GEOLOGICAL SURVEY OF ALABAMA

WALTER B. JONES, State Geologist

SPECIAL REPORT 24

Surface Water Resources and Hydrology of West-Central Alabama

By

LAURENCE B. PEIRCE
U. S. Geological Survey

With a section on Quality of Water by James W. Geurin
U. S. Geological Survey

Prepared by the
UNITED STATES GEOLOGICAL SURVEY
in cooperation with the
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LETTER OF TRANSMITTAL

University, Alabama
August 19, 1958

Honorable James E. Folsom
Governor of Alabama
Montgomery, Alabama

Sir:

I have the honor to transmit herewith the manuscript of a report entitled, "Surface Water Resources and Hydrology of West-Central Alabama," by Laurence B. Peirce, of the United States Geological Survey; with a section on Quality of Water, by James W. Geurin, of the United States Geological Survey. It is requested that it be printed as Special Report 24 of the Geological Survey of Alabama.

Respectfully,

WALTER B. JONES
State Geologist

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INTRODUCTION

Purpose and Scope

Systematic stream gaging in Alabama was begun in 1896 by the U. S. Geological Survey. Early investigations were limited in scope, being confined mostly to streams considered promising for developing hydroelectric power. With the growth of population and industry through the years and the ever-increasing demand for water and water knowledge, the fact-finding water program in Alabama has been greatly enlarged, although much remains to be done.

Streamflow information collected in Alabama by the U. S. Geological Survey in cooperation with the State and with other Federal agences is published in the Survey's water-supply papers[1] on an annual basis. While this method of publication makes the information currently available, it does not leave it in the most conveniently usable form; a 25-year record of streamflow, for example, appears in 25 separate publications. Then, too, these annual water-supply papers present only the bare figures of streamflow with no reference to the causative factors behind them nor any explanation of the many uses to which they can be put. To some extent this restricts their usefulness, for they can be fully appreciated only by the relatively small group of specialists who are able to extract maximum benefit from them.

In 1947, in cooperation with the Alabama Geological Survey, work was begun on a series of reports intended to overcome to some extent the disadvantages of the annual water-supply papers for water-use planning in Alabama. As originally planned, the water resources and hydrology of Alabama are to be covered in five companion volumes, each treating a different section of the State (see figure 1). Each report is to present a summary of available streamflow records in the report area, with a discussion of the physical and climatological features of the area that affect the quantity and quality of its surface waters. In addition, a few representative hydrologic studies are to be included to demonstrate how basic data can be used to solve specific water problems.

The first report of the series, "Water Resources and Hydrol-

[1] Surface Water Supply of South Atlantic and Eastern Gulf of Mexico Basins, Ogeechee River to Pearl River, Part 2-B, U. S. Geological Survey Water-Supply Papers.

ogy of Southeastern Alabama," was published in 1949 as Special Report 20 of the Alabama Geological Survey; the second report, "Hydrology and Surface-Water Resources of East-Central Alabama," followed in 1955 as Special Report 22. The present report is the third of the series.

Cooperation and Acknowledgment

This report was prepared as part of the cooperative program on water investigations between the Alabama Geological Survey and the U. S. Geological Survey. Cooperation on surface-water studies has been continuous since 1935. The material in the report was assembled in the Montgomery office of the Surface Water Branch, U. S. Geological Survey under the direction of M. R. Williams, District Engineer.

Description of the Area

The area covered by this report and referred to as "west-central Alabama" is shown on the map of figure 1. It is an area of 9,920 square miles comprising the Black Warrior River basin (6,274 square miles) and that part of the Tombigbee River basin in Alabama above the mouth of the Black Warrior River (3,646 square miles). West-central Alabama includes all or parts of 21 of the 67 Alabama counties. The 12 counties that account for 95 percent of the total report area are listed in table 1, with statistics of area, population, and industry. The remaining 5 percent of the area is represented by small parts of 9 counties not included in the table.

As evidenced by table 1, farming is general throughout the area and in most counties it is the principal occupation of the people. The major crops are cotton, corn, hay, and truck crops except in the southern counties of Hale, Greene, and Sumter, where dairying and the growing of beef are the major interests. The production of pulpwood—mostly pine—is also of considerable importance throughout the area.

