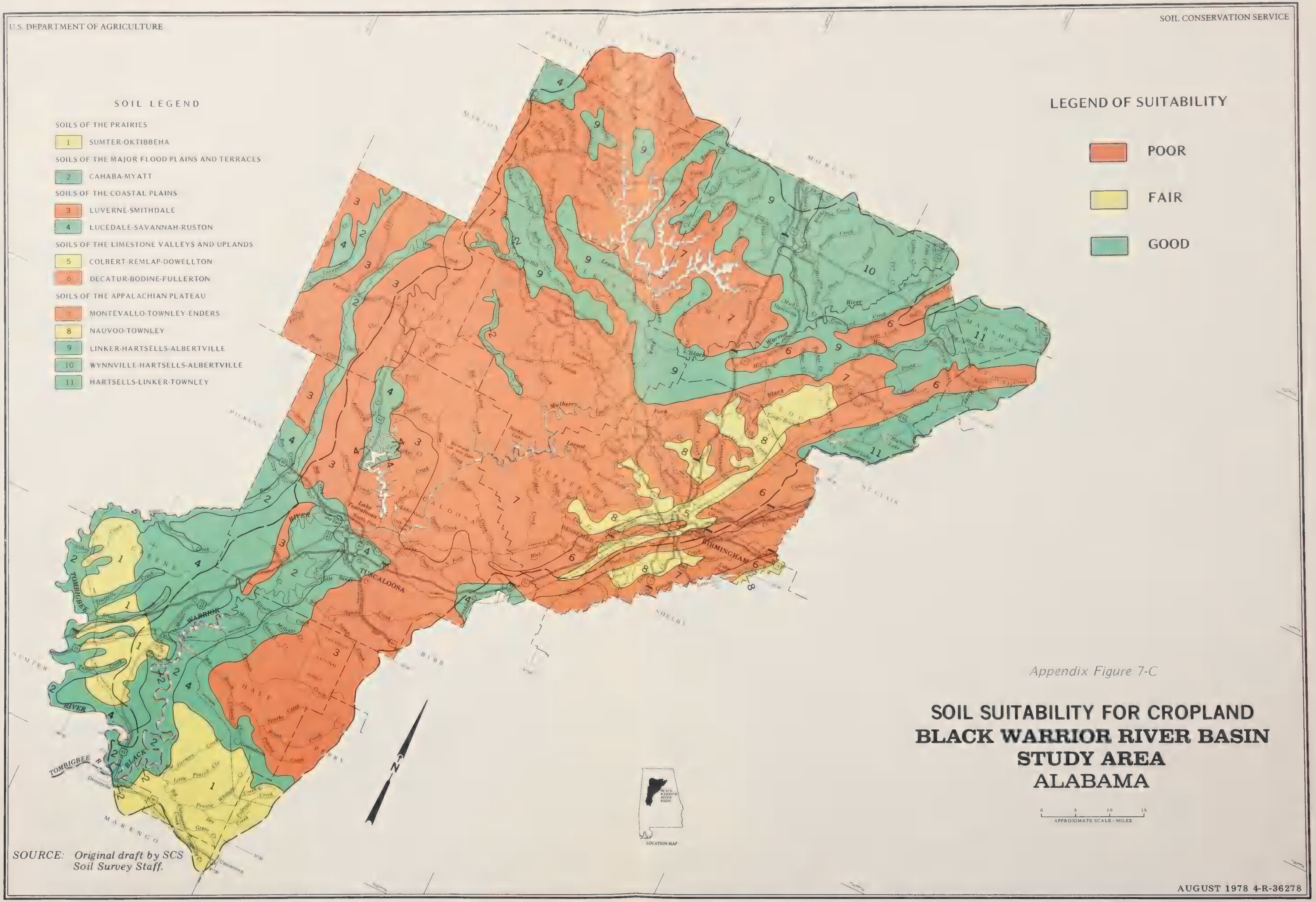
11. Hartsells-Linker-Townley

This association is mostly one with gently sloping cultivated fields and moderately sloping pastures adjacent to moderately steep woodland. It consists of moderately deep, well drained soils on uplands. This association is well suited for cropland and pasture on the less sloping areas. Suitability for woodland is good. Most urban uses are poorly suited.

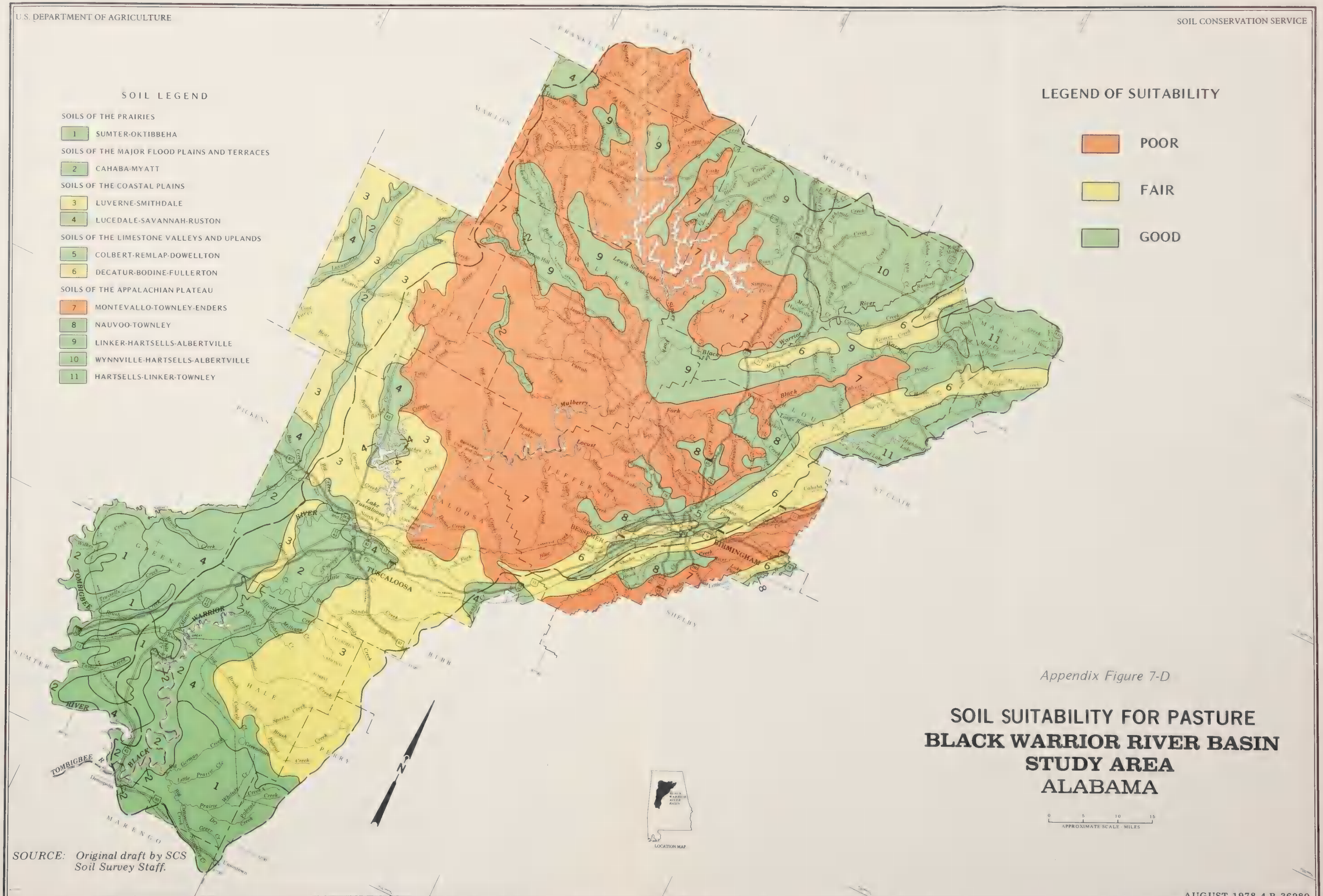


Appendix Figure 7-B

STATUS OF SOIL SURVEYS
October 1, 1979
BLACK WARRIOR RIVER BASIN
ALABAMA



Appendix Figure 7-C

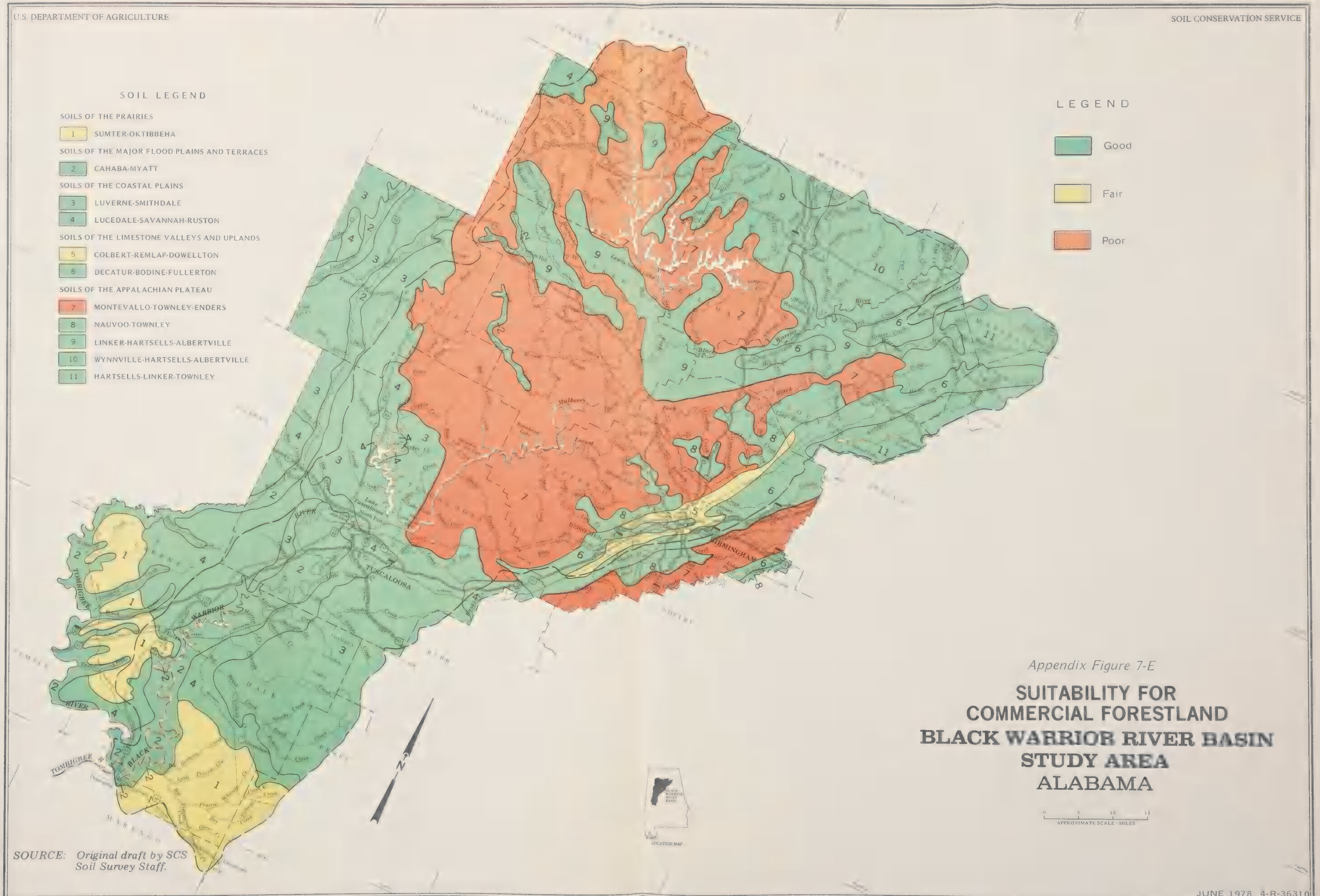


Appendix Figure 7-D

SOIL SUITABILITY FOR PASTURE
BLACK WARRIOR RIVER BASIN STUDY AREA ALABAMA

USDA—SCS—FORT WORTH, TEXAS 1979

REVISED AUGUST 1978 BASE 4-R-35608



Appendix Figure 7-E

SUITABILITY FOR COMMERCIAL FORESTLAND
BLACK WARRIOR RIVER BASIN STUDY AREA
ALABAMA

USDA—SCS—FORT WORTH, TEXAS 1979

REVISED AUGUST 1978 BASE 4-R-35608

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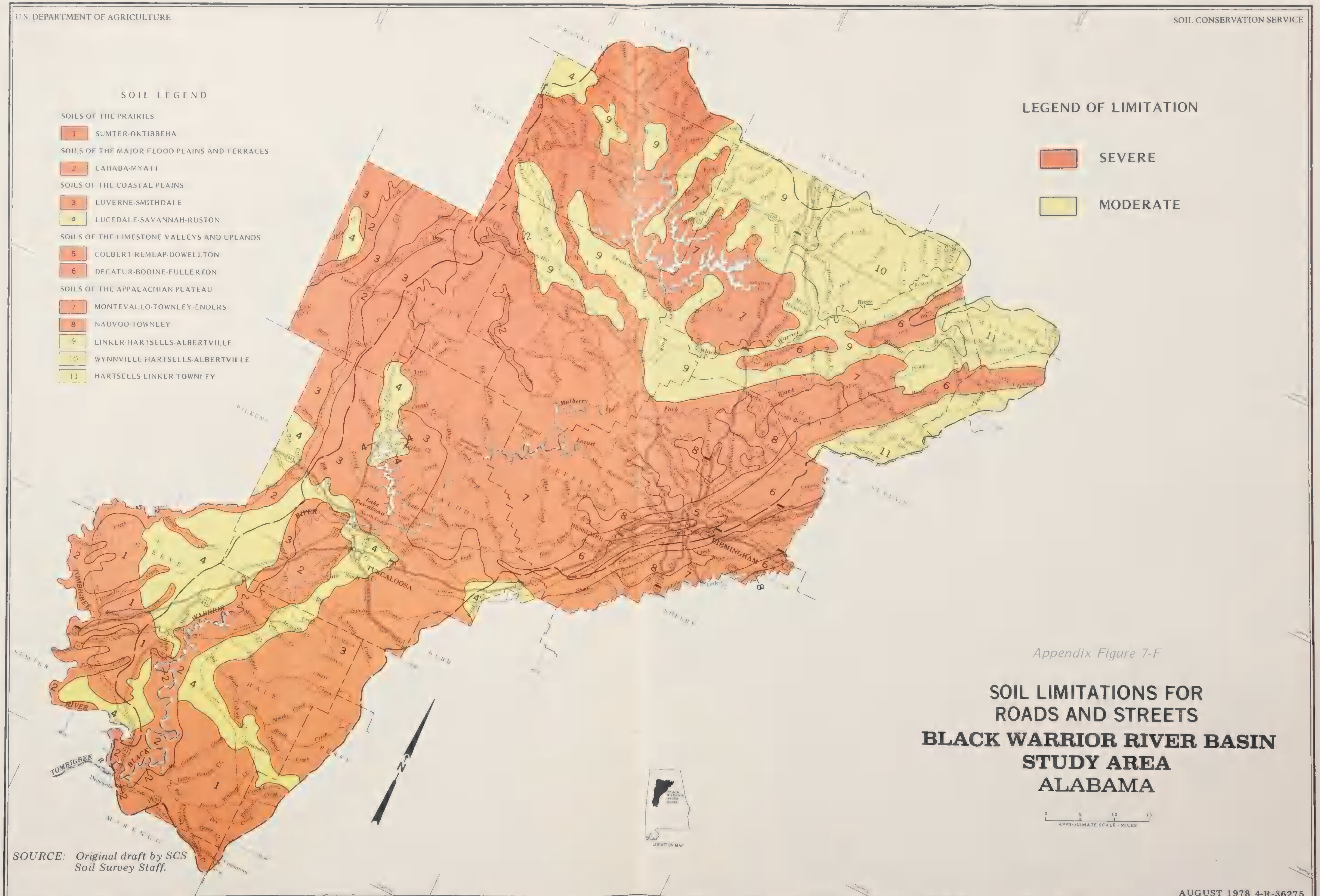
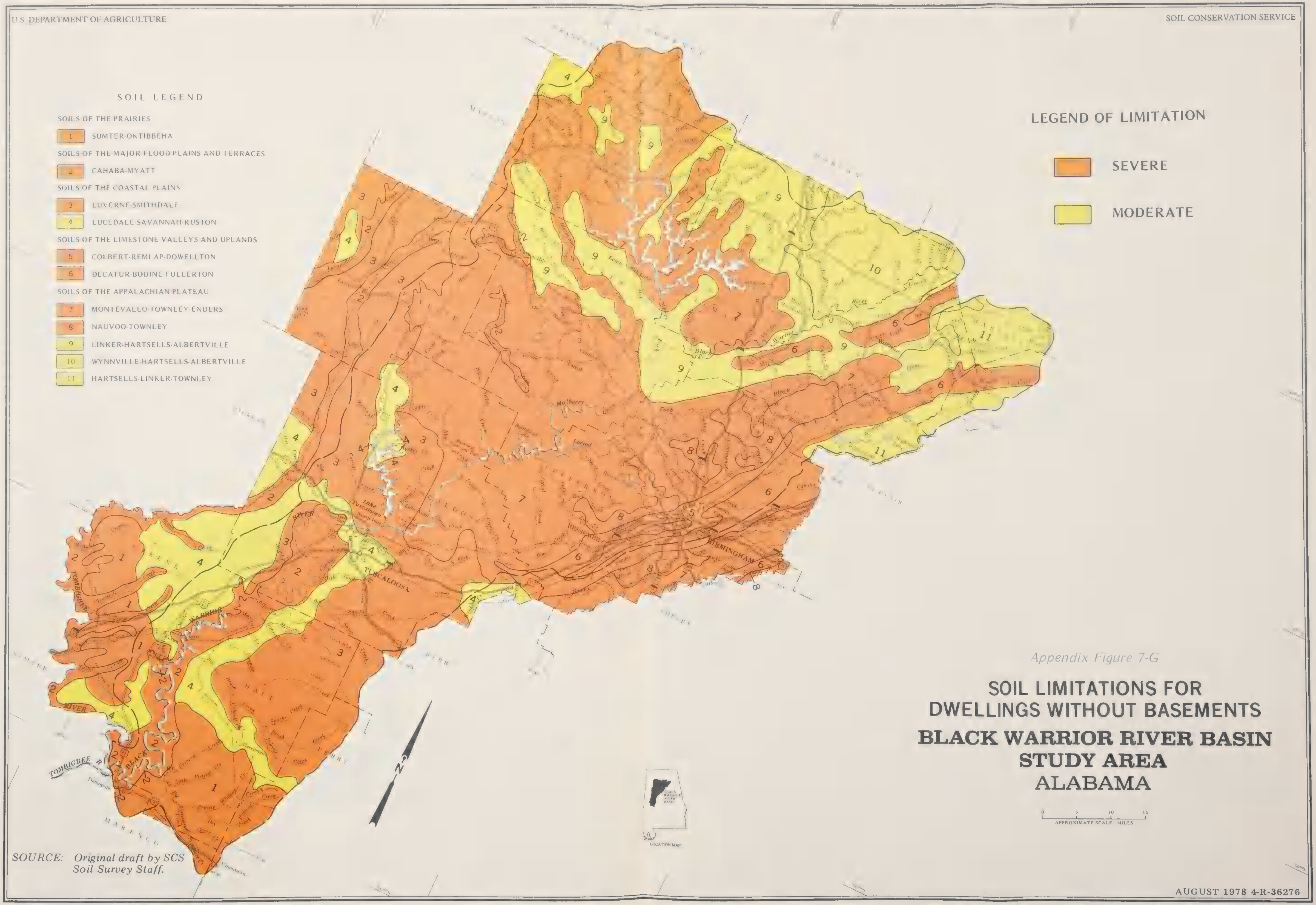