The Black Warrior River basin, particularly Jefferson and Tuscaloosa counties, is one of the most highly industrialized sections of the State. Much of this section is rocky and rough and, thus, poorly suited to agriculture. By a fortunate coincidence of nature, however, all raw materials of the steel industry are found in close proximity in the Warrion Basin. The city of Birmingham, at the eastern edge of the report area in Jefferson County, is situated to take advantage of this fact. Red Mountain, flanking for 60 miles the broad, open valley in which the city is located, bears a tremendous seam of red hematite iron ore. On the other side of the valley is the Warrior coal field, extending over 3,000 square miles. Ample supplies of limestone and dolomite for fluxing are also near at hand. Port Birmingham, twenty miles to the west of Birmingham, is the northern terminus of a modern waterway system providing economical transport to the sea. Mining of coal and iron ore, production of iron and steel, and the processing of steel products are, of course, the major industries in the Black Warrior River basin, but in recent years the manufacture of chemicals and textiles, paper making, oil refining, and wood preserving have grown to considerable importance.

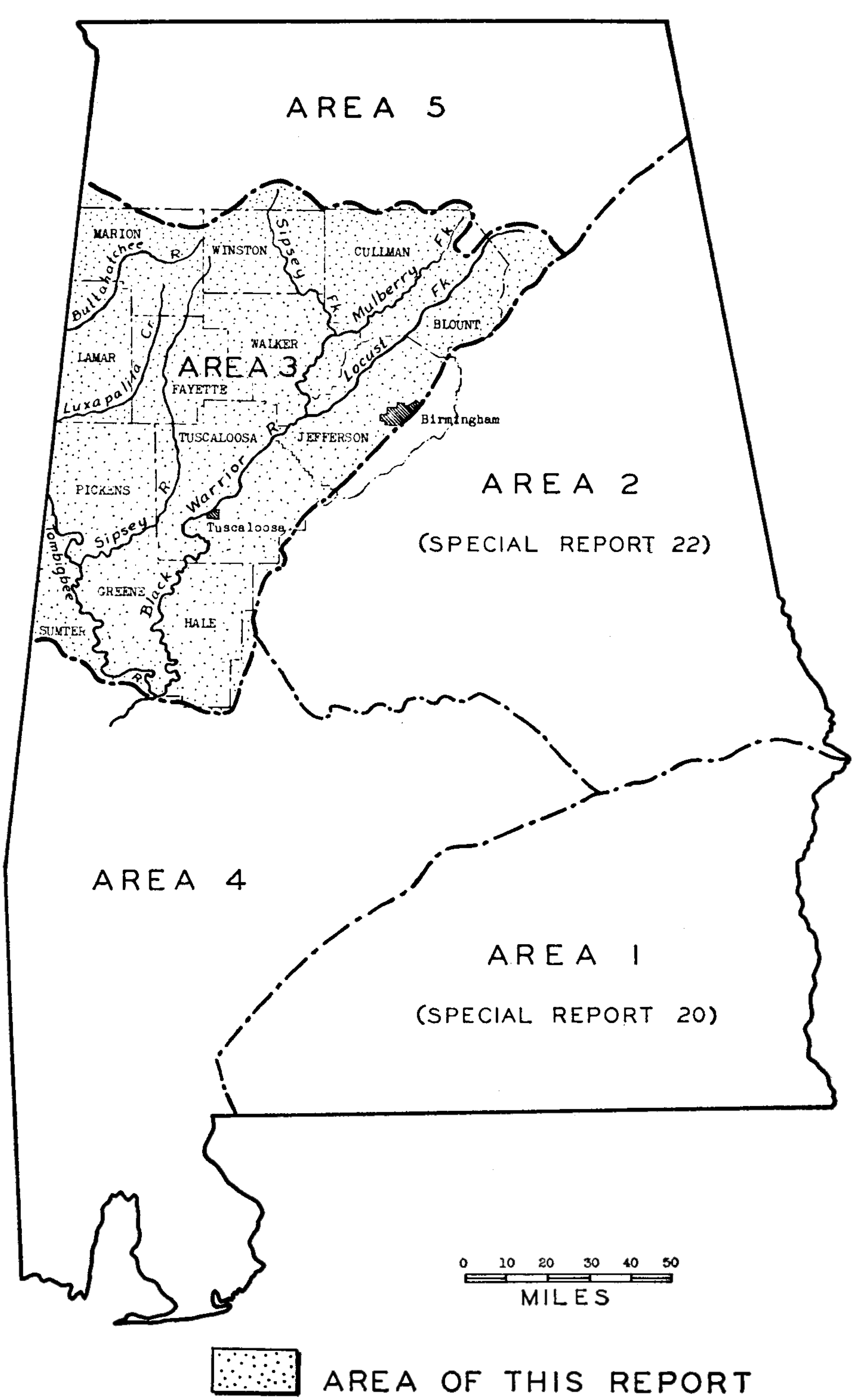

Figure 1.—Map of Alabama showing areas of reports on surface-water resources. Reports for Area 1 and Area 2 have been published; Area 3 is the area of this report.

TABLE 1.—POPULATION AND INDUSTRIAL PRODUCTION OF WEST-CENTRAL ALABAMA, BY COUNTIES.

County	Area (sq. mile)	Population 1940 Total	1950 Total	1950 Per sq. mile	1950 % Rural (farm)	*Value of farm produce, 1952 ($ millions)	*Sales of manufactured products, 1952 ($ millions)
Blount	640	29,490	28,975	45.3	69.9	13	3
Cullman	743	47,343	49,046	66.0	67.5	23	8
Fayette	627	21,651	19,388	30.9	59.9	6	10
Greene	645	19,185	16,482	25.6	78.6	5	5
Hale	663	25,553	20,832	31.4	69.5	7	2
Jefferson	1,118	459,930	558,928	499.9	2.6	12	874
Lamar	605	19,708	16,441	27.2	71.2	7	4
Marion	743	28,776	27,264	36.7	58.3	8	6
Pickens	887	27,671	24,349	27.5	66.4	9	9
Tuscaloosa	1,340	76,036	94,092	70.2	19.8	10	126
Walker	809	64,201	63,769	78.8	29.2	7	25
Winston	633	18,746	18,250	28.8	56.8	5	12
Totals	9,453	838,290	937,816	99.2	21.1	112	1,084

* Figures furnished by Alabama State Chamber of Commerce.

The climate and physiography of west-central Alabama are discussed in later sections of the report, and a detailed map of the area is shown by plate 1 (in pocket attached to back cover).

WATER USE AND CONTROL

At the present time, west-central Alabama uses only a small part of the surface-water resources of the area—resources which, with proper development, can satisfy all foreseeable demands. In the Birmingham area, the concentration of heavy industry has created a great demand for water. Existing supplies are somewhat limited, but ample additional supplies can be developed, though at considerable expense.

Current uses of surface water in west-central Alabama are discussed briefly in the following sections.

Public Water Supply

In west-central Alabama there are 60 public water supplies, 20 of which are obtained from surface streams. These surface-water supplies serve 80 percent of the population having municipal water service.

The largest consumer of surface water is the Birmingham metropolitan area (population about 430,000) which uses more than 100 million gallons per day of which about 55 million gallons daily are obtained from Lake Purdy on Little Cahaba River, which is outside the report area. Water for industrial use (and additional water for domestic use) is obtained from Blackburn Lake (also called Inland Reservoir) on Blackburn Fork, a tributary of the Black Warrior River. Blackburn Lake, which is 25 miles north of Birmingham, was completed in 1938 as a city and Federal works project. It has a surface area of 1,536 acres and a usable storage capacity of 60,000 acre-feet. Withdrawals from Blackburn Lake have now reached about 50 million gallons per day.[1]

[1] U.S. Geol. Survey Circ. 254, 1953, **Water Supply of the Birmingham area, Alabama,** presents a more detailed discussion of the present and possible future water supplies of the Birmingham area.