Appendix Figure 7-F



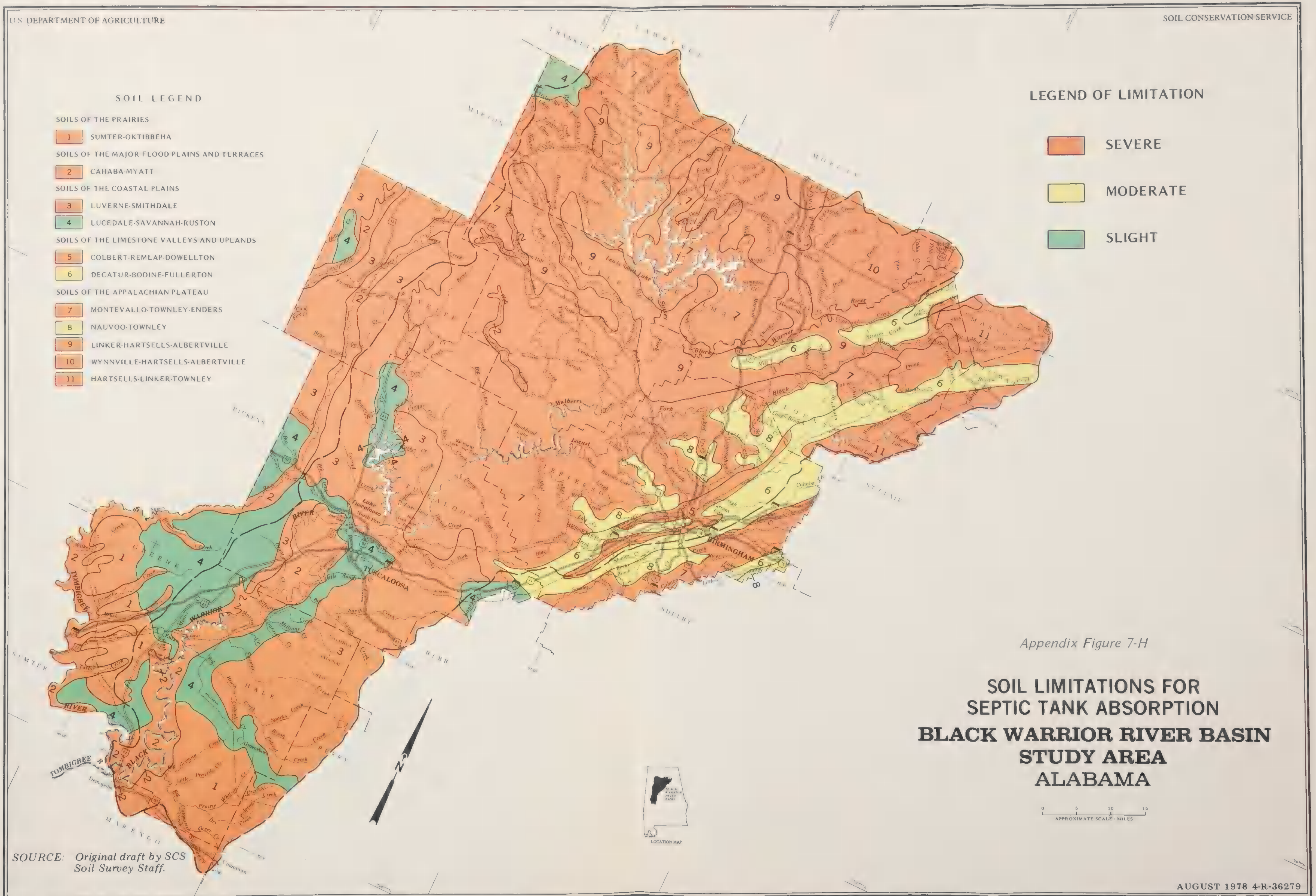
Appendix Figure 7-G

SOIL LIMITATIONS FOR DWELLINGS WITHOUT BASEMENTS

BLACK WARRIOR RIVER BASIN STUDY AREA ALABAMA

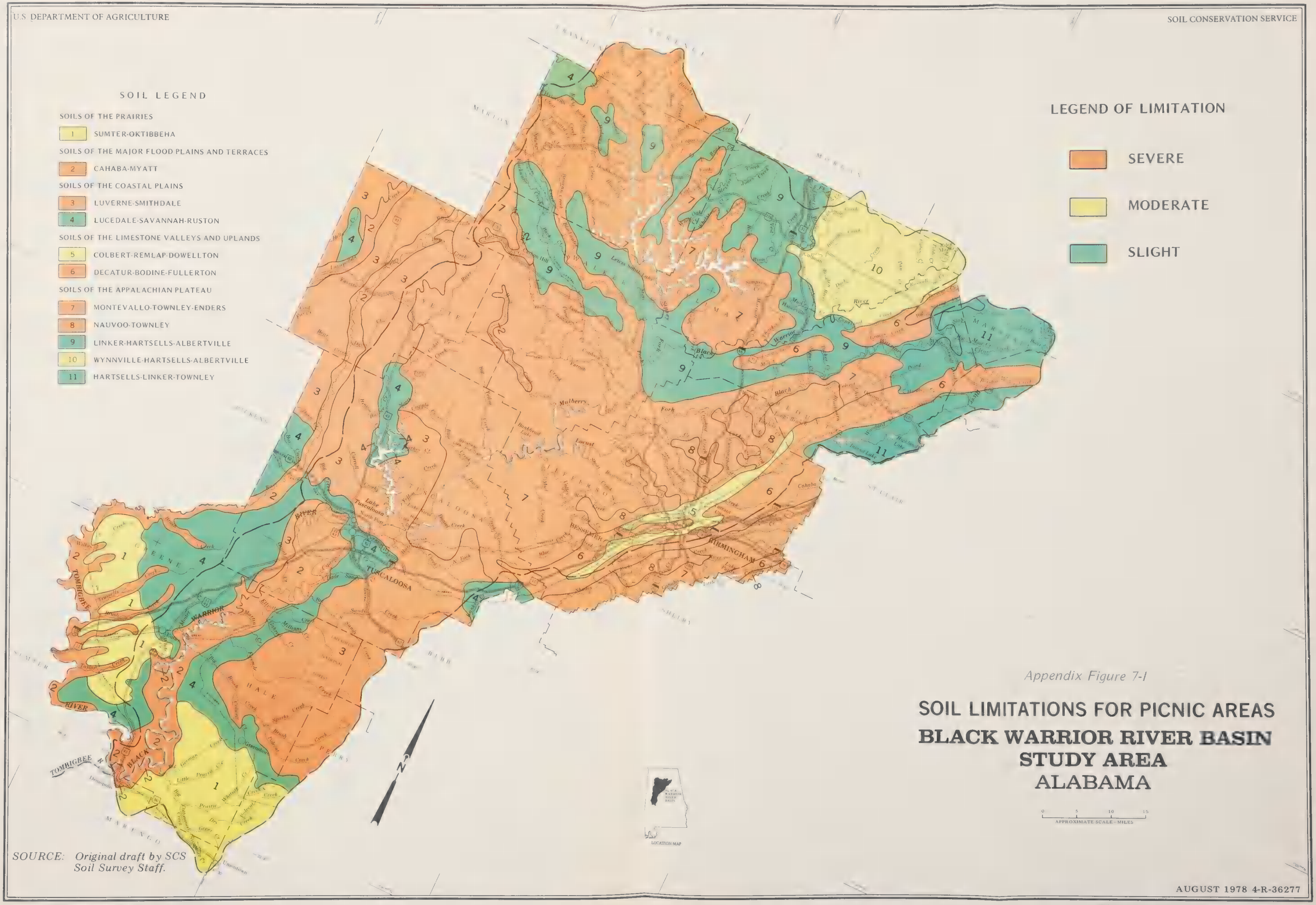
USDA—SCS—FORT WORTH, TEXAS 1979

REVISED AUGUST 1978 BASE 4-R-35608



USDA—SCS—FORT WORTH, TEXAS 1979

REVISED AUGUST 1978 BASE 4-R-35608



Appendix Figure 7-1

SOIL LIMITATIONS FOR PICNIC AREAS
BLACK WARRIOR RIVER BASIN STUDY AREA ALABAMA

USDA-SCS-FORT WORTH, TEXAS 1979

REVISED AUGUST 1978 BASE 4-R-35608

Appendix 8
Description of Land Capability Classes and Subclasses

Class I lands have few limitations that limit their use.

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

Class III lands have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Class IV lands have very severe limitations that restrict the choice of plants, require careful management, or both.

Class V lands have little or no erosion hazard but have other limitations that are impractical to remove, that limit their use largely to pasture, forest land, or wildlife.

Class VI lands have severe limitations that make them unsuitable for cultivation and limit their use largely to pasture, woodland, or for wildlife. Some can be used for grazing.

Class VII lands have very severe limitations that make them unsuitable to cultivation and restrict their use largely to woodland or wildlife. Some can be used for grazing.

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

Seventy-four percent of the basin's cropland is on land capability classes I, II, and III. Pastureland is about equally distributed on land capability classes II, III, and IV, with about 78 percent of all pastureland on these three capability classes. Only about 19 percent of all forest is on class I, II, and III land; however, 55 percent of all forest land is on capability classes VI and VII.

The kind of limitation (subclass) is designated by a small letter, e, w, or s following the class numeral; e.g. IIe, IIw, IIs. The letter "e" indicates the main limitation is erosion, "w" indicates that the main limitation is excess water in or on the soil, and "s" indicates the limitation is due to soil properties such as drouthiness or limited soils depth for root growth. Subclasses are not shown in table 14B, but are described here in order to describe the condition that limit capability and because they are commonly shown in land capability tables for more detailed studies.

Appendix 9
Description of Coal Groups in the Warrior Field

J Group: The J coal group contains the J, K, L, and M beds in a vertical sequence of about 1,500 feet. The beds have been recognized along the field's southeast margin where the thickness of each bed is highly variable and seldom exceeds 30 inches.

Black Creek Group: The Black Creek group contains the Lick Creek, Jefferson, and Black Creek beds in a vertical interval of about 75 to 150 feet. The aggregate thickness of coal, in places, may exceed 5 feet. The Black Creek is of excellent quality and averages about 24 inches in thickness. The Jefferson coal is thinner due to partings, but it is an important coal of good quality. The Lick Creek bed is generally thin and is usually mined only in conjunction with the lower beds.

Mary Lee Group: This coal group occurs from 50 to 200 feet above the Black Creek and contains five beds in an interval of 75 to 150 feet. The Ream bed at the base of the group occurs sporadically and often contains several benches, each only a few inches thick. The Jagger bed, about 30 to 60 feet above the Ream, has an average thickness of about 26 inches. The bed is absent in some areas and may exceed 100 inches in thickness in other areas. The Blue Creek bed, from 5 to 60 feet above the Jagger, ranges in thickness from a few inches in the northwestern part of the field to over 100 inches in eastern Tuscaloosa County. Only a few feet above the Blue Creek is the Mary Lee bed, commonly thought to be a bench of the Blue Creek bed. The two beds are mined extensively because of their good coking qualities. Uppermost is the Newcastle bed, which may attain a local thickness of 72 inches and often contains shale partings.

Pratt Group: This group contains five beds. The basal Gillespie and Curry beds thin westward but are persistent. They may attain thicknesses as great as 20 to 30 inches locally. About 15 to 75 feet above the Curry is the American bed, which commonly has two benches that contain as much as 60 inches of coal. The American has shale partings ranging from a few inches to more than 30 inches in thickness. The Fire Clay bed, about 30 feet higher, may attain thicknesses ranging from 20 to 40 inches with generally thin partings. The uppermost Pratt bed, generally only a few feet above the Fire Clay bed, is from 30 to 75 inches thick, usually with thin partings. The upper three beds are mined both for coking and for steam generation.

Cobb Group: This group is present from 100 to 250 feet above the Pratt bed and contains three beds in an interval ranging from 70 to 220 feet. The lowermost Thomas bed is frequently too thin for economic strip mining. It usually has two benches separated by about 2 to 3 feet of barren rock. About 100 to 150 feet above the Thomas, the Cobb Lower bed has a variable thickness ranging from 3 to 56 inches and locally contains shale partings. The Cobb Upper is about 20 feet higher and ranges in thickness from 10 to 32 inches, is generally less than 12 inches thick and has partings. The quality of the Cobb group coals is satisfactory for steam electric generation.

Gwin Group: This coal group occurs from 120 to 160 feet above the Cobb Upper bed and consists of the Thompson Mill and Gwin beds, either of which may attain a local thickness of 36 inches; however, the thicknesses are highly variable. The Gwin bed is the more persistent, occurring about 35 feet above the Thompson Mill bed. The quality of the Gwin coal beds is generally fair.

Utley Group: This coal group contains several unnamed beds in an interval of about 150 feet and lies about 60 feet above the Gwin bed. One persistent bed, commonly thought to be the Clements coal bed, is from 30 to 36 inches thick in Tuscaloosa County where it is mined extensively. Two Utley beds, ranging in thickness from 14 to 42 inches, are strip-mined in northwestern Tuscaloosa County.

Brookwood Group: This is the uppermost group in the field, occurring about 100 feet above the Utley group. The lowermost Johnson bed is about 15 inches thick, and is heavily mined. The Carter bed, about 20 feet above the Johnson, often occurs as two benches that locally become 30 inches thick. It is also extensively mined in Tuscaloosa County.

The Milldale bed ranges from a few feet to 30 feet above the Carter bed and seldom attains a thickness greater than 30 inches. It is persistent and the coal quality is good, being low in sulfur and ash content.

The Brookwood bed, occurring from a few feet to 40 feet above the Milldale, may be as thick as 60 inches locally, but it is about 38 inches thick on the average. It is split by partings that are about 3 inches thick. The quality is good for coking and steam generation, and it is heavily mined. The Guide bed, with an average thickness of about 6 inches, occurs about 30 feet above the Brookwood. In eastern Tuscaloosa County, it may be 18 inches thick and is mined conjunctively with the Brookwood bed.

Appendix 9A
Description of Coal Beds in the Plateau Field

West Sand Mountain District: The Bear Creek coal bed occurs in deeply dissected hills, known as the West Sand Mountains, in Franklin and Winston Counties in the extreme northern part of the Warrior Basin district. The bed averages 26 inches in thickness in the area and has a generally thin overburden. Locally, it contains a parting up to several inches in thickness; generally, it has a low-sulfur and medium-ash content.

The outcrop of the Polecat coal bed traverses Winston County and extends into Cullman County where it occurs about 100 feet below the Black Creek coal bed of the Warrior coal field. The Polecat may be correlative with the Bear Creek bed. Its thickness ranges from about 14 to 30 inches, but its commercial potential is largely unknown.

Blount Mountain District: The Caskie coal bed, occurring about 275 feet above the basal conglomerate of the Pottsville Formation, has an average thickness of about 42 inches, but generally contains clay partings. It is of coking quality and has been mined concurrently with a higher bed.

The Altoona coal bed which occurs on Altoona Mountain of the Blount Mountain district, has an average thickness of about 30 inches. Its quality is suitable for coking, and it has been extensively mined.

The Bynum coal bed occurs only on Altoona Mountain and is mined there with the Altoona bed. The maximum reported thickness is 60 inches, but the average is substantially less.

The Swansea coal bed, a possible equivalent of the Rosa bed of Sand Mountain (Culbertson, 1964) ranges in thickness from a few inches to about 40 inches. It has a high ash but low sulfur content and has been mined in southwestern areas of Blount Mountain.

Sand Mountain District: The Cliff coal bed occurs throughout the area and has an average thickness of about 20 inches and a maximum thickness of about 40 inches. It has a low sulfur and moderate ash content.

The Upper Cliff coal bed consists of two units numbered 1 and 2. Upper Cliff 1 may be as much as 40 inches thick and is satisfactory for coking. Upper Cliff 2 averages about 20 inches in thickness and has a maximum thickness of about 30 inches. It is approximately 30 feet below Upper Cliff 1 and its quality is slightly inferior to the upper bed.

The Rosa coal bed, probably the equivalent of the Swansea bed of Blount Mountain, averages about 20 inches in thickness and is of good coking quality.

Appendix table 9-A -- Average analyses of coals from principal beds in the Warrior coal field 1/ (modified from Culbertson, 1964)

	Proximate analysis (percent)				Ultimate analysis (percent)						
Bed	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur (percent)	Btu	Ash softening temp (°F)
Black Creek	3.0	31.6	62.1	3.3	5.3	81.4	1.8	7.5	0.7	14,310	2,500
Jefferson	2.3	31.9	58.5	7.3	5.1	76.7	1.6	6.2	1.3	13,780	2,300
Jagger	3.8	33.1	50.4	12.5	5.1	67.9	1.6	11.4	1.2	12,210	2,730
Jagger	2.3	26.7	62.6	8.5	---	----	---	---	0.8	13,780	-----
Blue Creek	3.1	23.4	63.6	9.9	4.9	76.7	1.5	6.2	0.8	13,530	2,900
Blue Creek	2.7	24.7	63.6	9.0	---	----	---	---	0.7	13,733	-----
Mary Lee	2.4	27.2	58.1	12.3	4.8	73.8	1.6	6.4	1.1	12,840	2,680
Mary Lee	2.1	33.3	54.1	10.5	---	----	---	---	0.8	13,201	-----
Newcastle	3.0	30.5	52.7	13.8	5.0	69.9	1.6	7.7	2.0	12,590	2,450
America	3.1	30.5	59.6	6.6	5.2	78.1	1.5	7.2	1.2	13,650	2,480
Pratt	2.5	29.4	62.6	6.4	5.1	79.4	1.6	5.9	1.4	14,250	2,460
Pratt	Moisture Free	37.4	51.0	11.9	---	----	---	---	2.6	13,150	-----
Cobb Lower	2.7	36.9	55.1	5.3	5.3	77.0	1.9	8.7	1.8	13,780	-----
Gwin	2.0	40.5	51.5	6.0	---	----	---	---	3.3	13,630	-----

Appendix table 9-A -- Average analyses of coals from principal beds in the Warrior coal field - Continued

	Proximate analysis (percent)			Ultimate analysis (percent)						
Bed	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur (percent)	Btu	Ash softening temp (°F)
Utley	1.8	36.3	52.5	9.4	---	----	---	---	1.9	13,109	-----
Utley	2.4	34.7	56.4	6.6	---	----	---	---	1.6	13,470	-----
Clements	1.2	24.5	65.3	9.0	4.7	77.4	1.4	6.2	1.3	13,360	2,690
Clements	1.8	35.3	59.1	5.7	---	----	---	---	1.7	14,388	-----
Johnson	1.7	35.9	55.6	8.9	---	----	---	---	2.1	13,932	-----
Carter	3.2	31.1	59.9	5.8	---	----	---	---	0.9	14,020	2,800
Carter	1.8	31.4	60.6	6.2	---	----	---	---	1.0	14,174	-----
Milldale	3.8	31.4	59.9	4.9	5.4	78.3	1.4	8.6	1.4	14,030	2,320
Milldale	2.9	31.6	60.5	5.0	---	----	---	---	1.2	14,158	-----
Brookwood	3.5	28.7	58.0	9.7	5.1	74.5	1.5	8.1	1.0	13,270	2,850
Brookwood	3.4	29.2	58.4	10.5	---	----	---	---	1.2	13,312	-----

1/ Where two analyses are listed for the same bed, the second one is the average for coals in Tuscaloosa County or closely surrounding areas; other analyses are modified from Culbertson (1964) and are unrestricted with respect to area.

Appendix table 9-B -- Average analysis of some coals that occur in the Plateau coal field in the Black Warrior River Basin (modified from Culbertson, 1964).

	Proximate analysis (percent)				Ultimate analysis (percent)						
Bed	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur (percent)	Btu	Ash softening temp (°F)
Bear Creek	3.0	41.7	46.6	13.1	4.2	69.2	1.7	9.7	0.8	12,740	-----
Upper Cliff No. 2	7.5	17.7	58.2	16.6	4.5	67.0	1.0	9.9	1.0	11,630	-----
Upper Cliff No. 1	2.5	20.9	69.4	7.3	4.6	80.7	1.3	4.9	1.3	14,300	-----
Cliff	3.2	18.7	68.5	10.3	4.2	77.8	1.1	6.4	1.0	13,380	-----
Caskie	1.4	32.6	60.5	5.5	---	----	---	---	1.2	------	-----
Swansea (Lowe-Harris)	3.4	27.7	55.8	13.1	---	----	---	---	1.2	12,740	-----
Altoona	3.5	32.6	60.8	3.1	5.5	80.6	1.7	7.8	1.3	13,850	2,220

APPENDIX 10
THREATENED AND ENDANGERED ANIMALS

\+ T - Flattened Musk Turtle - *Sternotherus minor depressus*

Mammals
- E - Gray Myotis - *Myotis grisescens*
- E - Indiana Myotis - *Myotis sodalis*
- E - Northern Black Bear - *Ursus a. americanus*
- E - Florida Panther - *Felis concolor coryi*

Freshwater Fishes
- \+ E - Frecklebelly Madtom - *Noturus munitus*
- E - Watercress Darter - *Etheostoma nuchale*
- T - Atlantic Sturgeon - *Acipenser oxyrhynchus*
- T - Blue Sucker - *Cycleptus elongatus*
- \+ T - Warrior Muscadine Darter - *Percina* sp.

Birds
- E - Golden Eagle - *Aquila chrysaetos*
- * E - Bald Eagle - *Haliaeetus leucocephalus*
- E - Osprey - *Pandion haliaetus*
- * E - Peregrine Falcon - *Falco peregrinus anutum*
  Falco peregrinus tundrius
- * E - Red-cockaded Woodpecker - *Dendrocopos borealis*
- * E - Bachman's Warbler - *Vermivora bachmanii*

THREATENED AND ENDANGERED PLANTS

Endangered

Gentiana villosa
Hymenocallis coronaria
Croton alabamensis
Phlox pulchra
Schisandra glabra
Arabis perstellata
Aconitum unsinatum
Selaginella riddelli
Marshallia mohrii
Lysimachia graminea
Trichomanes boschianum
Viburnum bracteatum
Leavenworthia exiqua var. lutea
Leavenworthis alabamica var. brachystyla
Leavenworthia crassa
Leavenworthia crassa var. elongata
Lesquerella densipila
Hydrastis canadensis
Neviusia alabamensis
Trichomanes petersii
Leptogramma pilosa var. alabamensis

Threatened

Asplenium ruta-muraria
Cheilanthes alabamensis
Rhapidophyllum hystrix
Scutellaria alabamensis
Asplenium bradleyi
Croomia pauciflora
Trillium lancifolium
Echinacea pallida
Thalictrum debile
Asplenium ebenoides
Leavenworthia alabamica
Trillium erectum

T - (Threatened) E - (Endangered) + - (Endemic) * - (From Federal list)

Appendix Table 11A - Projected Population By County, Black Warrior Study Area, 1990 to 2020

County	1990	2000	2020
	Persons		
Blount	41,300	44,000	50,000
Cullman	71,800	75,700	83,000
Fayette	16,700	17,000	17,700
Greene	9,800	9,600	8,500
Hale	14,300	13,900	13,100
Jefferson	687,500	703,300	750,000
Tuscaloosa	148,000	157,300	177,000
Walker	80,000	95,600	136,000
Winston	24,600	26,600	31,200
Total	1,094,000	1,143,000	1,266,500

Source: Alabama Co. Data Book, 1980, Office of State Planning and Federal Programs and estimates of planners in Regional Planning and Development Districts 1, 2, 3, and 11.

Appendix Table 11B - Projected land use, Blount County 1990, 2000 & 2020.

Land Use	1975	1990	2000	2020
	Thou. acres			
Cropland	85,700	79,800	76,300	69,400
Pasture	46,900	57,200	60,100	65,900
Forest land	245,600	238,300	236,300	232,300
Urban & built up	26,500	28,800	31,200	35,900
Water area	6,800	7,400	7,600	8,000
Total area	411,500	411,500	411,500	411,500

Source: ESS, USDA and Black Warrior Land Use Advisory Committee

Appendix Table 11C - Projected land use, Cullman County, 1990, 2000 & 2020

Land Use	1975	1990	2000	2020
	Thou. acres			
Cropland	118,200	88,800	88,700	87,400
Pasture	62,300	95,300	96,200	98,000
Forest land	252,000	244,500	242,500	238,300
Urban & built up	28,900	31,500	32,300	35,200
Water area	14,100	15,400	15,800	16,600
Total area	475,500	475,500	475,500	475,500

Source: ESS, USDA and Black Warrior Land Use Advisory Committee

Appendix Table 11D - Projected land use, Fayette County, 1990, 2000 & 2020.

Land Use	1975	1990	2000	2020
	----------------	Thou. acres	-------------	
Cropland	58,400	54,300	57,000	62,700
Pasture	20,100	33,500	33,100	32,200
Forest land	304,900	295,800	293,400	288,400
Urban & built up	12,200	11,500	11,400	11,300
Water area	5,700	6,200	6,400	6,700
Total area	401,300	401,300	401,300	401,300

Source: ESS, USDA and Black Warrior Land Use Advisory Committee

Appendix Table 11E - Projected land use, Greene County, 1990, 2000 & 2020.

Land Use	1975	1990	2000	2020
	----------------	Thou. acres	-------------	
Cropland	46,900	62,300	68,200	79,500
Pasture	82,800	78,200	76,100	72,000
Forest land	225,200	218,500	216,700	213,000
Urban & built up	58,600	53,900	51,700	47,700
Water area	7,000	7,600	7,800	8,300
Total area	420,500	420,500	420,500	420,500

Source: ESS, USDA and Black Warrior Land Use Advisory Committee

Appendix Table 11F - Projected land use, Hale County, 1990, 2000 & 2020.

Land Use	1975	1990	2000	2020
	---------------- Thou. acres			-------------
Cropland	94,700	99,900	99,000	97,900
Pasture	80,300	80,700	83,400	88,800
Forest land	220,900	214,300	212,500	209,000
Urban & built up	19,700	19,900	19,700	18,300
Water area	8,700	9,500	9,700	10,300
Total area	424,300	424,300	424,300	424,300

Source: ESS, USDA and Black Warrior Land Use Advisory Committee

Appendix Table 11G - Projected land use, Jefferson County, 1990, 2000 & 2020.