TABLE 2.—SURFACE-WATER SUPPLIES SERVING POPULATIONS OF 500 OR MORE IN WEST-CENTRAL ALABAMA

Supply	Source	Population served	Consumption (mgd)
Barney Mines	Mulberry Fork	500	0.03
Bessie	Locust Fork	1,000	.08
Bradford	Black Creek	2,200	.08
Cullman	Mulberry Fork	9,000	.65
Dupont	New Found Creek	500	.02
Fayette	Sipsey River	4,000	.32
Flattop	Locust Fork	500	.05
Gamma	Locust Fork	10,000	.20
Gorgas	Mulberry Fork	1,500	.22
Haleyville	Pumphouse Creek	3,400	*.42
Jasper	Mulberry Fork	8,600	1.10
Labuco	Locust Fork	625	.02
New Castle	Cunningham Creek	665	.19
Powhatan	Locust Fork	825	.04
Sayre	Locust Fork	800	.12
Tuscaloosa	Yellow Creek	50,000	6.75
Warrior	Locust Fork	1,400	.10

* Partly obtained from spring and well.

Information on other surface-water supplies serving populations of 500 or more in west-central Alabama is given in table 2. Additional information on public water supplies of the area can be obtained from the Alabama Department of Health.

Navigation

Navigation on the Tombigbee and Black Warrior Rivers dates back to colonial days. Before its improvement, the Black Warrior was navigable during high water as far upstream as Tuscaloosa. Side-wheel boats could navigate the river for about 4 months and light-draft stern-wheelers for 6 to 9 months of the year. Above Tuscaloosa a series of shoals and falls completely blocked navigation at low water, and the current was very swift at high water. Although it was possible for small flatboats to descend the river during floods, navigation of this type was extremely hazardous. Frequently, both boat and cargo were lost, a state of affairs that finally resulted in the abandonment of all attempts at navigation on the upper reaches of the river.

When the Warrior coal fields were opened about 1870, it was quickly recognized that the Tombigbee-Black Warrior river system, if developed for navigation, would provide an economical means of transporting coal from the mines to the Gulf of Mexico. In 1874, Congress authorized the first survey of the river. This and later suveys led to the planning of a series of locks and dams that would provide slack-water navigation to Daniels Creek, about 14 miles above Tuscaloosa. These locks were completed and opened to traffic in November 1895. On January 12, 1896, the first tow of coal from the Warrior coal fields started down the river to Mobile, where it arrived 18 days later. This small tow of one barge caused much excitement along the river. As it passed each town, it was greeted by town meetings and ovations proclaiming it a symbol of bigger things to come in the Warrior basin.

So successful was this first improvement of the river that Congress soon approved plans to extend the development farther upstream. By 1915, 17 locks had been opened to traffic, 4 on the lower Tombigbee and 13 on the Black Warrior. These locks, with an aggregate lift of 244 feet, provided a 6-foot channel from Mobile to Cordova on the Mulberry Fork and to Nichols Shoals, 20 miles due west of Birmingham, on the Locust Fork.

In more recent years the waterway has been deepened and much improved. In 1940, Oliver Lock and Dam was completed at Tuscaloosa, replacing old Locks 10, 11, and 12; and in 1956, Demopolis Lock and Dam at the mouth of the Black Warrior River replaced old Locks 4, 5, 6, and 7. Warrior Lock and Dam, now (1957) under construction near Eutaw, will replace old Locks 8 and 9. Eventually it is planned to replace Locks 13, 14, 15, and 16 by a single dam near Lock 13 and to enlarge the lock at existing Lock 17. As modernization of the navigation system progresses, however, more water for lockages will be needed in dry seasons and will most likely be supplied by additional headwater reservoirs.

The present waterway system has complete towing and barge service, with connection through the Intercoastal Waterway to the Mississippi River system. During 1956, nearly 4½ million tons of freight were transported over the system, the principal cargoes being coal, limestone, iron ore, iron and steel products, crude oil, gasoline, package freight, logs, and pulpwood.