Land Use	1975	1990	2000	2020
	---------------- Thou. acres			-------------
Cropland	22,800	23,000	19,400	13,800
Pasture	24,500	23,100	25,000	28,800
Forest land	445,700	440,900	428,400	414,200
Urban & built up	218,500	224,000	238,000	253,600
Water area	5,900	6,400	6,600	7,000
Total area	717,400	717,400	717,400	717,400

Source: ESS, USDA and Black Warrior Land Use Advisory Committee

Appendix Table 11H - Projected land use, Tuscaloosa County, 1990, 2000 & 2020.

Land Use	1975	1990	2000	2020
	Thou. acres			
Cropland	67,700	62,700	64,300	69,000
Pasture	19,900	35,600	36,400	37,900
Forest land	698,300	667,600	671,900	660,600
Urban & built up	55,900	64,000	66,600	70,400
Water area	21,600	23,500	24,200	25,500
Total area	863,400	863,400	863,400	863,400

Source: ESS, USDA and Black Warrior Land Use Advisory Committee

Appendix Table 11I - Projected land use, Walker County, 1990, 2000 & 2020.

Land Use	1975	1990	2000	2020
	Thou. acres			
Cropland	43,200	36,200	34,800	31,200
Pasture	53,000	57,900	58,000	58,200
Forest land	360,800	354,700	350,300	339,100
Urban & built up	55,800	63,500	69,000	83,300
Water area	5,600	6,100	6,300	6,600
Total area	518,400	518,400	518,400	518,400

Source: ESS, USDA and Black Warrior Land Use Advisory Committee

Appendix Table 11J - Projected land use, Winston County, 1990, 2000 & 2020.

Land Use	1975	1990	2000	2020
	----------------	Thou. acres	-------------	
Cropland	25,200	29,800	30,500	32,100
Pasture	26,300	29,300	29,800	30,900
Forest land	316,800	307,400	304,800	299,700
Urban & built up	25,200	26,000	27,000	28,700
Water area	11,600	12,600	13,000	13,700
Total area	405,100	405,100	405,100	405,100

Source: ESS, USDA and Black Warrior Land Use Advisory Committee

Appendix 12

Assumptions and Economic Framework Underlying OBERS Projections

The OBERS projections are based on longrun or secular trends and tend to smooth out the cyclical fluctuations which characterize the shortrun path of the economy. The general assumptions that underlie the projections are as follows:

1. Growth of population will be conditioned by a fertility rate which represents "replacement level fertility."

2. Nationally, reasonably full employment, represented by a 4 percent unemployment rate, will prevail at the points for which projections are made. As in the past, unemployment will be disproportionately distributed regionally, but the extent of disproportionality will diminish.

3. The projections are assumed to be free of the immediate and direct effect of wars.

4. Continued technological progress and capital accumulation will support a growth in private output per manhour of 2.9 percent annually.

5. The new products that will appear will be accommodated within the existing industrial classification system, and, therefore, no new industrial classifications are necessary.

6. Growth in output can be achieved without ecological disaster or serious environmental deterioration, although diversion of resources for pollution control will cause changes in the industrial mix of output.

The regional projections are based on the following additional assumptions:

1. Most factors that have influenced historical shifts in regional location of "export" industry will continue into the future with varying degrees of intensity.

2. Trends toward economic area self-sufficiency in local-service industries will continue.

3. Workers will migrate to areas of economic opportunities and away from slow-growth or declining areas.

4. Regional earnings per worker and income per capita will continue to converge toward the national average.

5. Regional employment/population ratios will tend to move toward the national ratio.

The OBERS projections prepared for the Water Resources Council were based on longrun trends in those factors that affect the supply and demand for land and water resources. Major assumptions underlying these projections were a low rate of population growth (the Census Bureau Series E, December 1972 population projection), a high level of employment, no foreign conflicts, and a 3-percent annual growth in labor productivity. An implied assumption was that total demand would be sufficiently strong to maintain high employment. Principal economic indicators for selected years are summarized in the following table.

Selected U.S. economic indicators, historic and projected, 1959-2000.

Item	1959	1969	Projected 1980	Projected 2000
Population, mil.	177.1	201.9	224.1	264.4
Total personal income, bil. 1967 dol.	432.3	689.7	1,072.6	2,158.8
Per capita income, 1967 dol.	2,441	3,416	4,786	8,165
Total employment, mil.	66.4	81.0	99.3	120.9
Index of crop production (1969 = 100)	94	100	117	131
Index of livestock production (1969=100)	90	100	115	136
Index of major manufacturing production (1969=100)	66	100	158	341

Source: OBERS

Total U.S. population was projected at about 264 million for the year 2000, an increase of more than 30 percent over the estimated 1969 population. In the same period, total personal income was projected to triple and per capita personal income was expected to increase by about 250 percent. The value of crop and livestock output, measured in 1967 dollars, was projected to increase by 31 and 36 percent, respectively. The gross national product should nearly triple.

Development of Selected Baseline Land Use Estimates

USDA agricultural analyses culminating in an estimate of production and land use for a state development district, county, or river basin, normally begin with an examination of OBERS state production estimates. The OBERS distribution of projected national output among states is accomplished by an extension of trends from a historical base of 1947 to 1970. National production estimates are based upon a balance of projected agricultural exports, imports, and total domestic consumption. These national projections can be accepted with a fairly high degree of confidence. However, as the geographic area becomes smaller, e.g., regional, state, economic area, etc., the degree of confidence in projections for specific commodities drops rapidly. OBERS guidelines recognize this and cite the need for possible adjustment of state and sub-area data based upon local knowledge and expectation.

Alabama's agriculture has undergone a significant transition since 1970. In the past 9 years, peanut yields have doubled, increasing the state's share of U.S. peanut output from 10 percent to 14 percent. Alabama's 43 million bushel soybean crop in 1978 represented 2.3 percent of the U.S. crop, compared to 1.3 percent in the early 1970's.

These, and other changes in the nature and direction of Alabama's agricultural growth since 1970, led the Black Warrior River Basin Land Use Advisory Committee, hereafter referred to as the Committee, to base projections on land use changes in the 1950-1975 period statewide and to the study area's relationship to statewide agricultural production. These changes are shown in Tables 5-6 and 5-8 of the main report with a comparison of the OBERS E' high export figures.

Corn acreage in the state has declined steadily since 1940 when 3.5 million acres were harvested for grain. By 1970, acreage had dropped to 550,000 acres. Since that time, acreage harvested has fluctuated sharply, reaching 800,000 acres in 1976, dropping to 375,000 acres in 1977, then climbing back to 540,000 acres in 1978. The Committee felt that a level of about 850,000 acres was reasonable to expect in both future time frames unless programs were developed to accelerate development. Specialists at the Experiment Station agreed with this assessment. Alabama farmers produce less than 1 percent of the nation's corn crop; consequently, adjustments in this area would have little, if any effect on the national market.

The loss of cotton acreage parallels that of corn. Harvested acreage has declined to about 325,000 acres. Specialists believe Alabama's cotton industry cannot sustain itself over the long run with fewer than 400,000 acres harvested. Consequently, the Committee held to this figure as a minimum level of operation, rather than assuming cotton acreage would drop to 100,000 acres by 2020, as indicated in OBERS.

In the 1970's, Alabama farmers were producing about 1.3 percent of the nations' soybeans. Since 1970, 1.5 million acres have been added statewide. Alabama now contributes 2.3 percent of all U.S. soybeans. This growth was not contemplated in the OBERS estimates. Uncertainty clouds the soybean picture. One can only speculate as to whether the recent rapid expansion of the soybean industry is a short or long term occurrence. The opinion of the Committee and Experiment Station personnel is that Alabama's soybean harvest will be around 2.5 million acres by 2020. With this acreage, production in 1990 would exceed OBERS by 50 percent; by 2020, production would be about 40 percent above OBERS.

Alabama's peanut acreage has climbed slowly during the past 10 years to the current 214,000 acres harvested. During this time, the state has increased its share of the U.S. peanut crop from 10 to 14 percent. OBERS, on the other hand, projects a decline in the share supplied by Alabama. This results partly from the fact that the tremendous increase in Alabama peanut yields, from 1,650 pounds per acre in 1970 to 2,750 pounds in 1977, was not anticipated in the OBERS analysis. For this reason, the Committee chose to hold to the current 214,000 acres for projection purposes. The resulting production is 20 percent above OBERS in 1990 and 45 percent higher by 2020. The projected share of U.S. production would be about 11 percent, a fairly conservative figure in light of the current share.

The overall effect of these differences is the additional 1.8 million acres projected to be used for crops under baseline conditions in 1990. The difference amounts to 1.9 million acres in 2020.

APPENDIX 14

The Statewide Agricultural Resource Model and Data Requirements

14A - THE MODEL

A statewide least cost linear programming model was used to make the initial estimates of total land requirements, land use shifts and costs and returns for both the selected baseline and OBERS E' scenarios. The analyses utilized 1975 as the base year and future time frames of 1990, 2000, and 2020.

The cost minimization approach was selected on the assumption that in the long run farmers will make adjustments to produce food and fiber more efficiently. This is not always the case because of personal preferences and legal arrangements, consequently restraints are built into the model to keep projections realistic and acceptable. These restraints largely take the form of restrictions on land use shifts.

Programmed results represented a starting point from which subjective changes were made as necessary. Indeed, changes were made, particularly in the baseline estimate, to obtain a set of projections indicating the most likely course of events without accelerated USDA project-type agricultural development.

While it is not the intent of this Appendix to completely document the model used, a basic understanding of the model's framework is essential if the results are to be accurately interpreted and understood. The following sections present the basic foundations of the model.

Basic Data Needs

The programming model operates within limitations of physical resource availabilities and nebulous but real constraints. Data requirements include:

1. land availability in each study area in each time period
2. current land use on each soil resource group (SRG)
3. yields on each SRG in each time period for each enterprise considered
4. costs of production for each enterprise on each soil group
5. projected state production of each commodity in each time period
6. rotation practices, or the percent of time each soil group can be used for row crops.

Soils Groupings

The accounting unit for land resources in the analysis is in soil resource groups (SRG's). These groups, representing combinations of soils with similar land treatment needs and productivity, are described in Appendix 14B. A total of 52 SRG's were identified statewide. Groupings were prepared by the SCS State Soil Scientist, State Resource Conservationist, and State Conservation Agronomist.

Land Availability and Use

The Conservation Needs Inventory (CNI) was selected as the appropriate land inventory for this study because the CNI is the only source of agricultural land use information by soil capability class and subclass, and by county, both necessary for the programming model. The 1967 land use estimates were updated to the base year 1975. The updated land use by SRG's and counties was the judgement of SCS field personnel. Specific crop acreages for counties are those reported by the Alabama Crop and Livestock Reporting Service.

Projected urban land requirements for future residents were estimated by county and deducted from each county's 1975 land base. The remaining openland was assumed to be available for agricultural use. Woodland clearing was permitted on a graduated scale by capability class up to a maximum 10 percent of available woodland in 1990 and 20 percent by 2020.

Yields

Six crop enterprises--corn, cotton, soybeans, peanuts, hay, and wheat--were selected for the analysis. Together, the six represent about 95 percent of all crops harvested in the state.

Predicted yields in SCS technical guides were used to determine base (1975) yields for each of the six crop and two pasture enterprises by soil resource group. Base yields assuming average management are shown in Appendix 15C. Trends in Alabama yields for the period 1950 to 1975 were studied and projections were developed for 1990 and 2020. These linear extrapolations were then subjectively adjusted by SRG by the SCS Agronomist, State Resource Conservationist, and Basin Study Staff. Projected yields agreed to during these meetings are also shown in Appendix 14C. These are yields that can be expected under average management with continued improvements in crop varieties and fertilizers, and with expenditures for land and water development occurring as in the past.

Cost and Returns

Production costs for the eight enterprises considered were estimated by soil groups from State resource area budgets prepared by Auburn University, SCS, and ESS in 1978. Cost per unit of output varied considerably depending on requirements of each SRG. Production inputs are assumed to increase at the same rate as has occurred during the past 2 decades, or about 1.5 percent annually on a constant basis. Prices received for commodities are adjusted normalized prices authorized by the Water Resources Council for planning use in October 1978. These are shown in Appendix 14D.

Other Restraints

The amount of change that could take place over time between 1975 and the two projected time periods was limited in the following manner:

APPENDIX TABLE 14A

Crop	Percent of 1975 acreage unchanged with respect to SRG's and subareas	
	1990	2020
	Min. - Max.	Min. - Max.
Corn	1.0 - 2.0	1.0 - 4.0
Cotton	0.7 - 1.4	0.5 - 2.0
Soybeans	1.0 - 3.0	1.0 - 4.4
Peanuts	1.0 - 2.0	0.85 - 3.4
Wheat	0.8 - 1.6	0.8 - 3.2
Hay	0.8 - 1.6	0.55 - 2.2

For example, Blount County had 6,000 acres of cotton harvested in 1975. Under these restrictions, Blount County's cotton acreage could range between 4,200 and 8,400 acres harvested in 1990. Cost efficiency would dictate the actual level projected.

Control factors were also built into the model to increase acreage to allow for crop failure, non-productive acres utilized for water disposal, turn rows, loss of grazing resulting from pasture/crop rotations, and so forth.

Appendix 14B
SOIL RESOURCE GROUP DESCRIPTIONS

Coastal Plain Soils

Group 1

Capability units I-11, I-12, I-16, IIs-11, IIs-12. Well-drained soils on uplands and stream terraces. Slopes range from 0 to 2 percent. Mainly sandy or loamy surface layers and loamy or clayey subsoils. Moderate permeability; rapid to medium infiltration; and slow runoff. Available water capacity is moderate to high. Major soils are Norfolk, Cahaba, Ruston, Marlboro, and Red Bay.

Group 2

Capability units IIe-11, IIe-15. Well-drained soils on uplands. Slopes range from 2 to 5 percent. Loamy surface layers and clayey subsoils. Moderate or moderately slow permeability; medium infiltration; and slow to medium runoff. Available water capacity is high. Major soils are Shubuta, Magnolia, Marlboro, and Greenville.

Group 3

Capability unit IIe-19. Well and moderately well-drained soils with fragipans on uplands and stream terraces. Slopes range from 2 to 5 percent. Loamy surface layers and subsoils. Moderately slow permeability; medium infiltration; and medium to slow runoff. Available water capacity is moderate. Major soils are Savannah, Ora, and Prentiss.

Group 4

Capability units IIe-12, IIe-13, IIe-16. Well and moderately well-drained soils on uplands. Slopes range from 2 to 5 percent. Loamy surface layers and subsoils. Moderate permeability; rapid to medium infiltration; and slow to medium runoff. Available water capacity is moderate to high. Major soils are Ruston, Bama, Norfolk, Tifton, Red Bay, and Orangeburg.

Group 5

Capability units IIw-11, IIw-12, IIw-19. Moderately well and somewhat poorly drained soils on uplands and stream terraces. Slopes range from 0 to 2 percent. Loamy surface layers and loamy or clayey subsoils. Some soils have fragipans. Moderate to slow permeability; medium infiltration; and slow runoff. Available water capacity is moderate to high. Major soils are Mantachie, Lynchburg, Angie, and Izagora.

Group 6

Capability unit IIw-13. Well and moderately well-drained soils on flood plains. Slopes range from 0 to 2 percent. Loamy surface layers and subsoils. Subject to occasional flooding. Moderate permeability; rapid to medium infiltration; and slow runoff. Available water capacity is moderate to high. Major soils are Ochlockonee and Iuka.

Group 7

Capability units IIs-13, IIs-14, IIs-19. Well-drained soils on uplands. Slopes range from 0 to 5 percent. Thick sandy surface layers and loamy or clayey subsoils. Slow to moderately rapid permeability; rapid infiltration; and slow runoff. Available water capacity is low to moderate. Major soils are Wicksburg, Wagram, and Lucy.

Group 8

Capability units IIIe-11, IIIe-15, IIIe-18, IIIe-111, IIIe-121. Well-drained soils on uplands. Slopes range from 2 to 8 percent. Loamy or clayey surface layers and loamy or clayey subsoils. Moderate to slow permeability; slow infiltration; and rapid runoff. Available water capacity is high. Major soils are Shubuta, Boswell, Angie, Wilcox, Magnolia, Marlboro, and Greenville.

Group 9

Capability units IIIe-19, IIIe-191. Well and moderately well-drained soils with fragipans on uplands and stream terraces. Slopes range from 5 to 8 percent. Loamy surface layers and subsoils. Moderately slow permeability; medium infiltration; and medium runoff. Available water capacity is moderate. Major soils are Ora and Savannah.

Group 10

Capability units IIIe-12, IIIe-13, IIIe-16. Well-drained soils on uplands and stream terraces. Slopes range from 5 to 8 percent. Loamy surface layers and subsoils. Moderate permeability; medium infiltration; and medium runoff. Available water capacity is moderate to high. Major soils are Ruston, Norfolk, Orangeburg, Red Bay, Saffell, Bowie, and Tifton.

Group 11

Capability units IIIw-12, IIIw-13, IIIw-14, IIIw-15, IIIw-16, IIIw-18, IIIw-19. Somewhat poorly and poorly drained soils on uplands and stream terraces. Slopes range from 0 to 2 percent. Loamy surface layers and loamy or clayey subsoils. Moderate to slow permeability; slow infiltration; and slow runoff. Available water capacity is low to high. Major soils are Stough, Bibb, Scranton, and Wahee.

Group 12

Capability units IIIs-14, IIIs-34. Well to excessively drained soils on uplands and stream terraces. Slopes range from 0 to 8 percent. Mostly sandy throughout, although soils on 5 to 8 percent slopes have loamy subsoils at depths ranging from 40 to 80 inches. Moderately rapid or rapid permeability; rapid infiltration; and slow runoff. Available water capacity is low. Major soils are Eustis, Chipley, Troup, and Alaga.

Group 13

Capability units IVe-11, IVe-12, IVe-13, IVe-15, IVe-17, IVe-18, IVe-19, IVe-111, IVe-121, IVe-151, IVe-181, IVe-191, IIIs-18, IVs-18. Well-drained soils on uplands. Slopes range from 5 to 12 percent. Loamy surface layers and loamy or clayey subsoils. Moderate to slow permeability; medium to slow infiltration; and rapid runoff. Available water capacity is moderate to high. Major soils are Boswell, Shubuta, Ruston, Bowie, and Luverne.

Group 14

Capability units IVw-11, IVw-12, IVw-13, IVw-14, IVw-16, IVw-19, IVw-32, IVw-35. Somewhat poorly and poorly drained soils on uplands, stream terraces, and flood plains. Slopes range from 0 to 2 percent. Loamy or sandy surface layers and loamy or clayey subsoils. Moderate to very slow permeability; slow infiltration; and slow runoff. Available water capacity is low to high. Subject to occasional flooding. Major soils are Mantachie, Myatt, Leaf, and Plummer.

Group 15

Capability unit IVs-14. Excessively drained soils on uplands and stream terraces. Slopes range from 0 to 8 percent. Mainly sandy throughout. Moderately rapid to rapid permeability; medium to rapid infiltration; and slow to medium runoff. Available water capacity is low. Major soils are Lakeland and Eustis.

Group 16

Capability units Vw-11, Vw-12, Vw-13, Vw-14, Vw-35, VIIw-12, VIIw-13, VIIw-16. Poorly and very poorly drained soils in upland depressions, on stream terraces, and on flood plains. Slopes range from 0 to 2 percent. These soils are commonly stratified with textures ranging from sandy to clayey. Permeability is variable, ranging from moderate to slow; slow to moderate infiltration; and slow runoff. Available water capacity is moderate or high. Subject to frequent flooding or ponding. Major soils are Bibb and unnamed frequently flooded alluvial soils.

Group 17

Capability units VIe-11, VIe-12, VIe-13, VIe-15, VIe-16, VIe-17, VIe-18, VIe-19, VIe-111, VIe-121, VIe-151, VIe-181, VIe-191, VIIe-11, VIIe-12, VIIe-13, VIIe-15, VIIe-17, VIIe-18, VIIe-19, VIIe-111, VIIe-121, VIIe-151, VIIe-171, VIIe-181, VIIe-191. Well-drained soils on uplands. Slopes are greater than 5 percent and range mostly from 8 to 25 percent. Mostly loamy surface layers and clayey or loamy subsoils. Moderate to slow permeability; slow infiltration; and rapid runoff. Available water capacity is low to high. Major soils are Cuthbert, Shubuta, Pikeville, Boswell, Ruston, Luverne, and Troup.

Group 18

Capability units VIs-14, VIs-17, VIIs-14, VIIs-17. Well-drained and excessively drained soils on uplands and stream terraces. Slopes range from 5 to 17 percent. Mostly sandy throughout, although some soils have loamy or clayey subsoils. Rapid permeability; medium infiltration; and medium to rapid runoff. Available water capacity is low. Major soils are Troup, Lakeland, and Flomaton.

Black Belt Soils

Group 19

Capability unit IIe-28. Well-drained soils on uplands. Slopes range from 1 to 3 percent. Loamy or clayey surface layers and clayey subsoils. Very slow or slow permeability; slow infiltration; and slow runoff. Available water capacity is high to low. Major soils are Oktibbeha and Sumter.

Group 20

Capability units IIw-28, IIs-28. Moderately well to somewhat poorly drained soils on uplands, stream terraces, and flood plains. Slopes range from 0 to 3 percent. Mostly clayey throughout. Very slow permeability; slow infiltration; and slow runoff. Available water capacity is high. Major soils are Leeper, Trinity, Kaufman, Catalpa, and Kipling.

Group 21

Capability units IIIe-28, IIIw-28. Well to somewhat poorly drained soils on uplands and stream terraces. Slopes range from 0 to 5 percent. Loamy and clayey surface layers and clayey subsoils. Very slow or slow permeability; slow infiltration; and slow to medium runoff. Available water capacity is high to low. Major soils are Oktibbeha, Vaiden, Sumter, and Kipling.

Group 22

Capability units IVe-28, IVs-27. Well to somewhat poorly drained soils on uplands. Slopes range from 5 to 8 percent. Loamy and clayey surface layers and clayey subsoils. Very slow or slow permeability; slow infiltration; and medium to rapid runoff. Available water capacity is high to low. Major soils are Oktibbeha, Sumter, and Vaiden.

Group 23

Capability units IIIw-25, IVw-21, IVw-28, Vw-28. Somewhat poorly and poorly drained soils on uplands, stream terraces, and flood plains. Slopes range from 0 to 2 percent. Loamy surface layers and clayey subsoils. Very slow permeability; slow infiltration; and slow runoff. Available water capacity is high. Major soils are Eutaw, Una, Urbo, and Forestdale.

Group 24

Capability units VIe-27, VIe-28, VIIe-28. Well-drained soils on uplands. Slopes range from 5 to 12 percent. Clayey surface layers and subsoils. Very slow or slow permeability; slow infiltration; and rapid runoff. Available water capacity is high to low. Major soils are Oktibbeha, Binnsville, and Sumter.

Piedmont Soils

Group 25

Capability units I-31, I-32, I-36. Well-drained soils on uplands and stream terraces. Slopes range from 0 to 2 percent. Loamy surface layers and subsoils. Moderate permeability; medium infiltration; and slow runoff. Available water capacity is high. Major soils are Wickham and Starr.

Group 26

Capability units IIe-31, IIe-35, IIe-36, IIe-38, IIe-39. Well and moderately well-drained soils on uplands and stream terraces. Slopes range from 2 to 5 percent. Loamy surface layers and loamy or clayey subsoils. Moderate permeability; medium infiltration; and slow to medium runoff. Available water capacity is moderate or high. Major soils are Wickham, Madison, and Altavista.

Group 27

Capability units IIw-32, IIw-33, IIw-36. Well and moderately well-drained soils on stream terraces and flood plains. Slopes range from 0 to 5 percent. Loamy surface layers and subsoils. Moderate or moderately rapid permeability; medium to rapid infiltration; and slow runoff. Available water capacity is moderate or high. Major soils are Toccoa, Altavista, and Congaree.

Group 28

Capability units IIIe-31, IIIe-35, IIIe-36, IIIe-38, IIIe-39, IIIe-311, IIIe-351. Well-drained soils on uplands. Slopes range from 2 to 8 percent. Loamy surface layers and clayey subsoils. Moderate permeability; medium infiltration; and medium runoff. Available water capacity is moderate or high. Major soils are Madison, Appling, Cecil, Durham, and Tatum.

Group 29

Capability units IIIw-32, IIIw-36. Moderately well and somewhat poorly drained soils on flood plains. Slopes range from 0 to 5 percent. Loamy surface layers and subsoils. Moderate permeability; medium infiltration; and slow runoff. Available water capacity is moderate or high. Major soils are Chewacla and Augusta.

Group 30

Capability units IVe-31, IVe-35, IVe-36, IVe-37, IVe-311, IVe-351, IVs-33. Well-drained soils on uplands and stream terraces. Slopes range from 6 to 15 percent. Loamy surface layers and loamy or clayey subsoils. Moderate permeability; medium infiltration; and rapid runoff. Available water capacity is moderate. Major soils are Madison, Cecil, Appling, and Gwinnett.

Group 31

Capability units VIe-31, VIe-35, VIe-36, VIe-37, VIe-311, VIe-351, VIe-371. Well-drained soils on uplands. Slopes range from 10 to 25 percent. Loamy surface layers and loamy or clayey subsoils. Moderate permeability; medium to slow infiltration; and rapid runoff. Available water capacity is moderate. Major soils are Madison, Cecil, Gwinnett, and Appling.

Group 32

Capability units VIIe-35, VIIe-37, VIIe-351, VIIe-371, VIs-31, VIs-33, VIs-35, VIs-37, VIIs-37, VIIs-351, VIIs-371. Well-drained soils on uplands. Some soils are stony and some are shallow to bedrock. Slopes range from 15 to 25 percent or more. Loamy surface layers and loamy or clayey subsoils. Moderate permeability; slow infiltration; and rapid runoff. Available water capacity is low. Major soils are Tallapoosa and Louisa.

Limestone Valley and Upland Soils

Group 33

Capability units I-41, I-42, I-43, I-45, IIs-46. Well-drained soils on uplands and stream terraces. Slopes range from 0 to 2 percent. Loamy surface layers and loamy or clayey subsoils. Moderate permeability; medium infiltration; and slow runoff. Available water capacity is moderate or high. Major soils are Grasmere, Sequatchie, and Holston.

Group 34

Capability units IIe-41, IIe-42, IIe-43, IIe-46. Well-drained soils on uplands and stream terraces. Slopes range from 2 to 6 percent. Loamy surface layers and loamy or clayey subsoils. Moderate permeability; medium infiltration; and slow to medium runoff. Available water capacity is moderate to high. Major soils are Dewey, Decatur, Allen, Holston, Fullerton, and Etowah.

Group 35

Capability units IIe-45, IIe-48, IIe-49. Well and moderately well-drained soils on uplands. Slopes range from 2 to 6 percent. Loamy surface layers and clayey or dense loamy subsoils. Moderately slow to very slow permeability; medium infiltration; and medium runoff. Available water capacity is low or moderate. Major soils are Dickson, Locust, Leadvale, and Hollywood.

Group 36

Capability units IIw-41, IIw-42, IIw-45, IIw-49, IIs-42. Well and moderately well-drained soils on uplands, stream terraces, and flood plains. Slopes range from 0 to 2 percent. Loamy surface layers and loamy or clayey subsoils. Moderate to slow permeability; medium infiltration; and slow runoff. Available water capacity is high to low. Major soils are Grasmere, Locust, Lobelville, Sango, and Greendale.

Group 37

Capability units IIIe-41, IIIe-42, IIIe-43, IIIe-47, IIIe-411, IIIe-421. Well-drained soils on uplands and stream terraces. Slopes range from 2 to 10 percent. Loamy surface layers and loamy or clayey subsoils. Moderate permeability; medium infiltration; and rapid runoff. Available water capacity is moderate to high. Major soils are Fullerton, Decatur, Dewey, Allen, and Holston.

Group 38

Capability units IIIe-45, IIIe-48, IIIe-49, IIIe-491. Well and moderately well-drained soils on uplands. Slopes range from 2 to 10 percent. Loamy surface layers and clayey or dense loamy subsoils. Very slow or slow permeability; slow infiltration; and rapid runoff. Available water capacity is low or moderate. Major soils are Colbert, Conasauga, and Talbott.

Group 39

Capability units IIIw-42, IIIw-46, IIIw-48, IIIw-49. Moderately well to poorly drained soils on uplands, stream terraces, and flood plains. Slopes range from 0 to 2 percent. Loamy surface layers and loamy or clayey subsoils. Moderate permeability; slow infiltration; and slow runoff. Available water capacity is moderate or high. Major soils are Lee, Chenneby, Tupelo, and Sylacauga.

Group 40

Capability units IVe-41, IVe-42. Well-drained soils on uplands and stream terraces. Slopes range from 10 to 15 percent. Loamy surface layers and loamy or clayey subsoils. Moderate permeability; slow infiltration; and rapid to medium runoff. Available water capacity is moderate. Major soils are Fullerton and Allen.

Group 41

Capability units IVe-45, IVe-47, IVe-48, IVe-411, IVe-421, IVe-451, IVe-481, IVe-491. Well-drained soils on uplands. Slopes range from 6 to 10 percent. Loamy and clayey surface layers and clayey subsoils. Slow permeability; slow infiltration; and rapid runoff. Available water capacity is moderate or high. Major soils are Decatur, Firestone, Montevallo, Dewey, and Fullerton.

Group 42

Capability units IVw-42, IVw-48, IVw-49, IVw-55. Poorly drained soils on uplands, stream terraces, and flood plains. Slopes range from 0 to 2 percent. Loamy surface layers and loamy or clayey subsoils. Slow permeability; slow infiltration; and slow runoff. Subject to frequent flooding or ponding. Available water capacity is moderate or high. Major soils are Melvin, Dowellton, Guthrie, and Purdy.

Group 43

Capability units IVs-41, IVs-42, IVs-43. Well-drained soils on uplands and stream terraces. Slopes range from 2 to 15 percent. Loamy surface layers and subsoils; many coarse fragments throughout. Moderately rapid permeability; medium infiltration; and medium to rapid runoff. Available water capacity is low. Major soil is Bodine.

Group 44

Capability units VIe-41, VIe-42, VIe-45, VIe-47, VIe-48, VIe-411, VIe-421 VIe-451, VIe-471, VIe-481. Well-drained soils on uplands and stream terraces. Slopes range from 10 to 25 percent. Loamy or clayey surface layers and subsoils. Very slow to moderate permeability; slow infiltration; and rapid runoff. Available water capacity is low to moderate. Major soils are Fullerton, Montevallo, and Firestone.

Group 45

Capability units VIIe-41, VIIe-45, VIIe-47, VIIe-48, VIIe-411, VIIe-421, VIIe-471, VIs-41, VIs-42, VIs-43, VIs-431, VIIs-41, VIIs-42, VIIs-43. Well-drained soils on uplands. Slopes range from 10 to 25 percent or more. Loamy and clayey surface layers and subsoils. Some soils contain many coarse fragments. Others are severely eroded. Moderate to slow permeability; slow infiltration; and rapid runoff. Available water capacity is low to moderate. Major soils are Montevallo and Fullerton.

Group 46

Capability units I-51, IIe-51, IIe-55, IIe-56. Well-drained soils on uplands. Slopes range from 0 to 6 percent. Loamy surface layers and subsoils. Moderate permeability; medium to rapid infiltration; and slow to medium runoff. Available water capacity is moderate. Major soils are Hartsells, Nauvoo, Albertville, Linker, and Enders.

Group 47

Capability units IIe-59, IIw-52, IIw-59. Moderately well-drained soils on uplands and stream terraces. Slopes range from 0 to 6 percent. Loamy surface layers and dense loamy subsoils. Slow permeability; medium infiltration; and medium runoff. Available water capacity is low. Major soils are Tilsit and Wynnville.

Group 48

Capability units IIIe-51, IIIe-55, IIIe-56, IIIe-57, IIIe-59, IIIe-551, IIIe-561, IIIw-59. Slopes range from 2 to 10 percent. Loamy surface layers and loamy or clayey subsoils. Moderate to slow permeability; slow infiltration; and rapid runoff. Available water capacity is moderate or low. Major soils are Hartsells, Nauvoo, Linker, Albertville, Enders, Mountainburg, and Tilsit.

Group 49

Capability units IVe-55, IVe-56, IVe-57, IVe-551, IVe-561, IVe-571. Well-drained soils on uplands. Slopes range from 6 to 15 percent. Loamy surface layers and loamy or clayey subsoils. Moderate to slow permeability; slow infiltration; and rapid runoff. Available water capacity is low or moderate. Major soils are Mountainburg, Linker, Nauvoo, Albertville, and Hector.

Group 50

Capability units VIe-57, VIe-551, VIe-561, VIe-571. Well-drained soils on uplands. Slopes range from 10 to 15 percent. Loamy or clayey surface layers and subsoils. Moderate to very slow permeability; slow infiltration; and rapid runoff. Available water capacity is low or moderate. Major soils are Mountainburg, Townley, Hector, and Albertville.

Group 51

Capability units VIIe-57, VIIe-551, VIIe-571, VIs-57. Well-drained soils on uplands. Slopes range from 6 to 25 percent or more. Loamy surface layers and loamy or clayey subsoils. Moderately rapid permeability; slow infiltration; and rapid runoff. Available water capacity is low. Major soils are Hector and Muskingum.

Group 52

Capability units VIIe-281, VIIs-47, VIIs-57, VIIw-11, VIIIs-11, VIIIs-14, VIIs-35. Soils and miscellaneous areas which have very limited potential for use as cropland or improved pasture.

Appendix Table 14C
1975 CROP AND PASTURE YIELDS
AVERAGE MANAGEMENT CONDITIONS
ALABAMA SOIL RESOURCE GROUPS

SRG No.	CORN bus.	COTTON lbs.	HAY tons	PEANUTS cwts.	SOYBEANS bus.	WHEAT bus.	PASTURE AUM'S	VEGETABLES cwts.
1	58	548	2.9	22.2	25	36	6.0	79
2	55	548	2.9	19.0	24	33	6.0	70
3	45	450	2.9	-	23	25	6.0	-
4	55	518	2.9	21.0	23	33	6.0	75
5	74	538	2.5	20.0	32	25	6.0	60
6	58	450	2.5	-	25	-	6.0	-
7	45	450	2.5	21.0	20	25	4.8	70
8	50	495	2.6	18.5	21	30	5.8	63
9	40	400	2.7	-	20	22	5.7	-
10	50	460	2.6	19.0	21	30	5.5	60
11	43	-	1.0	-	14	-	5.5	-
12	33	269	1.2	18.3	18	24	3.8	44
13	26	248	2.0	15.7	12	22	3.9	-
14	16	-	1.2	-	10	-	4.0	-
15	25	-	1.1	16.5	13	20	3.4	-
16	-	-	-	-	-	-	3.2	-
17	-	-	0.8	-	-	-	2.4	-
18	-	-	0.9	-	-	-	3.0	-
19	41	357	1.2	-	26	34	4.9	49
20	61	372	1.5	-	32	38	6.2	50
21	32	256	0.9	-	18	27	4.5	-
22	25	-	0.9	-	-	21	3.9	-
23	-	-	1.0	-	10	-	5.2	-
24	-	-	0.7	-	-	-	2.6	-
25	75	550	3.0	-	30	36	6.0	79
26	45	387	1.7	-	22	21	5.8	44
27	43	-	0.9	-	32	-	5.9	-
28	40	340	1.5	-	20	19	5.8	40
29	43	-	1.0	-	14	-	6.2	-
30	26	260	1.4	-	12	14	4.3	-
31	-	-	1.4	-	-	-	3.2	-
32	-	-	0.8	-	-	-	2.0	-
33	85	584	2.6	-	38	41	6.8	64
34	68	525	2.3	-	31	33	5.4	51
35	50	450	2.0	-	23	30	5.4	45
36	65	517	2.3	-	34	33	6.5	52
37	55	475	2.1	-	29	33	4.9	44
38	45	405	1.6	-	21	27	4.9	41
39	43	-	1.0	-	21	-	5.2	-
40	44	260	1.9	-	18	25	3.5	-
41	35	208	1.5	-	14	20	3.2	-
42	-	-	-	-	10	-	3.1	-
43	-	-	1.1	-	-	-	2.4	-
44	-	-	-	-	-	-	2.9	-
45	-	-	0.8	-	-	-	2.0	-
46	68	538	2.1	18.7	30	37	5.7	55
47	43	450	2.0	-	21	30	5.4	45
48	60	501	1.6	17.6	24	29	4.0	44
49	21	-	1.2	-	-	-	2.7	-
50	-	-	-	-	-	-	2.5	-
51	-	-	-	-	-	-	1.8	-

Source: SCS-ESS estimates for use in water resource planning, October, 1978

Appendix Table 14C
1990 CROP & PASTURE YIELDS
WITHOUT ACCELERATED DEVELOPMENT
AVERAGE MANAGEMENT CONDITIONS
ALABAMA SOIL RESOURCE GROUPS

SRG No.	CORN bus.	COTTON lbs.	HAY tons	PEANUTS cwts.	SOYBEANS bus.	WHEAT bus.	PASTURE AUM'S	VEGETABLES cwts.
1	77	641	5.4	33.3	28	42	7.3	96
2	73	641	5.4	28.1	27	39	7.0	85
3	59	526	5.4	-	26	29	7.0	-
4	73	606	5.4	31.1	26	39	7.0	91
5	101	629	4.6	30.4	37	29	7.0	73
6	77	526	5.4	-	28	-	7.0	-
7	58	526	5.4	30.2	22	29	5.6	85
8	66	579	5.0	27.0	23	35	6.6	76
9	52	468	5.1	-	22	26	6.5	-
10	66	538	5.0	27.7	23	35	6.3	73
11	58	-	1.9	-	16	-	6.4	-
12	43	307	2.2	26.4	20	28	4.4	53
13	34	290	3.7	22.3	13	26	4.4	-
14	21	-	2.2	-	11	-	4.6	-
15	32	-	2.0	23.8	14	23	4.0	-
16	-	-	-	-	-	-	3.7	-
17	-	-	1.6	-	-	-	2.7	-
18	-	-	1.7	-	-	-	3.4	-
19	54	418	2.2	-	29	40	5.7	59
20	84	435	2.8	-	37	44	7.5	60
21	42	300	1.7	-	20	32	5.3	-
22	32	-	1.7	-	-	25	4.4	-
23	-	-	1.9	-	11	-	5.9	-
24	-	-	1.2	-	-	-	3.0	-
25	100	643	5.6	-	34	42	7.3	96
26	59	452	3.3	-	25	25	6.8	53
27	59	-	1.7	-	37	-	7.1	-
28	52	398	2.8	-	22	22	6.6	48
29	58	-	1.9	-	16	-	7.5	-
30	34	304	2.6	-	13	16	4.9	-
31	-	-	2.6	-	-	-	3.6	-
32	-	-	1.6	-	-	-	2.3	-
33	113	683	5.0	-	42	48	8.2	77
34	90	614	4.3	-	35	39	6.3	62
35	66	526	3.7	-	26	35	6.3	54
36	89	605	4.3	-	40	39	7.9	63
37	72	556	3.9	-	32	39	5.6	53
38	59	473	2.9	-	24	32	5.6	50
39	58	-	1.9	-	25	-	6.3	-
40	57	304	3.4	-	20	29	4.0	-
41	45	229	2.8	-	16	23	3.6	-
42	-	-	-	-	12	-	3.8	-
43	-	-	2.0	-	-	-	2.7	-
44	-	-	-	-	-	-	3.3	-
45	-	-	1.6	-	-	-	2.3	-
46	90	629	3.9	28.0	34	43	6.9	67
47	57	526	3.7	-	24	35	6.3	54
48	79	586	2.9	25.7	27	34	4.6	53
49	27	-	2.2	-	-	-	3.1	-
50	-	-	-	-	-	-	2.9	-
51	-	-	-	-	-	-	2.0	-

Source: SCS-ESS estimates for use in water resource planning, October, 1978.

Appendix Table 14C
2020 CROP & PASTURE YIELDS
WITHOUT ACCELERATED DEVELOPMENT
AVERAGE MANAGEMENT CONDITIONS
ALABAMA SOIL RESOURCE GROUPS

SRG No.	CORN bus.	COTTON lbs.	HAY tons	PEANUTS cwts.	SOYBEANS bus.	WHEAT bus.	PASTURE AUM'S	VEGETABLES cwts.
1	108	875	7.0	50.2	32	51	8.7	114
2	101	875	7.0	42.0	31	47	8.2	101
3	82	720	7.0	-	29	36	8.2	-
4	101	829	7.0	46.4	29	47	8.2	108
5	145	861	6.0	46.2	45	36	8.2	86
6	108	720	6.0	-	32	-	8.2	-
7	79	720	6.0	44.3	26	36	6.5	101
8	90	792	6.2	40.0	27	42	7.5	91
9	72	640	6.5	-	26	31	7.4	-
10	90	736	6.2	41.0	27	43	7.2	86
11	82	-	2.3	-	20	-	7.5	-
12	58	401	2.8	38.6	23	34	5.2	63
13	46	397	4.6	32.3	15	31	5.1	-
14	28	-	2.8	-	13	-	5.2	-
15	44	-	2.6	34.8	17	28	4.6	-
16	-	-	-	-	-	-	4.4	-
17	-	-	1.9	-	-	-	3.1	-
18	-	-	2.2	-	-	-	3.9	-
19	75	571	2.8	-	33	48	6.7	71
20	121	595	3.6	-	45	54	9.0	72
21	58	410	2.2	-	23	38	6.1	-
22	44	-	2.2	-	-	30	5.1	-
23	-	-	2.3	-	13	-	6.8	-
24	-	-	1.7	-	-	-	3.4	-
25	140	880	7.1	-	38	51	8.7	114
26	83	619	4.0	-	28	30	7.9	63
27	84	-	2.2	-	45	-	8.6	-
28	72	544	3.4	-	26	27	7.5	58
29	82	-	2.3	-	20	-	9.0	-
30	46	416	3.3	-	15	20	5.6	-
31	-	-	3.3	-	-	-	4.2	-
32	-	-	1.9	-	-	-	2.6	-
33	158	934	6.2	-	49	58	9.9	92
34	124	840	5.6	-	40	47	7.3	73
35	92	720	4.8	-	29	43	7.3	65
36	129	827	5.6	-	48	47	9.4	75
37	100	760	5.1	-	37	47	6.4	63
38	81	648	3.7	-	27	38	6.4	59
39	82	-	2.3	-	29	-	7.5	-
40	78	416	4.5	-	23	36	4.6	-
41	61	281	3.4	-	17	27	4.0	-
42	-	-	-	-	14	-	4.5	-
43	-	-	2.6	-	-	-	3.1	-
44	-	-	-	-	-	-	3.8	-
45	-	-	1.9	-	-	-	2.6	-
46	126	861	5.1	42.3	38	52	8.3	79
47	79	720	4.8	-	27	43	7.3	65
48	109	802	3.9	38.0	31	41	5.2	63
49	37	-	2.8	-	-	-	3.5	-
50	-	-	-	-	-	-	3.2	-
51	-	-	-	-	-	-	2.3	-

Source: SCS-ESS estimates for use in water resource planning, October, 1978.

Appendix Table 14D - Normalized Commodity Prices Used in Projection Analyses, Alabama.

Commodity	Unit	Price received
		Dol.
Corn	Bu.	2.46
Cotton	Lb.	0.549
Cottonseed	Ton	86.06
Peanuts	Lb.	0.201
Soybeans	Bu.	6.05
Wheat	Bu.	2.10
Hay	Bale	47.12
Steers	Cwt	31.43
Calves	Cwt	29.22

Source: Water Resources Council, October 1978

Appendix Table 15
Estimated Non-Energy Mineral Production and Disturbed Acreage
by Whole County Areas of the Black Warrior River Basin

County and commodity	1975-90 Tonnage	1975-90 Disturbed acreage	1990-2020 Tonnage	1990-2020 Disturbed acreage
	Thou. tons	Acres	Thou. tons	Acres
Jefferson				
Clay and shale	10,000	100	24,000	500
Sand and gravel	890	50	3,800	230
Limestone aggregate	120,000	1,200	505,000	5,000
Cement	16,000	160	70,000	700
Blount				
Sand and gravel	2,500	150	9,900	600
Dimension sandstone	18	1	80	4.5
Walker				
Clay and shale	130	*	300	*
Tuscaloosa				
Sand and gravel	5,000	330	20,000	1,200
Clay	5,000	125	30,000	3,000
Fayette				
Sand and gravel	400	25	2,000	120
Greene				
Sand and gravel	700	40	3,000	160
Hale				
Sand and gravel	500	45	2,000	120

* To be mined in conjunction with coal mining. No new disturbed acreage.