The existing channel of the Tombigbee River above Gainesville, Ala., is inadequate for navigation by modern barges. Traffic on this river has consisted almost entirely of logs and piles moving in barges or in towed rafts during periods of high water. A waterway connecting the Tombigbee-Black Warrior system with the Tennessee River has been authorized by Congress, but, as yet, no funds have been made available for its construction. When completed, this project will provide a channel 9 feet deep with a minimum width of 150 feet from Demopolis to Pickwick Reservoir on the Tennessee River, by way of the East Fork Tombigbee, Mackeys Creek, and Yellow Creek.

Hydroelectric Power and Flood Control

At the present time there are no major hydroelectric developments or flood control works in west-central Alabama. A channel-improvement project related to flood control is the clearing and straightening of Luxapalila Creek, which in Alabama has been canalized by the Corps of Engineers from Winfield to the State line, a distance of about 50 miles.

Most of the direct damage from floods is to agricultural interests in the rich, extensively cultivated bottomlands along the major rivers. Only two urban centers, the Tuscaloosa-Northport area and Demopolis, are seriously affected by floods, and these only by very high floods.

Although there is a large steam-electric plant at Gorgas on the Mulberry Fork, much of the electric power comes to the area from the great hydroelectric plants on the Coosa, Tallapoosa, and Tennessee Rivers. Power developments of any magnitude in the Black Warrior basin are not feasible without substantial reservoir storage to supplement the low flow of the streams. Reservoirs built at the sites most favorable topographically might flood valuable mine holdings and operations. These considerations, together with the early development of the river for navigation and the availability of many excellent power sites in adjoining river basins, have retarded power development in the Black Warrior Basin. However, with the growth of industry and population in the area and the continued modernization of the waterway system, it appears likely that storage reservoirs will eventually be built. A system of multipurpose headwater reservoirs serving the combined interests of navigation, power, flood control, water supply, waste disposal, and recreation is now under study by the Corps of Engineers. Private interests also are active in planning power developments in the area. The

Alabama Power Co. has been granted preliminary permits to install hydroelectric generating plants at the proposed redeveloped Locks 13 and 17 on the Black Warrior River and also at the proposed New Hope reservoir site at the head of navigation on Sipsey Fork. In addition, the Warrior River Electric Cooperative Association has been granted a license to construct two hydroelectric plants on Locust Fork in Blount County.

Disposal of Sewage and Industrial Waste

A statewide survey of stream pollution in Alabama was completed in 1949.[1] According to this survey, the population equivalent of the total pollution load of the upper Tombigbee River basin is only 9,175. There were no industrial wastes of consequence entering the streams, which with few exceptions are in excellent sanitary condition.

The total pollution load entering streams of the Black Warrior basin was estimated to have a population equivalent of 590,975. Sewage and industrial waste from 30 municipal sewer systems contributed 57 percent of the pollution, and industrial wastes from private sewers, 43 percent. The most serious pollution in the basin comes from the Birmingham and Tuscaloosa areas.

Fivemile Creek, Village Creek, and Valley Creek, which serve as drainage outlets for sewage and industrial waste from metropolitan Birmingham, are grossly polluted. Sludge that collects in these streams during low flow is flushed downstream when heavy rains cause the streams to rise, creating concentrations of waste that the streams cannot assimilate. Deleterious effects of pollution from the Birmingham area extend down the main river to Lock 17. Water leaving Lock 16 is in relatively good sanitary condition.

Domestic and industrial wastes discharged without treatment into the Black Warrior River in the vicinity of Tuscaloosa create a bad sanitary condition. In the survey mentioned, the highest coliform count and biochemical oxygen demand along the Black Warrior River were found in the pool above Tuscaloosa Lock and Dam. Much of the solid wastes settle in the pool during low water and are flushed out when the river rises. At such times pollution from this source has been detected 75 miles downstream.

[1] **Studies of Pollution in Streams of Alabama,** State of Alabama, Water Improvement Advisory Commission, 1949.