Source: Alabama Geological Survey

Appendix Table 16A - Flood plain land use by CNI watersheds, Black Warrior River Basin, 1975 (within hydrologic boundary)

CNI watershed number	Drainage area acres	Flood plain land use				Total flood plain acres
		Crops	Pasture	Other	Woods	
		---------	-----Acres-----	---------	---------	
Mulberry Fork						
35a4(g)1-1	131,974	0	53	0	875	937
35a4(g)1-2	62,496	0	8	318	326	326
35a4(g)1-3	65,845	0	0	0	175	175
35a4(g)1-4	58,741	0	0	0	269	269
35a4(g)1-5	51,080	0	236	48	887	1,171
35a4(g)1-6	35,432	0	0	0	73	73
35a4(g)1-7	39,064	0	48	0	466	514
35a4(g)1-8	40,456	0	0	0	390	390
35a4(g)1-9	25,192	0	0	0	197	197
35a4(g)1-10	41,056	0	109	0	846	955
35a4(g)1-11	25,588	0	276	0	436	712
35a4(g)1-12	73,149	0	73	0	956	1,029
35a4(g)1-13	12,378	0	0	0	70	70
35a4(g)1-14	26,338	0	0	0	70	70
35a4(g)1-15	36,225	0	445	0	3,028	3,483
35a4(g)1-16	18,407	0	0	0	147	147
35a4(g)1-17	67,424	0	115	0	610	725
35a4(g)1-18	35,248	0	1,832	0	1,569	3,401
35a4(g)1-19	11,913	0	84	0	1,014	1,098
35a4(g)1-20	13,607	0	0	0	83	83
35a4(g)1-21	17,009	0	618	30	159	807
35a4(g)1-22	6,627	0	42	0	228	270
35a4(g)1-23	21,295	0	0	0	394	394
35a4(g)1-24	103,845	146	593	0	7,633	8,372
35a4(g)1-25	9,351	0	0	0	184	184
35a4(g)1-26	25,508	32	0	109	622	763
35a4(g)1-27	23,201	240	0	0	199	439
35a4(g)1-28	46,960	183	1,862	0	2,864	4,909
35a4(g)1-29	25,602	111	672	38	1,122	1,943
35a4(g)1-30	18,253	81	58	380	1,106	1,625
35a4(g)1-31	98,644	88	770	240	5,680	6,778
35a4(g)1-32	42,826	161	120	132	2,778	3,191
35a4(g)1-33	9,822	0	0	12	751	763

35a4(g)1-34	13,866	82	451	0	841	1,374
35a4(g)1-35	9,757	8	133	0	444	585
35a4(g)1-36	44,402	6	883	0	3,096	3,985
35a4(g)1-37	10,975	0	0	0	179	179
35a4(g)1-38	83,802	70	72	126	5,171	5,439
35a4(g)1-39	21,655	0	14	0	9	23
Mulberry Fork Subtotal	1,505,003	1,217	9,577	1,115	45,939	57,848
Locust Fork						
35a4(g)(1)(a)-1	33,715	0	154	0	800	954
35a4(g)(1)(a)-2	14,483	0	210	0	463	673
35a4(g)(1)(a)-3	75,481	27	85	23	2,324	2,459
35a4(g)(1)(a)-4	11,491	0	193	0	517	710
35a4(g)(1)(a)-5	14,086	0	362	0	665	1,027
35a4(g)(1)(a)-6	14,733	105	1,105	12	1,486	2,708
35a4(g)(1)(a)-7	13,179	70	223	0	691	984
35a4(g)(1)(a)-8	42,101	557	493	142	1,595	2,787
35a4(g)(1)(a)-9	18,594	0	685	0	2,225	2,910
35a4(g)(1)(a)-10	60,023	0	391	152	2,325	2,868
35a4(g)(1)(a)-11	95,508	38	881	362	3,089	4,370
35a4(g)(1)(a)-12	23,057	138	364	25	1,195	1,722
35a4(g)(1)(a)-13	62,568	38	262	0	1,012	1,312
35a4(g)(1)(a)-14	14,439	0	0	0	0	0
35a4(g)(1)(a)-15	65,321	0	129	330	1,737	2,196
35a4(g)(1)(a)-16	27,736	0	939	361	1,928	3,228
35a4(g)(1)(a)-17	24,460	0	367	56	1,409	1,832
35a4(g)(1)(a)-18	66,877	0	451	1,033	2,243	3,727
35a4(g)(1)(a)-19	67,317	0	246	2,153	2,420	5,819
35a4(g)(1)(a)-20	26,621	81	437	0	326	844
Locust Fork Subtotal	771,790	1,054	7,977	5,649	28,450	43,130
Black Warrior Main						
35a4(g)-1	71,802	707	405	222	2,505	3,839
35a4(g)-2	75,764	755	360	0	1,790	2,905
35a4(g)-3	52,562	0	121	0	3,104	3,225
35a4(g)-4	31,830	0	0	0	635	635
35a4(g)-5	108,778	0	112	0	1,378	1,490

Appendix Table 16A (con't) - Flood plain land use by CNI watersheds, Black Warrior River Basin, 1975 (within hydrologic boundary)

CNI watershed number	Drainage area acres	Flood plain land use				Total flood plain acres
		Crops	Pasture	Other	Woods	
		------------------Acres------------------				
35a4(g)-6	64,265	0	378	49	1,708	2,135
35a4(g)-7	76,182	0	706	0	296	1,002
35a4(g)-8	53,475	0	344	2,606	2,955	5,905
35a4(g)-9	44,509	0	21	0	1,508	1,529
35a4(g)-10	33,130	0	0	0	720	720
35a4(g)-11	34,138	0	0	0	523	523
35a4(g)-12	70,479	29	104	293	1,835	2,261
35a4(g)-13	50,797	2,747	357	619	3,969	7,692
35a4(g)-14	70,345	0	412	360	2,636	3,408
35a4(g)-15	45,676	6,324	1,596	294	13,179	21,393
35a4(g)-16	64,961	4,872	2,839	2,405	14,204	24,320
35a4(g)-17	75,104	2,057	798	106	8,577	11,538
35a4(g)-18	35,309	0	133	53	3,219	3,405
35a4(g)-19	48,033	95	324	5	2,956	3,380
35a4(g)-20	45,539	1,719	345	0	8,135	10,199
35a4(g)-21	43,479	882	314	21	5,771	6,988
35a4(g)-22	37,334	0	45	0	3,150	3,195
35a4(g)-23	74,763	257	333	242	8,632	9,464
35a4(g)-24	13,552	0	0	0	7,788	7,788
35a4(g)-25	33,004	2,694	811	300	19,304	23,109
35a4(g)-26	131,693	163	78	0	7,197	7,438
35a4(g)-27	31,094	451	400	45	12,788	13,684
35a4(g)-28	10,356	350	193	60	17,787	18,390
35a4(g)-29	202,148	5,507	9,639	941	11,229	27,316
Black Warrior Main Subtotal	1,730,101	29,609	21,168	8,621	169,478	228,876
Black Warrior Basin Total	4,006,894	31,880	38,722	15,385	243,867	329,854

Source: SCS estimate.

Appendix Table 16B - Estimated Flood Damages by Conservation Needs Inventory Watersheds, Black Warrior River Basin Study Area, 1975

CNI watershed	County	Name of stream	Flood plain location 1/	Average annual flood damage (dollars)				Total (dollars)	
				Crops	Pasture	Urban	Other indirect	Inside basin	Outside basin
35a4(g)-17	Bibb	Bear	Tributary	0	140	0	20	160	0
35a4(g)-18	Bibb	Lye	Tributary	0	0	0	0	0	0
35a4(g)-20	Bibb	-	Tributary	0	0	0	0	0	0
			Total	0	140	0	20	160	0
35a5(g)1-10	Blount	Pan	Tributary	0	400	0	50	450	0
35a4(g)1-20	Blount	Mulberry	Riverine	0	0	0	0	0	0
35a4(g)1-21	Blount	Blue Springs	Tributary	0	2470	1500	500	4470	0
35a4(g)1-22	Blount	Mulberry	Riverine	0	170	0	20	190	0
35a4(g)1-29	Blount	Mulberry	Riverine	940	2690	0	440	4070	0
35a4(g)1-34	Blount	Sloan	Tributary	0	0	0	0	0	0
		Mulberry	Riverine	0	700	0	80	780	0
35a4(g)(1)(a)-1	Blount	Stab	Tributary	0	0	0	0	0	0
		Warrior	Riverine	0	0	0	0	0	0
35a4(g)(1)(a)-2	Blount	Mud	Tributary	0	0	0	0	0	0
35a4(g)(1)(a)-3	Blount	Wood	Tributary	0	0	0	0	0	0
		Locust	Riverine	230	280	0	60	570	0
35a4(g)(1)(a)-4	Blount	Graves	Tributary	0	770	0	90	860	0
35a4(g)(1)(a)-5	Blount	Wynnville	Tributary	0	1340	0	160	1500	0
35a4(g)(1)(a)-7	Blount	Dry	Tributary	600	890	0	180	1670	0
35a4(g)(1)(a)-8	Blount	Calvert	Tributary	4730	1970	3050	1170	10920	0
35a4(g)(1)(a)-9	Blount	Locust	Riverine	0	0	0	0	0	0
35a4(g)(1)(a)-10	Blount	Long	Tributary	0	210	0	20	230	0
			Riverine	0	690	0	80	770	0
35a4(g)(1)(a)-11	Blount	Hogeland	Tributary	0	280	0	30	310	0
		Locust	Riverine	0	990	0	120	1110	0
35a4(g)(1)(a)-12	Blount	Chittwood	Tributary	1170	1460	0	320	2950	0
35a4(g)(1)(a)-13	Blount	Blackburn	Tributary	320	1050	0	160	1530	0
35a4(g)(1)(a)-14	Blount	-	Tributary	0	0	0	0	0	0
35a1-10	Blount	-	Tributary	0	0	0	0	0	0
21-67	Blount	Browns	Tributary	0	2110	0	250	0	2360
21-68	Blount	Big Springs	Tributary	0	1510	0	180	0	1690
			Subtotal	7990	19980	4550	3910	32380	4050

Appendix Table 16B (con't) - Estimated Flood Damages by Conservation Needs Inventory Watersheds, Black Warrior River Basin Study Area, 1975

CNI watershed	County	Name of stream	Flood plain location 1/	Average annual flood damage (dollars) Crops	Pasture	Urban	Other indirect	Total (dollars) Inside basin	Outside basin
35a4(g)1-3	Cullman	Blevens	Tributary	0	0	0	0	0	0
35a4(g)1-4	Cullman	Crooked	Tributary	0	0	0	0	0	0
35a4(g)1-5	Cullman	Ryan	Tributary	0	940	2400	400	3740	0
35a4(g)1-6	Cullman	Eight Mile	Tributary	0	0	0	0	0	0
35a4(g)1-7	Cullman	Brindle	Tributary	0	190	0	20	210	0
		Mulberry	Riverine	0	0	0	0	0	0
35a4(g)1-8	Cullman	Duck	Tributary	0	0	0	0	0	0
35a4(g)1-9	Cullman	Mulberry	Tributary	0	0	0	0	0	0
		Mulberry	Riverine	0	0	0	0	0	0
35a4(g)1-10	Cullman	Pan	Tributary	0	0	0	0	0	0
35a4(g)1-17	Cullman	Ryan	Tributary	0	460	0	60	520	0
35a4(g)1-18	Cullman	Marriot	Tributary	0	5450	0	650	6100	0
			Riverine	0	1880	0	230	2100	0
35a4(g)1-19	Cullman	Mud	Tributary	0	340	0	40	380	0
		Mulberry	Riverine	0	0	0	0	0	0
35a4(g)1-27	Cullman	-	Tributary	0	0	0	0	0	0
35a4(g)1-28	Cullman	Dorseys	Tributary	0	3770	0	450	4220	0
		Mulberry	Riverine	0	3680	0	440	4120	0
21-59	Cullman	Flint	Tributary	0	670	0	80	750	0
			Total	0	17380	2400	2370	22150	0
35a4(g)(1)(a)-3	Etowah	Locust	Riverine	0	0	0	0	0	0
35a4(g)(1)(a)-5	Etowah	Winnville	Tributary	0	100	0	0	100	0
35a4(g)(1)(a)-6	Etowah	Bristows	Tributary	890	4420	0	640	5950	0
35a4(g)(1)(a)-9	Etowah	Samuels	Tributary	0	540	0	60	600	0
		Locust	Riverine	0	2200	0	260	2460	0
			Subtotal	890	7260	0	960	9110	0
35a4(g)1-20	Fayette	Lost	Tributary	0	0	0	0	0	0
35a4(g)1-35	Fayette	Pendley	Tributary	100	0	0	0	100	0
35a4(g)1-36	Fayette	Wolf	Tributary	0	550	0	70	620	0
35a4(g)1-39	Fayette	-	Tributary	0	0	0	0	0	0
35a4(g)-1	Fayette	Toro-Cedar	Tributary	2860	1200	11100	1820	16980	0
35a4(g)-2	Fayette	North River	Tributary	6420	1440	0	940	8800	0
35a4(g)-3	Fayette	North River	Tributary	0	0	0	0	0	0
35a4(g)-5	Fayette	Big Yellow	Tributary	0	0	0	0	0	0
35a4(g)-1	Fayette	L. New River	Tributary	0	0	0	0	0	0
35a4(e)-2	Fayette	Turkey	Tributary	730	200	0	110	0	1040
		Sipsey	Riverine	21800	2910	0	2960	0	27670
35a4(e)-3	Fayette	Boxes	Tributary	1720	1500	0	390	0	3610
35a4(e)-4	Fayette	-	Riverine	2490	4290	3550	1220	0	11350
35a4(e)-5	Fayette	Davis	Tributary	0	560	0	70	0	630
35a4(d)-3	Fayette	Yellow	Tributary	250	380	0	80	0	710
35a4(d)-4	Fayette	Luxapallila	Tributary	11640	8260	8850	3450	0	32200
35a4(d)-5	Fayette	D. Langston	Tributary	2350	150	0	300	0	2800
35a4(d)-6	Fayette	Hells	Tributary	1080	290	0	160	0	1530
			Subtotal	51440	21730	23300	15570	26500	81540

Appendix Table 16B (cont') - Estimated Flood Damages by Conservation Needs Inventory Watersheds, Black Warrior River Basin Study Area, 1975

CNI watershed	County	Name of stream	Flood plain location 1/	Average annual flood damage (dollars) Crops	Pasture	Urban	Other indirect	Total (dollars) Inside basin	Outside basin
35a4(g)-19	Greene	Buck	Tributary	0	0	0	0	0	0
		Warrior	Riverine	720	630	0	160	1510	0
35a4(g)-22	Greene	Warrior	Riverine	0	180	0	20	200	0
35a4(g)-24	Greene	Warrior	Riverine	0	0	0	0	0	0
35a4(g)-27	Greene	Needham	Tributary	2420	540	0	350	3310	0
		Warrior	Riverine	1410	1060	0	300	2770	0
35a4(g)-28	Greene	Warrior	Riverine	2980	770	3000	810	7560	0
35a4(e)-6	Greene	Taylor	Tributary	170	2490	0	320	0	2980
		Sipsey	Riverine	1560	1780	0	400	0	3740
35a4(e)-7	Greene	Sipsey	Riverine	6090	480	0	790	0	7360
35a4-17	Greene	Wilkes	Tributary	0	3760	0	450	0	4210
		Tombigbee	Riverine	11430	780	0	1470	0	13680
35a4-18	Greene	Tubbs	Tributary	0	1660	0	200	0	1860
		Tombigbee	Riverine	4900	1680	0	790	0	7370
35a4-19	Greene	Trussell	Tributary	100	0	0	0	0	100
		Tombigbee	Riverine	480	0	0	60	0	540
35a4-20	Greene	Bush	Tributary	1020	160	0	140	0	1320
		Tombigbee	Riverine	1400	0	0	170	0	1570
35a4-22	Greene	Tombigbee	Riverine	6130	1110	0	870	0	8110
35a4-23	Greene	Taylor	Tributary	2340	1180	0	420	0	3940
		Tombigbee	Riverine	1190	640	0	220	0	2050
35a4-24	Greene	Tombigbee	Riverine	7520	430	0	950	0	8900
			Total	51860	19330	3000	8890	15350	67730
35a4(g)-17	Hale	Big Sandy	Tributary	0	0	0	0	0	0
35a4(g)-20	Hale	Warrior	Riverine	5310	1180	0	780	7270	0
35a4(g)-21	Hale	Warrior	Riverine	7500	1260	0	1050	9810	0
35a4(g)-23	Hale	Warrior	Riverine	2180	1330	0	420	3930	0
35a4(g)-25	Hale	Warrior	Riverine	22900	3240	0	3140	29280	0
35a4(g)-26	Hale	Warrior	Riverine	1390	310	0	200	1900	0
35a4(g)-29	Hale	Big Prairie	Tributary	31500	25550	0	6850	63900	0
			SubTotal	74680	35700	0	13250	123630	0
35a4(g)(1)(a)-10	Jefferson	Gurley	Tributary	0	660	5800	780	7240	0
		Locust	Riverine	0	0	0	0	0	0
35a4(g)(1)(a)-11	Jefferson	Cane	Tributary	320	1900	0	670	2890	0
		Locust	Riverine	0	880	0	100	980	0
35a4(g)(1)(a)-15	Jefferson	Crooked	Tributary	0	260	0	30	290	0
		Locust	Riverine	0	260	0	30	290	0
35a4(g)(1)(a)-16	Jefferson	Turkey	Tributary	0	3720	0	450	4170	0
		Locust	Riverine	0	0	0	0	0	0
35a4(g)(1)(a)-17	Jefferson	Locust	Riverine	0	1470	0	180	1650	0
35a4(g)(1)(a)-18	Jefferson	Five Mile	Tributary	0	1800	46100	5750	53650	0
		Locust	Riverine	0	0	0	0	0	0
35a4(g)(1)(a)-19	Jefferson	Village	Tributary	0	280	157650	18950	176880	0
		Locust	Riverine	0	700	0	80	780	0
35a4(g)(1)(a)-20	Jefferson	Short	Tributary	0	0	0	0	0	0
		Locust	Riverine	690	1750	0	290	2730	0
35a4(g)1-38	Jefferson	Mulberry	Riverine	0	0	0	0	0	0
35a4(g)-6	Jefferson	Mud	Tributary	0	1510	0	180	1690	0
		Warrior	Riverine	0	0	0	0	0	0
35a4(g)-7	Jefferson	Valley	Tributary	0	2820	0	340	3160	0
35a4(g)-8	Jefferson	Valley	Tributary	0	1380	125300	15200	141880	0
35a4(g)-12	Jefferson	Davis	Tributary	0	0	0	0	0	0
35a1-10	Jefferson	Canoe	Tributary	0	200	0	20	0	220
35a3-1	Jefferson	Pinchgut	Tributary	0	870	400	1270	0	2540
		Cahaba	Riverine	0	0	0	0	0	0
35a3-3	Jefferson	Shades	Tributary	0	3240	64350	8100	0	75690
35a3-4	Jefferson	L. Cahaba	Riverine	0	1000	18950	2400	0	22350
35a3-5	Jefferson	Patton	Tributary	0	0	10150	1220	0	11370
		Cahaba	Riverine	0	130	9500	1150	0	10780
			Subtotal	1010	24830	438200	57190	398280	122950

Appendix Table 16B (con't) - Estimated Flood Damages by Conservation Needs Inventory Watersheds, Black Warrior River Basin Study Area, 1975

				Average annual flood damage (dollars)				Total (dollars)	
CNI watershed	County	Name of stream	Flood plain location 1/	Crops	Pasture	Urban	Other indirect	Inside basin	Outside basin
35a4(g)1-1	Lawrence	Borden	Tributary	0	210	0	20	230	0
		Sipsey	Riverine	0	0	0	0	0	0
35a4(g)1-2	Lawrence	Brushy	Tributary	0	0	0	0	0	0
			Total	0	210	0	20	230	0
35a4(g)-29	Marengo	Cottonwood	Tributary	4710	5390	0	1210	11310	0
			Riverine	3820	600	0	530	4950	0
			Total	8530	5990	0	1740	16260	0
35a4(g)1-10	Marshall	Pan	Tributary	0	0	0	0	0	0
35a4(g)(1)(a)-1	Marshall	Stab	Tributary	0	610	0	90	700	0
35a4(g)(1)(a)-2	Marshall	Mud	Tributary	0	840	0	100	940	0
35a4(g)(1)(a)-3	Marshall	Clear	Tributary	0	0	0	0	0	0
		Locust	Riverine	0	0	0	0	0	0
			Total	0	1450	0	190	1640	0
35a4(g)-29	Perry	Big Prairie	Tributary	2890	4180	0	850	7920	0
			Subtotal	2890	4180	0	850	7920	0
35a4(g)-1	Tuscaloosa	Tyro	Tributary	3150	420	0	430	4000	0
35a4(g)-3	Tuscaloosa	Binnion	Tributary	0	480	0	60	540	0
35a4(g)-4	Tuscaloosa	Turkey	Tributary	0	0	0	0	0	0
35a4(g)-5	Tuscaloosa	Big Yellow	Tributary	0	450	0	50	500	0
		Warrior	Riverine	0	0	0	0	0	0
35a4(g)-9	Tuscaloosa	Carrolls	Tributary	0	100	0	0	100	0
35a4(g)-10	Tuscaloosa	Yellow	Tributary	0	0	0	0	0	0
		Warrior	Riverine	0	0	0	0	0	0
35a4(g)-11	Tuscaloosa	Warrior	Riverine	0	0	0	0	0	0
35a4(g)-12	Tuscaloosa	Davis	Tributary	250	420	11750	1490	13910	0
		Warrior	Riverine	0	0	0	0	0	0
35a4(g)-13	Tuscaloosa	Two Mile	Tributary	1510	450	1850	460	4270	0
		Warrior	Riverine	21840	980	15300	4570	42690	0
35a4(g)-14	Tuscaloosa	Hurrican	Tributary	0	1650	10400	1440	13490	0
		Warrior	Riverine	0	0	7600	900	8500	0
35a4(g)-15	Tuscaloosa	Grant	Tributary	0	0	0	0	0	0
		Warrior	Riverine	53750	6380	0	7220	67350	0
35a4(g)-16	Tuscaloosa	L. Sandy	Tributary	0	400	57500	6950	64850	0
		Warrior	Riverine	41400	10950	36950	10700	100000	0
35a4(g)-17	Tuscaloosa	Big Sandy	Tributary	3990	2810	0	800	7600	0
		Warrior	Riverine	13500	250	0	1650	15400	0
35a4(g)-18	Tuscaloosa	Lye	Tributary	0	530	0	60	590	0
35a4(g)-19	Tuscaloosa	Buck	Tributary	100	340	0	50	490	0
		Warrior	Riverine	0	330	0	40	370	0
35a4(g)-20	Tuscaloosa	Elliott	Tributary	0	0	0	0	0	0
		Warrior	Riverine	9300	200	0	1140	10640	0
35a3-3	Tuscaloosa	Shades	Tributary	0	710	0	90	0	800
35a4(e)-4	Tuscaloosa	Sipsey	Riverine	350	760	2900	480	0	4490
35a4(e)-6	Tuscaloosa	Taylor	Tributary	0	0	0	0	0	0
			Subtotal	149140	28610	144250	38580	355290	5290

Appendix Table 16B (con't) - Estimated Flood Damages by Conservation Needs Inventory Watersheds, Black Warrior River Basin Study Area, 1975

CNI watershed	County	Name of stream	Flood plain location 1/	Average annual flood damage (dollars)				Total (dollars)	
				Crops	Pasture	Urban	Other indirect	Inside basin	Outside basin
35a4(g)1-36	Walker	Wolf	Tributary	0	2890	0	360	3340	0
35a4(g)1-31	Walker	Lost	Tributary	750	3080	0	460	4290	0
35a4(g)1-23	Walker	Mill	Tributary	0	0	0	0	0	0
35a4(g)1-24	Walker	Blackwater	Tributary	1240	2020	0	290	3650	0
35a4(g)1-30	Walker	Lost	Tributary	690	230	19000	2390	22310	0
35a4(g)1-35	Walker	Pendley	Tributary	0	530	0	60	590	0
35a4(g)1-32	Walker	Cane	Tributary	1370	480	6600	1010	9460	0
35a4(g)1-33	Walker	Poley	Tributary	0	0	0	0	0	0
35a4(g)1-34	Walker	Sloan	Tributary	0	510	0	60	570	0
		Mulberry	Riverine	700	590	0	150	1440	0
35a4(g)1-37	Walker	-	Tributary	0	0	0	0	0	0
35a4(g)1-38	Walker	Burnt Cane	Tributary	0	130	0	20	150	0
		Mulberry	Riverine	600	160	4300	610	5670	0
35a4(g)1-39	Walker	Indian	Tributary	0	0	0	0	0	0
35a4(g)1-12	Walker	-	Tributary	0	0	0	0	0	0
35a4(g)1-25	Walker	-	Tributary	0	0	0	0	0	0
35a4(g)1-26	Walker	Locust	Riverine	130	0	5450	670	6250	0
35a4(g)1-27	Walker	Sipsey	Riverine	2040	0	0	250	2290	0
35a4(g)1-28	Walker	Mulberry	Riverine	1550	0	0	190	1740	0
35a4(e)-2	Walker	Mallard	Tributary	0	0	0	0	0	0
35a4(e)-5	Walker	Warrior	Riverine	0	0	0	0	0	0
			Subtotal	9070	10710	35350	6620	61750	0
35a4(g)1-1	Winston	Borden	Tributary	0	0	0	0	0	0
		Sipsey	Riverine	0	0	0	0	0	0
35a4(g)1-2	Winston	Capsey	Tributary	0	0	0	0	0	0
35a4(g)1-3	Winston	Rock	Tributary	0	0	0	0	0	0
35a4(g)1-4	Winston	Crooked	Tributary	0	0	0	0	0	0
35a4(g)1-11	Winston	Tanyard	Tributary	0	1100	0	130	1230	0
35a4(g)1-12	Winston	Clear	Tributary	0	290	0	40	330	0
35a4(g)1-13	Winston	Cane	Tributary	0	0	0	0	0	0
35a4(g)1-14	Winston	Brushy	Tributary	0	0	0	0	0	0
35a4(g)1-15	Winston	Browns	Tributary	0	1820	0	220	2040	0
35a4(g)1-16	Winston	Dismal	Tributary	0	0	0	0	0	0
35a4(g)1-17	Winston	Ryan	Tributary	0	0	0	0	0	0
35a4(g)1-24	Winston	Blackwater	Tributary	0	350	0	40	390	0
35a4(g)1-26	Winston	Sipsey	Riverine	0	0	0	0	0	0
			Subtotal	0	3560	0	430	3990	0
			Grand Total	357500	201060	651060	146590	1074640	281560

Source: SCS Estimate.

1/ Floodplain lands located along small streams and creeks are designated as "Tributary" and floodplain lands along rivers and major streams are designated as "Riverine".

APPENDIX 17
SHEET & RILL EROSION
1975, 1990, 2020

Considerable concern has been focused on soil erosion and the nation's ability to continue the production of food and fiber. Sheet and rill erosion taking place in 1975 and projected erosion for 1990 and 2020 is a concern of Soil Conservation Districts of Alabama and the USDA, Soil Conservation Service. This report provides the results of a computerized study to estimate sheet and rill erosion. It is presented in two parts. The first is a total basin report without respect to political (county) boundaries. The second part is a report for nine individual counties that are substantially within the basin. An interdisciplinary team, meeting as a group, established a method for estimating sheet and rill erosion for comparison with the maximum level of soil erosion that will permit high levels of crop productivity to be sustained economically and indefinitely. The method used to make the determination, a discussion of input data for the computer and tables showing the results are included. These figures are weighted averages for individual soils in each Soil Resource Group (SRG) for the basin. The major soils are listed by name in the SRG description and are shown in descending acreage order from high to low. Caution should be exercised in the use of figures for individual soils of a group in a single county. Factors applying to a particular soil should be substituted in the USLE to determine soil loss at a county level. Erosion estimates shown are based on the assumption that all input data as shown represents combinations of conditions found in the field.

Appendix 17A
METHOD FOR ESTIMATING SHEET AND RILL EROSION
FOR THE BLACK WARRIOR RIVER BASIN, ALABAMA

Establishing Acreage Estimates

The district conservationist (DC) determined acreage of major crops and pasture grown during the selected base year for each soil resource group found in the county. County land use acreage estimates by SRG were developed through a field review process. The Economics and Statistics Service (ESS) initially applied a crop distribution ratio by SRG determined from the 1967 Conservation Needs Inventory to 1975 crop acreages by county as published in Alabama Agricultural Statistics. The district conservationist used this information to make adjustments in crop distribution by soils as necessary, based on changes during the 1967 to 1975 period. Projections for 1990 and 2020 were based on best judgment and a study of trends and related analysis.

The Universal Soil Loss Equation (USLE) was used to develop erosion estimates. Detailed explanation of the USLE and all references may be found in USDA-SCS-Alabama Field Office Technical Guide (FOTG) dated July 1976 or revised data, Sections IIC and IIIB. Soil loss factors for erosion estimates were developed by an interdisciplinary team consisting of a district conservationist, area conservationist, state conservation agronomist, a river basin geologist and soil conservationist, state soil scientist, state resource conservationist, or their representative.

The universal soil loss equation A=RKLSCP was applied according to the following definitions and methods:

A - Soil Loss Per Acre Per Year
The soil loss is usually expressed as average annual soil loss in tons per acre. "A" was determined for each SRG by the above equation after all necessary data were collected.

R - Rainfall Factor
The rainfall factor is the number of erosion-index units in a normal year's rain or a portion of a normal year's rain. The erosion-index is a measure of the erosive force of specific rainfall. It is a product value of two rainstorm characteristics: total kinetic energy of the storm times its maximum 30-minute intensity (El). The erosion potential of rainfall is highest where the rainfall energy and intensity are greatest. In Alabama, the values are highest in the southern part of the state and lowest in the northeastern part.

The Rainfall factor value "R" was determined from Table 1, Section lll-l-B.l, Alabama FOTG dated July 1976. "R" factors remain the same in all time periods.

K - Soil-Erodibility Factor

The soil-erodibility factor is the erosion rate per unit of erosion index for a specific soil in cultivated continuous fallow, on a 9 percent slope, 72.6 feet long. "K" factors were experimentally determined for some soils and estimated for other soils using the experimental values as a reference. These factors are given in Table 2, Section III-1-B Alabama FOTG.

Soil-Erodibility (K) Value - The "K" value is a weighted average for the soils that make up the SRG. The amount of each soil was determined from the most recent SCS soil interpretation records. "K" values for each soil were obtained from Section II or III, Alabama Technical Guide. Weighted "K" values remain constant in all time frames.

L - Slope Length

Slope length is defined as the distance from the point of origin of overland flow to either of the following: 1) the point where the slope decreases to the extent that deposition occurs, 2) the point where runoff enters a well-defined natural channel or waterway, or 3) the point where runoff enters a terrace of diversion channel. It is usually not the total length of the field.

Slope Length - Soil survey maps were studied to determine general slope lengths for soils in the SRG at various locations. On-site studies were made in the field as necessary, at locations based on soil map studies, to determine average slope lengths for soils in each SRG. The river basin geologist was responsible for collecting the field study information. Other team members collected information and provided it to the geologist as they did routine field work. Area conservationists provided guidance to district conservationists in estimating the percent of land terraced and the average terrace spacing for each SRG.

Based on field studies and the DC's estimates, the interdisciplinary team developed weighted "L" values by land uses for SRG's. The "L" value was determined for years 1975, 1990, and 2020 based on estimated future conservation practices to be installed and to function as planned. The net increase in the acreage treated was determined by the interdisciplinary team. The increases were placed in a computer program which computed the net soil loss with the treatment in place. (See details in later portion of this chapter.)

S - Slope Gradient Factor

The slope gradient is the ratio of soil loss from the field gradient compared to that of a 9 percent slope.

Slope Gradient - The slope ranges were determined for each soil unit in the SRG from Section III; Alabama FOTG. The middle of the slope range was used as slope gradient. The amount of each unit was determined from the 1967 Conservation Needs Inventory records. The percent of each unit and slope gradient for the various units was used to determine a weighted average for the SRG. This work was reviewed by the interdisciplinary team. Slope gradient normally remains constant in all time frames.

In field application of the equation, it is more convenient to consider the slope length (L) and slope gradient (S) as a single topographic factor, LS. Length and slope gradient was determined in the field.

"LS" Value - The "LS" value for slope length and gradient was read directly from Table 3 Section III-1-B of the Alabama FOTG. LS-1 values were used for corn, cotton, soybeans, wheat, hay, minor crops, and other cropland. LS-2 values were used for all pasture, incorportated and transportation land, and orphan mined land.

C - Cropping-Management Factor

This factor takes into consideration the combined effects of different crops, management of crop residues, fertility level, and methods and time of tillage. It is influenced by the distribution of erosive rainstorms and periods of plant growth during the year. The cropping-management factor is the expected ratio of soil loss from land cropped under specified conditions in comparison to soil loss from fallow conditions on which the "K" factor is evaluated. The computation of this factor is rather complex. Table 4, Section III-1-B of the Alabama FOTG contains "C" factors for the most common cropping-management systems in Alabama.

"C" Value - Average "C" values for typical cropping systems were provided by the interdisciplinary team for each crop listed on the accepted yield sheet for the years 1975, 1990, and 2020 by SRG's. The "C" values were determined after considering the various cropping systems, present and future. The various cropping systems have an influence on the established "C" values but only three values (one for 1975, 1990 and 2020) were calculated for each crop. Base year and projected yields for each crop were used for calculation of the three values. Final "C" values were determined by the interdisciplinary team.

P - Erosion Control Practice Factor

This factor is the ratio of soil loss with contouring or stripcropping to that with up and down hill operation. The effects of terraces and diversions are taken into consideration in (L) slope length. The value of other conservation practices are built into the "C" cropping-Management factor. "P" factor values are contained in Table 5, Section III-1-B-1 Alabama FOTG.

"P" Value - "P" values were provided for each crop that is listed on the yield data sheet for each SRG. Different values were provided for years 1975, 1990, and 2020 for some crops based on trends. The "P" values were established by studying the management and acreage of soil in each SRG, CNI data, and trends in farming operations. The final values were determined by the interdisciplinary team. "P-1" value was used for corn, cotton, soybeans, and wheat. "P-2" was used for all other land uses.

Cropland

Values for R, K, L, S, C, and P were established by the team for each soil resource group (SRG) that is presently growing or expected to grow tillage crops. A set of factor values was developed for each use listed on the SRG yield data sheet--for 1975.

Pasture
Values for R, K, L, S, C, and P were established for each category of pasture--improved, unimproved and idle.

Improved pasture is defined as having necessary management practices applied that will provide at least an 80 percent protective soil cover. Unimproved pasture is defined as having few management practices or with a cover condition of less than 80 percent protective soil cover.

The district conservationist estimated from local SCS records the percent of pasture that is terraced by SRG's. This information was considered in establishing the length of slope. The "C" value was always different for the improved and unimproved pasture. All erosion factors were determined by the interdisciplinary team after data were collected using the same method adopted for cropland.

Minor Crops, Other Crops and Miscellaneous Agricultural Land:
Erosion factor values for R, K, L, S, C, and P were established for these land uses.

Minor crops, other crops, and miscellaneous agricultural land all had very similar sheet and rill erosion characteristics. Like cropland and pastureland the data were collected from the field and considered by the interdisciplinary team along with other sources of information. Common "C" values were determined for these uses and are shown as input factors used to secure sheet and rill erosion estimates.

Incorporated and Transportation Land and Orphan Mined Land
The study showed that incorporated and transportation land along with orphan mined land compare with poorly managed unimproved pasture. Comparable "C" factors were determined for these uses when sheet and rill erosion only is considered. Gully erosion would need to be added to sheet and rill erosion to give total erosion.

Gully Erosion Areas:
No attempt was made to tabulate or compute gully erosion in this report. It is shown elsewhere.

Some Multipliers and Divisors Rounded
Multipliers and divisors were carried to four places by the computer but were rounded to two places to facilitate printing. Some figures in the report may not agree because of rounding.

GLOSSARY OF TERMS

SRG--Soil Resource Group--A grouping of soils that have similar cropping patterns, yield characteristics, and responses to fertilizers, management and land treatment measures.

CL--Land Capablilty Classes--a grouping of soils into special units, subclasses and classes according to their capability for intensive use and the treatment required for sustained use.

T/Ac--Soil Loss Tolerance in tons per acre--A term denoting the maximum level of annual soil erosion that will permit a high level of crop productivity to be sustained economically and indefinitely.

Rate/A--Tons of Annual soil loss per acre--The computer rounded rates to two places.

Ton--Total Tons of erosion with given acres and rate of erosion.

P-1--Support Practice Factor--The factor used in the USLE when corn, cotton, peanuts, soybeans, or wheat was grown.

P-2--Support Practice Factor--The factor used in the USLE when hay, minor crops, other crops, pasture, forest, miscellaneous agricultural land or nonagricultural land was the land use.

LS-1--Topographic Factor--Value used when corn, cotton, peanuts, wheat, hay, minor crops or other crops was the land use.

LS-2--Topographic Factor--Value used when pasture, incorporated and transportation, forest, or orphan mined land was the land use.

Combined rate (tons/ac) = 1975 untreated amount X

1990 untreated % + 1990 treated amount.

Example - corn on SRG 8 that is
13% treated @ 5 tons/ac (.13x5 = .65)
87% untreated @ 17.19 tons/acre (from step 1)

Combined rate = (17.19 x .87) + .65 = 15.60 tons/ac.

Step 3: Find total erosion for 1990

Acreage growing corn (1990) on SRG 8 is 296 acres

Then: 15.60 X 296 = 4617.6 (total tons)

2020

Erosion was computed with the same rates per acre as 1975 for all land uses except Class IIe cropland consisting of the following SRG's; 2, 3, 4, 19, 26, 34, 35, 46, 47; and IIIe cropland consisting of the following SRG's: 8, 9, 10, 21, 37, 38, and 48. For these SRG's it was necessary to determine two unknowns. This was done by determining erosion for the portion of cropland that is treated to acceptable limits and erosion for that portion of the cropland that is untreated. The 1975 ratio was 12 percent treated and 88 percent untreated for the IIIe land. The 1975 ratio was 22 percent treated and 78 percent untreated for the IIe land. In 2020, 25 percent of the cropland on the IIe SRG's will be treated to reduce soil loss and 14 percent of the cropland on the IIIe SRG's will be treated as follows:

Treated area SRG 38 = 2 tons per acre annually
" " " 46 " " " " "

Treated area SRG's 9, 21, & 48 = 3 tons per acre annually
" " " 3, 35 = " " " " "

Treated area SRG 19 = 4 tons per acre annually

Treated area SRG - 8, 10, & 37 = 5 tons per acre annually
" " " 2, 4, 26, 34 = " " " " "

Step 1: Determine the per acre erosion rate for the untreated area for 1975.

Using the equation:

Percent 1975 treated @ known rate in tons/acre +

Percent untreated @ unknown tons/acre =

Given tons per acre. This was determined by the 1975 runs for the said SRG's.

Erosion rate for untreated area =

APPENDIX 17B
INPUT FACTORS USED TO FIGURE SHEET AND RILL EROSION

1975

Soil loss (Erosion) for 1975 was computed with the universal soil loss equation using appropriate input factors shown in Appendix Tables 17B1 and 17B2.

1990

Erosion was computed with the same rate per acre as 1975 for all land uses except Class IIIe cropland consisting of the following SRG's; 8, 9, 10, 21, 37, 38, and 48. For these SRG's, it was necessary to estimate two unknowns. This was done by determining erosion for the portion of cropland that was treated to acceptable limits and the erosion for that portion of the cropland that was untreated. The 1975 ratio was 12 percent treated and 88 percent untreated. In 1990 13 percent of the cropland on the above SRG's will be treated to reduce soil loss as follows:

Treated area SRG 38 = 2 tons per acre annually

Treated area SRG's 9, 21 & 48 = 3 tons per acre annually

Treated area SRG's - 8, 10, & 37 = 5 tons per acre annually

Step 1: Determine the per acre erosion rate for the untreated area for 1975.

Using the equation:

Percent treated @ known rate in tons/acre +

Percent untreated @ unknown tons/acre =

Given tons per acre. This was

determined by the 1975 runs for

the said SRG's.

Erosion rate for untreated area =

$$\frac{\text{Given tons/acre (1975) - \% treated @ known tons/ac.}}{\text{\% untreated}}$$

Example = Corn on SRG 8 - that is 12 percent treated at 5 tons/acre and a combined erosion rate of 15.73 tons/acre

$$\text{Erosion rate for untreated} = \frac{15.73\ \ (0.12x5)}{0.88} = 17.19 \text{ tons/acre.}$$

Step 2: Find the combined erosion rate for 1990.

$$\frac{\text{Given 1975 tons/acre - \% treated @ known tons/ac.}}{\text{\% untreated}}$$

Example = Corn on SRG 8 - that is 12 percent treated at 5 tons/acre and a combined erosion rate of 15.73 tons/acre

$$\text{Erosion rate for untreated} = \frac{15.73 - (0.12x5)}{0.88} = 17.19 \text{ tons/acre.}$$

Step 2: Find the combined erosion rate for 2020.

Combined rate (tons/ac) = 1975 untreated amount X

2020 untreated % + 2020 treated amount

Example - corn on SRG 8 that is
14% treated @ 5 tons/ac (.14x5 = .70)
86% untreated @ 17.19 tons/acre (from step 1)

Combined rate = (17.19 x .86) + .70 = 15.48 tons/ac.

Step 3: Find total erosion for 2020

Acreage growing corn (2020) on SRG 8 is 296 acres

Then: 15.47 x 296 = 4579.12 (total tons)

APPENDIX TABLE 17B1
INPUT FACTORS TO FIGURE SHEET & RILL EROSION FOR ALABAMA

SRG	RAINFALL EROSION INDEX	SOIL ERODIBILITY	P-1 EROSION CONTROL PRACTICE	L/S-1 SLOPE LENGTH	P-2 EROSION CONTROL PRACTICE	L/S-2 SLOPE LENGTH	SOIL LOSS TOLERANCE	CLASS
1	350.00	0.20	0.50	0.17	1.00	0.17	4	1
2	350.00	0.30	0.76	0.46	1.00	0.50	5	2E
3	350.00	0.31	0.85	0.33	1.00	0.34	3	2E
4	350.00	0.22	0.77	0.41	1.00	0.43	5	2E
5	350.00	0.28	0.50	0.14	1.00	0.14	4	2W
6	350.00	0.22	0.50	0.15	1.00	0.15	5	2W
7	350.00	0.15	0.80	0.32	1.00	0.34	5	2S
8	350.00	0.37	0.80	0.46	1.00	0.59	5	3E
9	350.00	0.29	0.75	0.77	1.00	1.15	3	3E
10	350.00	0.21	0.77	0.72	1.00	0.80	5	3E
11	350.00	0.24	0.50	0.14	1.00	0.14	4	3W
12	350.00	0.17	0.87	0.63	1.00	0.67	5	3S
13	350.00	0.32	0.84	1.00	1.00	1.34	5	4E
14	350.00	0.26	0.50	0.16	1.00	0.16	5	4W
15	350.00	0.17	0.87	0.31	1.00	0.31	5	4S
16	350.00	0.20	0.50	0.14	1.00	0.14	5	5W
17	350.00	0.32	1.00	3.50	1.00	3.50	3	6E
18	350.00	0.17	0.90	1.80	1.00	2.00	5	6S
19	350.00	0.33	0.75	0.23	1.00	0.23	4	2E
20	350.00	0.30	0.60	0.16	1.00	0.16	4	2W
21	350.00	0.32	0.80	0.23	1.00	0.26	3	3E
22	350.00	0.32	0.80	0.65	2.00	0.75	3	4E
23	350.00	0.35	0.50	0.17	1.00	0.17	4	4W
24	350.00	0.32	0.90	1.25	1.00	1.25	2	6E
25	350.00	0.20	0.50	0.15	1.00	0.15	5	1
26	350.00	0.22	0.80	0.48	1.00	0.52	5	2E
27	350.00	0.19	0.50	0.14	1.00	0.14	4	2W
28	350.00	0.28	0.75	0.72	1.00	0.80	3	3E
29	350.00	0.23	0.50	0.13	1.00	0.13	5	3W
30	350.00	0.28	0.85	1.85	1.00	2.20	3	4E
31	350.00	0.30	0.90	4.50	1.00	4.50	3	6E
32	350.00	0.28	1.00	4.90	1.00	4.90	1	7E

APPENDIX TABLE 17B1 (con't)
INPUT FACTORS TO FIGURE SHEET & RILL EROSION FOR ALABAMA (Con't)

SRG	RAINFALL EROSION INDEX	SOIL ERODIBILITY	P-1 EROSION CONTROL PRACTICE	L/S-1 SLOPE LENGTH	P-2 EROSION CONTROL PRACTICE	L/S-2 SLOPE LENGTH	SOIL LOSS TOLERANCE	CLASS
33	350.00	0.35	0.50	0.14	1.00	0.14	5	1
34	350.00	0.32	0.70	0.31	1.00	0.37	5	2E
35	350.00	0.40	0.70	0.32	1.00	0.37	3	2E
36	350.00	0.34	0.50	0.15	1.00	0.15	4	2W
37	350.00	0.32	0.70	0.93	1.00	1.14	5	3E
38	350.00	0.41	0.85	0.82	1.00	0.90	2	3E
39	350.00	0.31	0.50	0.15	1.00	0.15	5	3W
40	350.00	0.28	0.90	2.30	1.00	2.53	5	4E
41	350.00	0.37	0.72	0.92	1.00	1.13	2	4E
42	350.00	0.39	0.50	0.14	1.00	0.14	5	4W
43	350.00	0.28	1.00	1.54	1.00	1.54	5	4S
44	350.00	0.35	1.00	5.35	1.00	5.35	3	6E
45	350.00	0.35	1.00	7.50	1.00	7.50	3	7E
46	350.00	0.30	0.65	0.21	1.00	0.21	3	2E
47	350.00	0.24	0.50	0.14	1.00	0.14	2	2E
48	350.00	0.30	0.70	0.53	1.00	0.66	3	3E
49	350.00	0.30	0.76	1.65	1.00	1.87	3	4E
50	350.00	0.30	1.00	1.89	1.00	1.89	2	6E
51	350.00	0.17	1.00	4.28	1.00	4.28	1	7E
52	350.00	0.17	1.00	3.65	1.00	3.65	1	7S

APPENDIX TABLE 17B2
INPUT FACTORS TO FIGURE SHEET & RILL EROSION
COVER AND MANAGEMENT FACTORS (C), ALA.