Irrigation

Irrigation is little used in west-central Alabama as crops can normally be brought to harvest without supplementing natural rainfall. However, dry periods are common during the fall months and not uncommon during the growing-season months of May and June, and at such time supplemental irrigation often proves profitable for special crops and pastures. The development in recent years of light-weight aluminum pipe designed specifically for irrigation use has greatly stimulated interest in supplemental irrigation. Installations of this type, using pumps and portable sprinkler systems, are becoming increasingly popular in the area.

Recreation

Bankhead Lake, the largest body of water in the report area, is used for recreational purposes. It is formed by Lock and Dam 17 and covers about 7,500 acres. All land adjacent to this lake is privately owned, and all boating, camping, and fishing facilities are privately operated. Inland Lake on Blackburn Fork, although municipally owned, is open to the public and is heavily fished. Public lakes constructed and maintained by the Alabama Department of Conservation in Cullman, Fayette, Lamar, Marion, and Tuscaloosa counties are open to the general public. A considerable number of small private ponds also are available for public fishing, usually on a fee basis.

HYDROLOGIC ENVIRONMENT

Considered on a worldwide scale, water is one of the most abundant commodities on earth. By far the greater part of the earth's water is stored in the oceans, which contain some 300 million cubic miles of salt water and cover 70 percent of the earth's surface to an average depth of over 2 miles. Smaller amounts of water appear in other places and in other forms. Frozen in the polar ice is enough water to raise the level of the sea 150 feet, according to some estimates. Contained in the atmosphere as vapor is enough water to produce a 1-inch rainfall over the entire earth. Stored beneath the ground is what has been estimated as the equivalent of more than 30 years' rainfall. Still other water is combined chemically with the materials of the earth's crust and with the tissues of living things.

Although the distribution of the earth's water—in the ocean, in the atmosphere, on and under the land—is continually varying, the total amount remains essentially constant and is used over and over again in a vast process of continuous circulation called the hydrologic cycle. Rising salt-free from the ocean under the vaporizing power of the sun, water is wind-borne across the land, some as invisible vapor, some as condensed droplets of clouds and fog. Part of this airborne moisture is precipitated as rain, snow, hail, or sleet, and falls either on land surfaces or directly back into the ocean. Of the moisture that falls on land, the greater part is returned to the atmosphere by evaporation from land and water surfaces and by transpiration from plant life. Another portion enters the ground and either seeps slowly into the streams or feeds the roots of plants. When the rain falls faster than the ground can absorb it, the excess water runs over the land surface and enters streams or lakes, to return eventually to the ocean. These various phases of the hydrologic cycle are diagrammed in figure 2.[1]

Factors that work to control or modify the hydrologic cycle may be classified under two headings, climate and land. Climatic factors include precipitation, temperature, evaporation, and wind. Land factors include geology, topography, soil depths and types, and land use. Water is seldom, if ever, distributed by these factors in amounts that completely harmonize with man's uses; the pattern of needs is often different from the pattern of supply as provided by nature.

Man has little control over the climatic factors, but he can modify the hydrologic cycle to some extent through his limited control of some of the land factors. Some hydrologists believe that man, by varying land uses, can increase or decrease the ability of water to enter into ground storage. Similarly, he can increase or decrease the consumptive use of water (water used up by vgetation) and thus change the relation between evapotranspiration and runoff. On the other hand, man can make physical changes that scarcely affect the hydrologic cycle and yet create great benefits for himself. Thus he can harness and use some of the energy otherwise lost in the descent of a stream to the sea; he can impound water during seasons of plenty for use during periods of inadequate supply; he can build protective works for use during periods of over-abundant supply. Given sufficient information about the factors that produce and con-

[1] Reproduced from **Water,** an editorial report by **Power,** September 1952.