SRG	Corn	Cotton	Peanuts	Soybeans	Wheat	Hay	Minor Crops	Other Crops	Improved Pasture	Unimp. Pasture	Idle Pasture	Forest	Misc. Agri. Land	Non-Agri. Land
1	0.304	0.445	0.395	0.341	0.140	0.004	0.225	0.225	0.003	0.012	0.012	0.004	0.225	0.012
2	0.315	0.450	0.400	0.345	0.140	0.004	0.160	0.160	0.003	0.012	0.012	0.004	0.160	0.012
3	0.310	0.460	0.440	0.340	0.140	0.004	0.160	0.160	0.003	0.012	0.012	0.004	0.160	0.012
4	0.320	0.460	0.440	0.340	0.140	0.004	0.175	0.175	0.003	0.012	0.012	0.004	0.175	0.012
5	0.310	0.489	0.440	0.345	0.140	0.004	0.175	0.175	0.003	0.012	0.012	0.001	0.175	0.012
6	0.310	0.489	0.440	0.345	0.140	0.004	0.175	0.175	0.003	0.012	0.012	0.001	0.175	0.012
7	0.327	0.489	0.460	0.365	0.140	0.004	0.185	0.185	0.006	0.012	0.012	0.004	0.185	0.012
8	0.330	0.480	0.465	0.365	0.140	0.004	0.150	0.150	0.008	0.012	0.012	0.004	0.150	0.012
9	0.330	0.490	0.460	0.345	0.140	0.004	0.140	0.140	0.008	0.012	0.012	0.004	0.140	0.012
10	0.335	0.485	0.470	0.365	0.140	0.004	0.170	0.170	0.008	0.012	0.012	0.004	0.170	0.012
11	0.306	0.000	0.000	0.345	0.140	0.004	0.150	0.150	0.003	0.012	0.012	0.001	0.150	0.012
12	0.340	0.510	0.480	0.365	0.140	0.004	0.190	0.190	0.008	0.012	0.012	0.004	0.190	0.012
13	0.330	0.550	0.500	0.350	0.140	0.004	0.200	0.200	0.008	0.012	0.012	0.004	0.200	0.012
14	0.306	0.520	0.000	0.350	0.140	0.004	0.160	0.160	0.003	0.012	0.012	0.001	0.160	0.012
15	0.378	0.520	0.515	0.410	0.140	0.004	0.180	0.180	0.008	0.012	0.012	0.004	0.180	0.012
16	0.350	0.000	0.000	0.400	0.140	0.004	0.140	0.140	0.003	0.012	0.012	0.001	0.140	0.012
17	0.400	0.540	0.525	0.415	0.140	0.004	0.150	0.150	0.003	0.012	0.012	0.004	0.150	0.012
18	0.420	0.560	0.540	0.435	0.140	0.004	0.150	0.150	0.008	0.012	0.012	0.004	0.150	0.012
19	0.330	0.466	0.000	0.325	0.140	0.005	0.190	0.190	0.004	0.043	0.043	0.004	0.190	0.043
20	0.330	0.466	0.000	0.325	0.140	0.005	0.180	0.180	0.004	0.043	0.043	0.001	0.180	0.043
21	0.325	0.468	0.000	0.335	0.140	0.006	0.180	0.180	0.004	0.043	0.043	0.004	0.180	0.043
22	0.350	0.500	0.000	0.340	0.140	0.006	0.175	0.175	0.006	0.043	0.043	0.004	0.175	0.043
23	0.330	0.470	0.000	0.350	0.140	0.004	0.175	0.175	0.003	0.012	0.012	0.001	0.175	0.012
24	0.350	0.525	0.000	0.410	0.140	0.006	0.165	0.165	0.006	0.043	0.043	0.004	0.165	0.043
25	0.300	0.410	0.395	0.340	0.140	0.004	0.200	0.200	0.003	0.012	0.012	0.004	0.200	0.012
26	0.304	0.445	0.395	0.341	0.140	0.004	0.180	0.180	0.003	0.012	0.012	0.004	0.180	0.012
27	0.327	0.410	0.395	0.340	0.140	0.004	0.165	0.165	0.003	0.012	0.012	0.004	0.165	0.012
28	0.320	0.460	0.410	0.350	0.140	0.004	0.150	0.150	0.003	0.012	0.012	0.004	0.150	0.012
29	0.327	0.410	0.395	0.340	0.140	0.004	0.150	0.150	0.003	0.012	0.012	0.001	0.150	0.012
30	0.340	0.489	0.430	0.389	0.140	0.006	0.160	0.160	0.006	0.012	0.012	0.004	0.160	0.012
31	0.341	0.500	0.440	0.420	0.180	0.006	0.140	0.140	0.006	0.012	0.012	0.004	0.140	0.012
32	0.341	0.500	0.440	0.420	0.180	0.006	0.140	0.140	0.006	0.012	0.012	0.004	0.140	0.012
33	0.320	0.465	0.000	0.339	0.140	0.004	0.200	0.200	0.003	0.012	0.012	0.004	0.200	0.012
34	0.327	0.489	0.000	0.375	0.140	0.004	0.190	0.190	0.003	0.012	0.012	0.004	0.190	0.012

APPENDIX TABLE 17B2 (con't)
INPUT FACTORS TO FIGURE SHEET & RILL EROSION
COVER AND MANAGEMENT FACTORS (C), ALA. (Con't)

SRG	Corn	Cotton	Peanuts	Soybeans	Wheat	Hay	Minor Crops	Other Crops	Improved Pasture	Unimp. Pasture	Idle Pasture	Forest	Misc. Agri. Land	Non-Agri. Land
35	0.327	0.489	0.000	0.375	0.140	0.004	0.180	0.180	0.003	0.012	0.012	0.004	0.180	0.012
36	0.304	0.466	0.000	0.371	0.140	0.004	0.150	0.150	0.003	0.012	0.012	0.004	0.150	0.012
37	0.327	0.490	0.000	0.376	0.140	0.004	0.180	0.180	0.003	0.012	0.012	0.004	0.180	0.012
38	0.335	0.495	0.000	0.385	0.140	0.006	0.190	0.190	0.005	0.020	0.020	0.004	0.190	0.020
39	0.305	0.466	0.000	0.371	0.140	0.004	0.150	0.150	0.003	0.012	0.012	0.001	0.150	0.012
40	0.350	0.500	0.000	0.411	0.140	0.005	0.150	0.150	0.004	0.012	0.012	0.004	0.150	0.012
41	0.350	0.500	0.000	0.411	0.140	0.005	0.150	0.150	0.004	0.012	0.012	0.004	0.150	0.012
42	0.327	0.489	0.000	0.380	0.140	0.004	0.140	0.140	0.003	0.012	0.012	0.001	0.140	0.012
43	0.320	0.460	0.000	0.360	0.140	0.005	0.140	0.140	0.004	0.012	0.012	0.004	0.140	0.012
44	0.310	0.440	0.000	0.350	0.140	0.005	0.140	0.140	0.004	0.012	0.012	0.004	0.140	0.012
45	0.327	0.000	0.000	0.000	0.140	0.008	0.140	0.140	0.006	0.040	0.040	0.004	0.140	0.040
46	0.257	0.467	0.420	0.365	0.140	0.006	0.200	0.200	0.003	0.012	0.012	0.004	0.200	0.012
47	0.273	0.467	0.420	0.393	0.140	0.006	0.200	0.200	0.003	0.012	0.012	0.004	0.200	0.012
48	0.268	0.461	0.420	0.393	0.140	0.006	0.180	0.180	0.005	0.017	0.017	0.004	0.180	0.017
49	0.270	0.465	0.425	0.395	0.140	0.006	0.170	0.170	0.005	0.020	0.020	0.004	0.170	0.020
50	0.275	0.470	0.430	0.400	0.140	0.006	0.160	0.160	0.005	0.020	0.020	0.004	0.160	0.020
51	0.275	0.470	0.000	0.400	0.140	0.008	0.150	0.150	0.006	0.040	0.040	0.004	0.150	0.040
52	0.000	0.000	0.000	0.000	0.000	0.010	0.140	0.140	0.008	0.045	0.045	0.004	0.140	0.045

APPENDIX 17C
SHEET AND RILL EROSION
1975, 1990, 2020

SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALA. 1975

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	23155	0.96	22290
2	2E	5	15896	5.67	90120
3	2E	3	17283	4.11	71060
4	2E	5	39848	4.31	171800
5	2W	4	40984	0.46	18930
6	2W	5	30719	0.50	15390
8	3E	5	27726	2.18	60380
9	3E	3	23897	3.99	95380
10	3E	5	87077	2.29	199520
11	3W	4	15567	0.60	9270
12	3S	5	10366	3.95	40930
13	4E	5	64317	5.01	322480
14	4W	5	113806	0.19	21660
15	4S	5	7395	0.56	4150
16	5W	5	104714	0.05	4740
17	6E	3	370353	3.59	1329150
18	6S	5	47046	0.97	45670
19	2E	4	26274	2.09	54810
20	2W	4	54851	1.49	81510
21	3E	3	53634	3.16	169680
22	4E	3	9815	6.01	59000
23	4W	4	22629	0.93	21090
24	6E	2	13634	2.44	33280
26	2E	5	988	0.19	180
27	2W	4	21317	0.26	5580
29	3W	5	44895	0.27	12020
33	1	5	7890	1.91	15060
34	2E	5	20567	2.14	43990
35	2E	3	33216	2.99	99320
36	2W	4	11183	0.78	8700
37	3E	5	25945	3.99	103460
38	3E	2	457	2.24	1020
39	3W	5	50428	0.34	17390
40	4E	5	15116	5.22	78840
41	4E	2	51666	4.02	207820
42	4W	5	7099	0.59	4220
43	4S	5	3047	2.29	6970
44	6E	3	48473	9.79	474480
45	7E	3	448902	9.13	4099900
46	2E	3	246188	1.74	429330
47	2E	2	65499	1.12	73050
48	3E	3	352468	3.17	1115970
49	4E	3	154063	6.58	1014280
50	6E	2	143736	5.77	829070
51	7E	1	245528	2.90	713010
52	7S	1	710107	2.20	1564130
		TOTAL	3,929,764	3.53	13,860,110

*Rounded

APPENDIX 17C
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALA. 1990

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	23188	0.96	22340
2	2E	5	15877	5.17	82090
3	2E	3	17223	3.52	60550
4	2E	5	39801	4.05	161390
5	2W	4	40819	0.73	29610
6	2W	5	30395	0.54	16500
8	3E	5	27694	2.01	55650
9	3E	3	23869	3.51	83760
10	3E	5	86948	2.29	198800
11	3W	4	15504	0.47	7290
12	3S	5	10354	3.22	33310
13	4E	5	70242	4.11	288990
14	4W	5	113353	0.11	12830
15	4S	5	7386	0.16	1180
16	5W	5	104294	0.02	2550
17	6E	3	369156	3.63	1341160
18	6S	5	46991	0.98	45970
19	2E	4	26261	2.39	62790
20	2W	4	54685	2.34	127810
21	3E	3	53632	2.66	142720
22	4E	3	9815	1.93	18910
23	4W	4	22529	0.89	20040
24	6E	2	13635	5.09	69350
26	2E	5	988	0.19	190
27	2W	4	21152	0.38	7960
29	3W	5	45547	0.19	8340
33	1	5	7878	2.15	16920
34	2E	5	20535	2.62	53820
35	2E	3	33026	2.23	73510
36	2W	4	11096	1.09	12070
37	3E	5	25904	4.14	107300
38	3E	2	456	2.39	1090
39	3W	5	50037	0.17	8390
40	4E	5	15092	4.62	69650
41	4E	2	51585	2.91	150130
42	4W	5	7043	0.53	3760
43	4S	5	3042	2.26	6870
44	6E	3	38397	6.87	263780
45	7E	3	448198	9.86	4421240
46	2E	3	245802	1.60	394170
47	2E	2	65396	0.93	60820
48	3E	3	351914	2.96	1043200
49	4E	3	153822	4.58	704030
50	6E	2	143511	3.38	485430
51	7E	1	245256	3.05	749160
52	7S	1	709993	2.33	1656880
		TOTAL	3,918,321	3.36	13,184,170

*Rounded

APPENDIX 17C
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALA. 2020

-----------SOIL-----------			------------GRAND TOTAL------------		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	23190	0.94	21780
2	2E	5	15836	5.17	81840
3	2E	3	17222	2.35	40440
4	2E	5	39704	4.01	159340
5	2W	4	40493	0.75	30430
6	2W	5	30344	0.62	18800
8	3E	5	27632	1.74	47950
9	3E	3	23815	2.59	61700
10	3E	5	86757	2.14	185920
11	3W	4	15383	0.52	7970
12	3S	5	10333	3.02	31210
13	4E	5	64096	4.37	280170
14	4W	5	112451	0.12	13540
15	4S	5	7373	0.16	1150
16	5W	5	103454	0.02	2570
17	6E	3	367137	3.47	1275040
18	6S	5	46877	0.97	45630
19	2E	4	26234	2.26	59250
20	2W	4	54351	2.42	131670
21	3E	3	53621	2.73	146480
22	4E	3	9815	1.82	17830
23	4W	4	22328	0.85	19040
24	6E	2	13634	4.03	54940
26	2E	5	988	0.20	200
27	2W	4	20821	0.35	7340
29	3W	5	43851	0.20	8760
33	1	5	7850	0.52	4100
34	2E	5	20470	1.15	23450
35	2E	3	32644	2.28	74360
36	2W	4	10921	1.09	11930
37	3E	5	25823	3.12	80660
38	3E	2	455	2.30	1050
39	3W	5	49259	0.16	8000
40	4E	5	15044	4.93	74240
41	4E	2	51419	2.95	151630
42	4W	5	6930	0.53	3680
43	4S	5	3031	2.19	6640
44	6E	3	48249	5.97	288040
45	7E	3	446796	9.89	4420320
46	2E	3	245029	1.59	389030
47	2E	2	55187	0.92	60270
48	3E	3	350808	2.48	869700
49	4E	3	153336	5.04	773360
50	6E	2	143066	3.67	525124
51	7E	1	244799	2.86	700750
52	7S	1	709766	2.51	1778500
		TOTAL	3,908,622	3.32	12,995,820

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

BLOUNT, 1975

------SOIL------			------GRAND TOTAL------		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
27	2W	4	1758	0.10	180
29	3W	5	9023	0.63	5650
33	1	5	429	1.75	750
34	2E	5	4749	4.23	20080
35	2E	3	3891	5.46	21230
36	2W	4	4261	1.04	4420
37	3E	5	10111	7.27	73460
38	3E	2	220	1.64	360
39	3W	5	12007	0.72	8690
40	4E	5	4960	3.52	17440
41	4E	2	5364	9.18	49240
42	4W	5	4075	1.16	4720
43	4S	5	2144	3.17	6800
44	6E	3	8816	8.62	76010
45	7E	3	72225	7.56	546090
46	2E	3	38675	2.24	86690
47	2E	2	3005	0.31	930
48	3E	3	65837	3.98	262060
49	4E	3	31145	8.04	250480
50	6E	2	38287	8.20	313790
51	7E	1	5573	5.10	28440
52	7S	1	77983	1.91	149310
		TOTAL	404,538	4.76	1,926,810

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK RIVER WARRIOR RIVER BASIN, ALABAMA

BLOUNT, 1990

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
27	2W	4	2400	0.69	1650
29	3W	5	8903	0.49	4390
33	1	5	444	2.01	890
34	2F	5	4717	4.88	23020
35	2E	3	4024	3.87	15550
36	2W	4	4387	0.84	3107
37	3E	5	10298	6.15	63280
38	3E	2	213	1.58	340
39	3W	5	12202	0.19	2290
40	4E	5	5141	2.13	10930
41	4E	2	5260	6.24	32820
42	4W	5	4020	1.06	4250
43	4S	5	2103	3.21	6750
44	6E	3	8455	5.25	44370
45	7E	3	69081	7.22	498770
46	2E	3	37891	1.67	63380
47	2E	2	2895	0.33	960
48	3F	3	63974	4.40	281590
49	4E	3	29161	2.85	83110
50	6E	2	37451	4.48	167850
51	7E	1	5463	5.17	28230
52	7S	1	74778	1.77	132180
		TOTAL	393,261	3.74	1,470,321

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

BLOUNT, 2020

-----------SOIL------------			------------GRAND TOTAL------------		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
27	2W	4	1561	0.13	200
29	3W	5	8930	0.49	4390
33	1	5	465	0.19	90
34	2E	5	4839	3.80	18390
35	2E	3	3892	3.47	13510
36	2W	4	4170	0.95	3950
37	3E	5	10663	5.67	60450
38	3E	2	213	1.59	340
39	3W	5	12495	0.21	2590
40	4E	5	5411	2.40	12990
41	4E	2	5211	6.21	32330
42	4W	5	4029	1.09	4400
43	4S	5	2103	3.41	7170
44	6F	3	8659	7.84	67900
45	7E	3	70336	10.33	726370
46	2E	3	40262	1.76	71050
47	2E	2	3005	0.21	620
48	3E	3	65411	2.97	193960
49	4E	3	30807	8.86	272803.8
50	6F	2	37828	8.75	331140.0
51	7E	1	5466	5.64	30830
52	7S	1	76417	2.55	195030
		TOTAL	402,173	5.10	1,050,490

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

CULLMAN, 1975

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRES	TONS *
27	2W	4	1129	0.59	670
28	3F	3	1241	0.34	420
29	3W	5	11849	0.16	1920
33	1	5	1978	2.48	4910
34	2F	5	3300	0.71	2340
35	2E	3	5770	2.51	14470
36	2W	4	1790	0.14	260
37	3E	5	3298	2.06	6780
39	3W	5	15859	0.30	4770
40	4E	5	432	1.82	790
41	4E	2	4813	11.18	53800
44	6E	3	3477	8.85	30770
45	7E	3	40631	7.24	294250
46	2E	3	79246	1.95	154720
47	2E	2	27169	1.36	36980
48	3E	3	98691	4.20	414600
49	4E	3	25670	10.93	280590
50	6E	2	43512	5.97	259880
51	7E	1	7048	13.68	96410
52	7S	1	83795	1.80	150450
		TOTAL	460,698	3.93	1,809,810

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

CULLMAN, 1990

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	26	0.14	4
2	2E	5	5	0.63	3
3	2E	3	163	0.44	72
4	2E	5	52	0.40	21
5	2W	4	243	0.16	40
6	2W	5	48	0.14	7
8	3E	5	65	0.92	60
9	3E	3	94	1.40	131
10	3E	5	217	0.71	153
11	3W	4	159	0.14	22
13	4E	5	179	1.80	322
14	4W	5	209	0.17	36
15	4S	5	7	0.22	2
16	5W	5	140	0.12	16
17	6E	3	1643	4.70	7729
27	2W	4	1128	0.62	700
29	3W	5	12549	0.09	1184
33	1	5	1908	2.48	4738
34	2E	5	3295	1.79	5898
35	2E	3	5676	1.27	7200
36	2W	4	1757	0.70	1221
37	3E	5	3311	2.16	7157
39	3W	5	15656	0.20	3078
40	4E	5	408	1.80	733
41	4E	2	4568	9.84	44948
44	6E	3	3294	3.69	12142
45	7E	3	39673	9.28	368139
46	2E	3	75181	1.52	114395
47	2E	2	25761	1.11	28677
48	3E	3	93640	2.87	269020
49	4E	3	24435	8.78	214477
50	6E	2	41139	3.54	145789
51	7E	1	6655	14.09	93755
52	7S	1	79876	1.47	117709
		TOTAL	443,160	3.27	1449,580

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

CULLMAN, 2020

-----------SOIL-----------			------------GRAND TOTAL------------		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
27	2W	4	1241	0.57	712
29	3W	5	16181	0.41	6593
33	1	5	1964	1.62	3178
34	2E	5	3606	0.33	1180
35	2E	3	5987	1.23	7394
36	2W	4	1897	0.64	122
237	3E	5	3621	2.47	8949
39	3W	5	16842	0.20	3297
40	4E	5	420	2.02	850
41	4E	2	4748	9.96	47276
44	6E	3	3396	4.71	15996
45	7E	3	40278	10.53	424014
46	2E	3	81704	1.37	111619
47	2E	2	26914	1.01	27243
48	3E	3	97264	2.74	266308
49	4E	3	25193	11.45	288439
50	6E	2	42501	6.39	271428
51	7E	1	6906	14.07	97169
52	7S	1	81373	2.09	170268
		TOTAL	462,036	3.79	1,753,133

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

FAYETTE, 1975

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	2020	2.05	4142
2	2E	5	895	5.21	4667
3	2E	3	13012	5.46	71073
4	2E	5	4930	4.28	21094
5	2W	4	19937	0.70	13947
6	2W	5	4038	0.77	3108
8	3E	5	5818	0.89	5194
9	3E	3	8972	6.39	57358
10	3E	5	18811	3.14	59066
11	3W	4	13427	0.65	8757
12	3S	5	201	0.37	74
13	4E	5	15036	5.47	82207
14	4W	5	17679	0.52	9136
15	4S	5	1119	0.90	1006
16	5W	5	11858	0.22	2597
17	6E	3	144372	4.29	619812
29	3W	5	1343	0.44	598
33	1	5	2014	2.42	4873
35	2E	3	1118	2.82	3153
37	3E	5	224	14.79	3312
39	3W	5	2238	0.08	171
41	4E	2	671	0.82	551
44	6E	3	902	39.16	35322
45	7E	3	68989	9.26	638816
46	2E	3	10070	1.55	15582
48	3E	3	13000	1.77	22994
49	4E	3	9683	7.55	73072
50	6E	2	3357	11.04	37052
		TOTAL	395,734	4.55	1,798,728

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

FAYETTE, 1990

-----------SOIL	------------		------------GRAND TOTAL	------------	
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	2026	0.29	596
2	2E	5	913	1.60	1463
3	2E	3	12781	4.79	61210
4	2E	5	4965	3.74	18544
5	2W	4	20395	0.67	13732
6	2W	5	4162	0.77	3212
8	3E	5	6049	1.36	8230
9	3E	3	8763	6.05	53050
10	3E	5	19329	2.53	48873
11	3W	4	13146	0.34	4528
13	4E	5	14474	4.02	58138
14	4W	5	17249	0.22	3738
15	4S	5	1088	0.56	606
16	5W	5	11483	0.13	1460
17	6E	3	130863	4.36	610289
27	2W	4	50	0.11	6
29	3W	5	1890	0.07	126
33	1	5	2119	2.72	5766
34	2E	5	161	0.50	80
35	2E	3	1382	3.18	4393
36	2W	4	75	0.21	16
37	3E	5	349	9.29	3243
39	3W	5	2940	0.10	290
40	4E	5	16	2.98	48
41	4E	2	752	0.91	686
44	6E	3	935	4.94	4622
45	7E	3	67734	9.36	634204
46	2E	3	13343	1.20	16028
47	2E	2	992	0.14	140
48	3E	3	16246	1.55	25202
49	4E	3	10201	6.86	69960
50	6E	2	4878	8.06	39302
51	7E	1	282	10.19	2873
52	7S	1	2604	9.77	25449
		TOTAL	403,635	4.26	1,720,100

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

FAYETTE, 2020

-----SOIL-----			-----GRAND TOTAL-----		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	2092	0.29	601
2	2E	5	1349	2.55	3437
3	2E	3	13150	3.12	41019
4	2E	5	5116	3.73	19097
5	2W	4	21156	0.74	15644
6	2W	5	2998	0.82	3278
8	3E	5	5711	0.78	4478
9	3E	3	8762	3.57	31295
10	3E	5	18236	2.28	41573
11	3W	4	13162	0.35	4551
13	4E	5	14694	5.15	75675
14	4W	5	17201	0.22	3707
15	4S	5	1078	0.56	607
16	5W	5	11445	0.18	2067
17	6E	3	148269	4.44	613781
29	3W	5	1450	0.05	66
33	1	5	2099	0.26	540
35	2E	3	1095	3.46	3789
37	3E	5	222	10.86	2412
39	3W	5	2348	0.07	166
41	4E	2	650	0.75	486
44	6E	3	878	4.54	3990
45	7E	3	65969	9.44	622695
46	2E	3	10814	1.80	19423
48	3E	3	12506	2.50	31272
49	4E	3	9369	9.23	86489
50	6E	2	3265	11.38	37167
		TOTAL	386,084	4.32	1,669,302

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

GREENE, 1975

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	18294	0.98	17859
2	2E	5	5690	5.46	31071
3	2E	3	16192	2.54	41134
4	2E	5	13961	2.21	30870
5	2W	4	27445	0.85	23385
6	2W	5	14959	0.18	2653
8	3E	5	12956	2.38	30836
9	3E	3	1461	1.28	1868
10	3E	5	5423	1.51	8183
11	3W	4	3626	0.67	2420
12	3S	5	9912	2.16	21429
13	4E	5	12753	4.11	52448
14	4W	5	87369	0.19	17030
16	5W	5	19293	0.12	2370
17	6E	3	69172	6.19	428239
18	6S	5	6431	1.56	10051
19	2E	4	5714	2.46	14028
20	2W	4	18109	0.60	10933
21	3E	3	27047	1.30	35094
22	4E	3	2605	1.98	5156
23	4W	4	18288	0.49	8910
24	6E	2	8686	4.05	35188
33	1	5	118	1.57	186
52	7S	1	1925	0.87	1672
		TOTAL	407,429	2.04	833,012

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

GREENE, 1990

-----SOIL-----			-----GRAND TOTAL-----		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	18794	1.05	19810
2	2E	5	5882	5.62	33074
3	2E	3	16805	2.09	35160
4	2E	5	14294	1.89	26967
5	2W	4	28183	1.16	32805
6	2W	5	15503	0.22	3452
8	3E	5	13509	3.30	44600
9	3E	3	6467	12.83	82945
10	3E	5	5632	1.55	8709
11	3W	4	3774	0.60	2268
12	3S	5	9792	1.74	17028
13	4E	5	13083	3.70	48355
14	4W	5	85936	0.23	19663
16	5W	5	19009	0.11	2065
17	6E	3	68110	6.40	435940
18	6S	5	6334	1.57	9968
19	2E	4	5714	2.34	13360
20	2W	4	22921	0.93	21271
21	3E	3	25138	0.77	19332
22	4E	3	2676	1.80	4806
23	4W	4	18114	0.39	7124
24	6E	2	5565	5.48	30506
33	1	5	863	3.62	3128
52	7S	1	2209	3.44	7610
		TOTAL	414,308	2.24	929,945

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

GREENE, 2020

-----SOIL-----			-----GRAND TOTAL-----		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	19259	1.21	23312
2	2E	5	6065	6.40	38826
3	2E	3	16966	1.88	31967
4	2E	5	14953	2.34	34940
5	2W	4	28910	1.22	35353
6	2W	5	15065	0.22	3389
8	3E	5	12605	1.74	21871
9	3E	3	6400	1.03	6594
10	3E	5	5308	1.52	8054
11	3W	4	3962	0.58	2281
12	3S	5	9643	1.84	17733
13	4E	5	12598	3.72	46838
14	4W	5	84245	0.20	16723
16	5W	5	18730	0.11	2015
17	6E	3	66746	6.44	430129
18	6S	5	6217	1.58	9842
19	2E	4	6875	2.25	15452
20	2W	4	23365	1.31	30643
21	3E	3	27044	1.93	52226
22	4E	3	2740	1.48	4069
23	4W	4	17897	0.38	6883
24	6E	2	9382	5.02	47126
33	1	5	914	0.25	226
52	7S	1	2164	3.50	7571
		TOTAL	418,053	2.14	894,063

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

HALE, 1975

-----SOIL-----			-----GRAND TOTAL-----		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	10260	0.92	9399
2	2E	5	4682	6.15	28802
3	2E	3	973	8.58	8350
4	2E	5	12929	7.91	102264
5	2W	4	15273	0.49	7483
6	2W	5	6921	0.25	1738
8	3E	5	3836	5.81	22304
9	3E	3	259	0.69	180
10	3E	5	5586	1.86	10370
11	3W	4	4544	0.54	2471
12	3S	5	731	0.47	345
13	4E	5	14474	3.90	56419
14	4W	5	40675	0.12	4907
15	4S	5	780	3.18	2321
16	5W	5	55788	0.07	3699
17	6E	3	110071	5.24	576324
18	6S	5	1496	0.99	1481
19	2E	4	19500	1.49	29096
20	2W	4	34449	1.39	47855
21	3E	3	42220	3.15	141395
22	4E	3	8926	6.43	57388
23	4W	4	18489	0.96	17780
24	6E	2	2179	9.92	21623
52	7S	1	1300	1.65	2150
		TOTAL	416,286	2.78	1,156,142

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

HALE, 1990

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	10566	0.89	9423
2	2F	5	4717	4.43	20908
3	2E	3	974	6.24	6075
4	2E	5	12927	7.31	94488
5	2W	4	15727	0.79	12407
6	2W	5	7296	0.23	1657
8	3E	5	3955	4.32	17088
9	3E	3	254	0.70	178
10	3E	5	5760	1.45	8329
11	3W	4	4006	0.70	2786
12	3S	5	731	0.46	337
13	4E	5	14939	3.33	49734
14	4W	5	39958	0.09	3553
15	4S	5	712	0.16	112
16	5W	5	54524	0.04	2079
17	6E	3	108022	5.41	584101
18	6S	5	955	0.97	924
19	2E	4	19683	1.45	28509
20	2W	4	34523	2.31	79606
21	3E	3	42250	2.78	117449
22	4E	3	9054	1.44	13017
23	4W	4	18429	0.94	17337
24	6E	2	1461	7.47	10911
52	7S	1	1249	1.12	1397
		TOTAL	412,672	2.62	1,082,402

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

HALE, 2020

-----------SOIL-----------			-----------GRAND TOTAL-----------		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	11793	0.80	9482
2	2E	5	4938	3.71	18333
3	2E	3	1066	5.47	5834
4	2E	5	14205	6.84	97232
5	2W	4	17565	0.83	14607
6	2W	5	8089	0.33	2644
8	3E	5	4481	4.08	18282
9	3E	3	271	1.08	293
10	3E	5	6451	1.57	10131
11	3W	4	5210	0.60	3142
12	3S	5	800	0.69	551
13	4E	5	16710	3.83	63953
14	4W	5	42816	0.18	7569
15	4S	5	800	0.30	240
16	5W	5	58620	0.09	5308
17	6E	3	115601	7.24	836744
18	6S	5	1611	1.62	2609
19	2E	4	21754	1.48	32189
20	2W	4	37959	2.36	89683
21	3E	3	46407	2.63	121890
22	4E	3	10006	1.86	18607
23	4W	4	20193	1.00	20186
24	6E	2	1599	8.19	13101
52	7S	1	1359	3.08	4183
		TOTAL	450,304	3.10	1,396,795

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

JEFFERSON, 1975

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
12	3S	5	1403	0.49	683
27	2W	4	10922	0.23	2520
29	3W	5	11991	0.19	2257
33	1	5	3819	0.22	843
34	2F	5	16136	1.97	31799
35	2E	3	729	0.71	518
36	2W	4	2138	0.39	833
37	3E	5	20098	1.79	35970
39	3W	5	14418	0.17	2417
40	4E	5	7003	9.38	65706
41	4E	2	4079	1.37	5579
42	4W	5	935	0.17	160
44	6E	3	11619	7.40	85982
45	7E	3	145230	16.86	2448645
46	2E	3	12632	0.27	3360
48	3E	3	33303	1.93	64112
49	4E	3	26261	3.03	79594
50	6E	2	35681	3.16	112593
51	7E	1	123461	4.98	614864
52	7S	1	224941	4.33	973288
		TOTAL	706,799	6.41	4,531,720

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

JEFFERSON, 1990

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
12	3S	5	1373	0.49	676
27	2W	4	11048	0.41	4546
29	3W	5	12214	0.12	1405
33	1	5	3793	0.83	3156
34	2E	5	15981	2.19	34949
35	2E	3	724	0.71	512
36	2W	4	2196	0.67	1475
37	3E	5	19402	2.38	46269
39	3W	5	16036	0.32	5140
40	4E	5	7018	4.04	28344
41	4E	2	3922	1.22	4787
42	4W	5	921	0.17	160
44	6E	3	10939	7.45	81463
45	7E	3	140126	16.82	2357550
46	2E	3	12620	0.62	7822
48	3E	3	30998	1.67	51648
49	4E	3	8937	6.53	58362
50	6E	2	34726	2.78	96711
51	7E	1	121706	5.24	637508
52	7S	1	218693	4.30	940836
		TOTAL	673,373	6.48	4,363,315

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

JEFFERSON, 2020

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
12	3S	5	1426	2.45	3494
27	2W	4	11392	0.73	8288
29	3W	5	12584	0.55	6882
33	1	5	3822	0.24	911
34	2E	5	16292	1.41	23010
35	2E	3	744	0.76	562
36	2W	4	2335	0.89	2078
37	3E	5	21621	1.78	38532
39	3W	5	15758	0.20	3183
40	4E	5	7202	4.89	35228
41	4E	2	4560	1.60	7281
42	4W	5	950	0.19	182
44	6E	3	13299	7.92	105392
45	7E	3	147683	19.14	2826403
46	2E	3	14500	0.52	7579
48	3E	3	33871	1.84	62473
49	4E	3	26688	3.76	100449
50	6E	2	36077	3.48	125495
51	7E	1	125441	5.61	703753
52	7S	1	228997	4.84	1109452
		TOTAL	725,242	7.13	5,170,625

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

TUSCALOOSA, 1975

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	1329	1.52	2025
2	2E	5	8886	5.66	50279
3	2F	3	7026	3.26	22899
4	2F	5	19305	1.94	37396
5	2W	4	13854	0.14	1998
6	2W	5	15582	0.88	13738
8	3E	5	25072	1.31	32898
0	3E	3	18708	3.24	60704
10	3E	5	73820	2.06	151744
11	3W	4	7999	0.63	5045
12	3S	5	3672	9.12	33472
13	4E	5	38999	4.71	183617
14	4W	5	29114	0.57	16698
15	4S	5	9426	0.36	3383
16	5W	5	55646	0.06	3558
17	6E	3	209289	2.92	610372
18	6S	5	34856	0.64	22359
26	2E	5	898	0.33	292
27	2W	4	4041	0.08	307
28	3E	3	36	0.94	34
29	3W	5	861	0.05	42
33	1	5	895	0.17	149
34	2E	5	2691	0.34	923
37	3E	5	3560	0.87	3096
39	3W	5	2245	0.08	181
41	4E	2	4071	0.92	3753
44	6E	3	4940	4.16	20574
45	7E	3	24251	7.00	169811
46	2E	3	7715	0.52	3982
48	3E	3	17332	1.18	20527
49	4E	3	16109	1.37	22057
50	6E	2	5388	1.39	7515
51	7E	1	51101	2.37	120886
52	7S	1	105809	1.67	177052
		TOTAL	824,546	2.19	1,803,352

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

TUSCALOOSA, 1990

-----SOIL-----			-----GRAND TOTAL-----		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	1327	1.23	1636
2	2E	5	8667	5.66	49014
3	2E	3	6789	2.80	19018
4	2E	5	18062	1.90	34280
5	2W	4	14742	0.25	3729
6	2W	5	14298	1.07	15243
8	3E	5	23604	1.21	28595
9	3E	3	17529	2.72	47724
10	3E	5	69077	2.17	149891
11	3W	4	7883	0.38	3813
12	3S	5	3385	6.47	21898
13	4E	5	36544	4.04	147783
14	4W	5	28659	0.29	8218
15	4S	5	8846	0.19	1718
16	5W	5	54596	0.05	2687
17	6E	3	196461	2.94	576822
18	6S	5	32667	0.61	19860
26	2E	5	880	0.33	289
27	2W	4	3961	0.08	304
29	3W	5	879	0.05	46
33	1	5	924	0.91	841
34	2E	5	2851	1.01	2882
37	3E	5	3039	0.89	2696
39	3W	5	2200	0.08	181
41	4E	2	4301	0.90	3877
44	6E	3	4729	4.11	19428
45	7E	3	23145	6.27	145074
46	2E	3	7337	0.67	4906
48	3E	3	17717	0.81	14356
49	4E	3	15410	1.32	20314
50	6E	2	5158	1.35	6942
51	7E	1	66077	1.81	119297
52	7S	1	100336	1.42	142228
		TOTAL	802,080	2.01	1,614,781

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

TUSCALOOSA, 2020

-----------SOIL-----------			-----------GRAND TOTAL-----------		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
1	1	4	4914	0.39	1905
2	2E	5	6654	8.21	54663
3	2E	3	6163	2.71	16688
4	2E	5	8563	4.17	35679
5	2W	4	3673	1.03	3772
6	2W	5	12883	1.45	18716
7	2S	5	397	0.07	28
8	3E	5	6676	3.46	23067
9	3E	3	6836	5.15	35203
10	3E	5	19095	7.40	141209
11	3W	4	7088	0.43	3042
12	3S	5	3145	7.50	23591
13	4E	5	13188	11.09	146225
14	4W	5	12981	0.67	8725
15	4S	5	4959	0.43	2108
16	5W	5	7416	0.37	2725
17	6E	3	21126	26.70	563968
18	6S	5	7318	2.80	20487
19	2E	4	21460	0.11	2280
20	2W	4	5596	0.02	94
22	4E	3	14055	0.34	4722
23	4W	4	14225	0.02	296
24	6E	2	4768	0.56	2670
25	1	5	61119	0.04	2567
26	2E	5	93615	0.16	15183
27	2W	4	327	0.64	209
28	3E	3	2700	0.31	847
29	3W	5	1696	0.04	65
30	4E	3	10406	0.86	8974
31	6E	3	10899	1.89	20599
32	7E	1	3264	1.92	6270
33	1	5	566	0.23	132
34	2E	5	20680	0.29	6029
35	2E	3	11451	0.21	2373
36	2W	4	52794	0.07	3770
37	3E	5	3819	0.99	3778
38	3E	2	411	0.52	212
39	3W	5	27020	0.02	623
40	4E	5	15538	0.99	15410
41	4E	2	8498	0.86	7312
42	4W	5	46462	0.02	888
43	4S	5	181280	0.60	109435
44	6E	3	31153	3.06	95425
45	7E	3	1964	68.37	134284
46	2E	3	2437	2.01	4891
48	3E	3	5062	3.50	17717
49	4E	3	1346	12.78	17206
50	6E	2	436	13.65	5954
51	7E	1	5637	19.92	112269
52	7S	1	9488	15.43	146415
		TOTAL	823,247	2.25	1,850,682

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

WALKER, 1975

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
3	2E	3	1408	3.09	4351
10	3E	5	1372	0.49	673
17	6E	3	3201	3.24	10356
27	2W	4	6894	0.32	2199
29	3W	5	9709	0.14	1339
33	1	5	467	2.54	1188
34	2E	5	3801	2.19	8325
35	2E	3	14560	1.50	21863
36	2W	4	3508	0.45	1589
37	3E	5	467	14.61	6824
39	3W	5	9483	0.32	3000
41	4E	2	32728	2.03	66327
42	4W	5	2821	0.18	519
44	6E	3	21417	4.21	90182
45	7E	3	125392	8.91	1117504
46	2E	3	34786	0.56	19508
47	2E	2	15087	0.86	13016
48	3E	3	66162	2.00	132231
49	4E	3	16369	5.36	87749
50	6E	2	4595	6.22	28593
51	7E	1	12820	3.15	40371
52	7S	1	130880	2.52	329648
		TOTAL	517,927	3.84	1,987,349

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

WALKER, 1990

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
3	2E	3	1408	2.44	3435
10	3E	5	1317	0.49	646
17	6E	3	3071	3.23	9929
27	2W	4	7300	0.32	2323
29	3W	5	9982	0.08	800
33	1	5	460	2.55	1173
34	2E	5	3737	1.89	7066
35	2E	3	14448	0.76	10960
36	2W	4	3459	1.31	4534
37	3E	5	451	8.27	3729
39	3W	5	8517	0.13	1098
41	4E	2	31253	1.08	33906
42	4W	5	2783	0.18	495
44	6E	3	20745	6.16	127811
45	7E	3	116575	9.08	1058616
46	2E	3	31875	0.89	28214
47	2E	2	13656	0.67	9114
48	3E	3	60696	1.25	76133
49	4E	3	15506	1.88	29095
50	6E	2	4289	1.45	6228
51	7E	1	11635	2.60	30269
52	7S	1	122156	2.17	265107
		TOTAL	485,319	3.52	1,710,679

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

WALKER, 2020

-----------SOIL-----------				------------GRAND TOTAL------------	
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
3	2E	3	1446	0.63	913
10	3E	5	1389	0.69	960
17	6E	3	3261	4.68	15265
27	2W	4	8006	0.31	2460
29	3W	5	10644	0.10	1066
33	1	5	485	0.83	403
34	2E	5	4326	0.49	2104
35	2E	3	10574	1.42	15063
36	2W	4	3555	1.21	4311
37	3E	5	470	10.61	4986
39	3W	5	9007	0.16	1442
41	4E	2	33075	1.80	59695
42	4W	5	2825	0.21	589
44	6E	3	22708	9.49	215597
45	7E	3	127116	14.33	1821592
46	2E	3	36691	1.13	41372
47	2E	2	15212	0.68	10344
48	3E	3	66849	1.15	77091
49	4E	3	16957	6.46	109471
50	6E	2	4641	6.89	31962
51	7E	1	12966	4.55	58935
52	7S	1	132464	3.54	468876
		TOTAL	524,667	5.61	2,944,496

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

WINSTON, 1975

-----------SOIL-----------			------------GRAND TOTAL------------		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
3	2E	3	1605	3.10	4974
4	2E	5	911	0.17	156
5	2W	4	843	0.09	76
6	2W	5	303	0.06	19
9	3E	3	371	7.02	2604
10	3E	5	3008	0.28	844
13	4E	5	303	1.01	306
17	6E	3	6044	2.97	17924
18	6S	5	303	0.77	234
27	2W	4	1679	0.48	804
29	3W	5	1518	0.05	77
33	1	5	1447	0.68	984
34	2E	5	1983	1.80	3577
35	2E	3	3738	1.36	5093
37	3E	5	256	8.27	2117
39	3W	5	7937	0.27	2173
41	4E	2	2899	2.90	8404
44	6E	3	3107	4.00	12418
45	7E	3	10186	13.30	135481
46	2E	3	38275	0.87	33487
47	2E	2	11703	0.52	6139
48	3E	3	42309	0.96	40700
49	4E	3	26339	5.51	145221
50	6E	2	18928	5.04	95385
51	7E	1	73225	3.11	227676
52	7S	1	133638	1.91	254668
		TOTAL	392,858	2.55	1,001,540

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

WINSTON, 1990

SOIL			GRAND TOTAL		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
3	2E	3	1619	1.31	2115
4	2E	5	870	0.17	114
5	2W	4	874	0.23	197
6	2W	5	297	0.06	19
9	3E	3	368	1.17	430
10	3E	5	2855	0.27	763
13	4E	5	295	1.01	299
17	6E	3	5911	2.99	17668
18	6S	5	295	0.78	229
27	2W	4	1739	0.49	855
29	3W	5	1488	0.05	77
33	1	5	1372	0.37	508
34	2E	5	1952	1.56	3041
35	2E	3	3678	0.97	3568
37	3E	5	250	9.29	2324
39	3W	5	8208	0.15	1226
41	4E	2	2826	2.11	5956
44	6E	3	2998	3.95	11828
45	7E	3	9922	15.05	149280
46	2E	3	37595	0.89	33477
47	2E	2	11958	0.27	3172
48	3E	3	41487	1.25	51677
49	4E	3	25828	3.23	83335
50	6E	2	18590	1.73	32100
51	7E	1	71550	2.43	174004
52	7S	1	130734	2.14	280156
		TOTAL	385,559	2.23	858,448

*Rounded

APPENDIX 17D
COUNTY SUMMARIES
SHEET AND RILL EROSION BY RESOURCE GROUP
BLACK WARRIOR RIVER BASIN, ALABAMA

WINSTON, 2020

-----------SOIL-----------			-----------GRAND TOTAL-----------		
SRG	CLASS	TONS/AC	ACRES	RATE/ACRE	TONS *
3	2E	3	1687	1.30	2190
4	2E	5	879	0.21	184
5	2W	4	902	0.22	202
6	2W	5	293	0.07	21
9	3E	3	371	1.26	466
10	3E	5	2908	0.35	1016
13	4E	5	293	1.11	325
16	5W	5	437	0.57	248
17	6E	3	5426	1.64	8898
18	6S	5	272	0.48	130
27	2W	4	1809	0.48	867
29	3W	5	1466	0.06	85
33	1	5	1578	0.16	245
34	2E	5	2146	0.33	712
35	2E	3	3638	1.01	3676
37	3E	5	254	10.21	2595
39	3W	5	8563	0.17	1437
41	4E	2	2820	2.20	6192
44	6E	3	3012	4.53	13658
45	7E	3	9899	19.34	191416
46	2E	3	37499	0.70	26142
47	2E	2	12940	0.39	5000
48	3E	3	42277	0.97	41037
49	4E	3	25696	5.85	150447
50	6E	2	18474	5.41	99987
51	7E	1	70875	2.62	185637
52	7S	1	129818	2.33	302495
		TOTAL	386,232	2.71	1,045,306

*Rounded