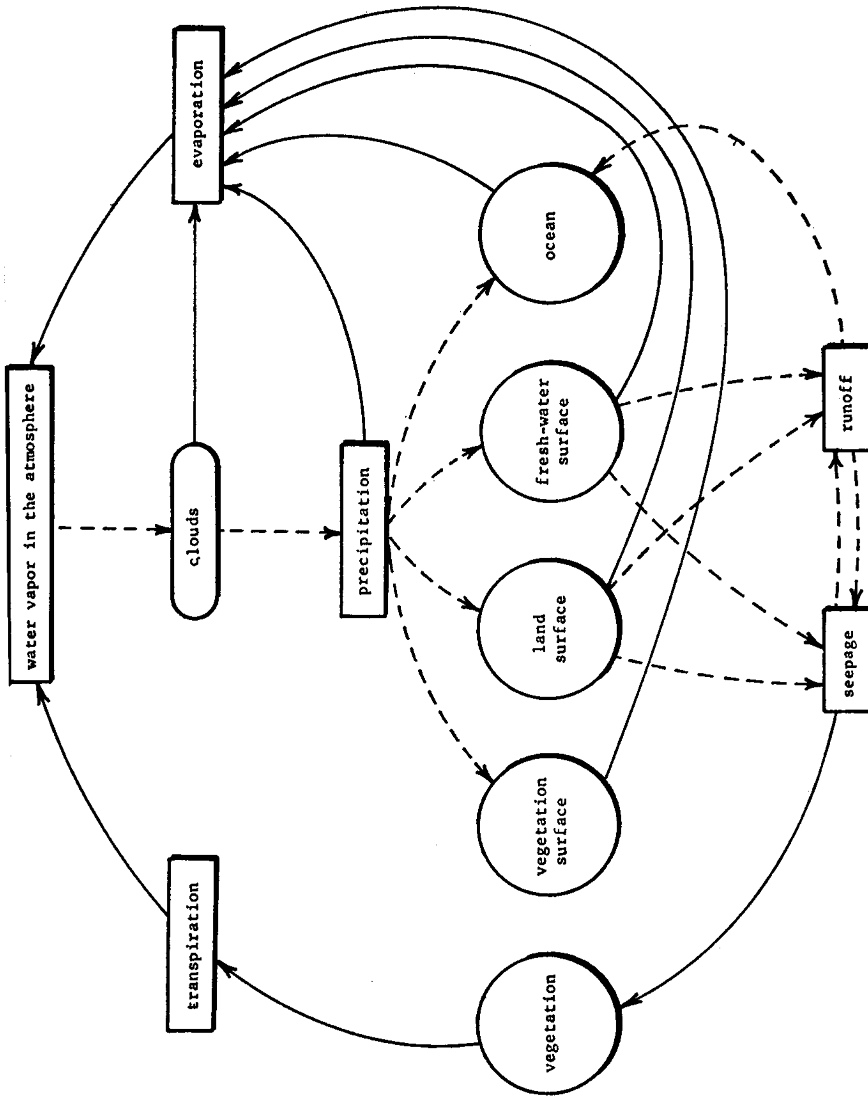

Figure 2.—The hydrologic cycle.

trol his water supplies, man can make better and wiser use of those supplies.

This section presents information regarding the factors of climate and land that affect the water supplies of west-central Alabama.

Climate

The climate of west-central Alabama is temperate and humid, differing but little from that of the State as a whole. The principal factors that affect the climate of the area are its geographic position, topography, prevailing winds, and exposure to maritime air masses from the Gulf of Mexico. Summers are long, hot, and occasionally oppressive, but winters are short and generally mild. Rainfall, which averages about 53 inches a year, is normally adequate for agricultural needs. Damaging areawide droughts are rare.

The climatic elements, precipitation, temperature, and wind, each of which have a distinct influence on the hydrology and water resources of west-central Alabama, are treated separately in greater detail in the following sections.

Precipitation

In west-central Alabama, precipitation is nearly all in the form of rain. On the average there are only two light snowfalls each year, and hail accompanies only one thunderstorm in about 200. Thus rainfall is the basic source of water supply in the area.

The effectiveness of rainfall in generating water supplies and in growing crops depends not only on the total amount of rainfall each year, but also on its distribution throughout the year. The intensity, duration, and areal extent of individual rainstorms are factors of great importance to be considered in connection with floods. The various aspects of rainfall mentioned above are discussed briefly in this section of the report to show the amounts and pattern of rainfall that have occurred in the past and may be expected to recur in the future.

Rainfall records.—Records of rainfall in west-central Alabama are collected by the U. S. Weather Bureau or by other agencies in cooperation with the Weather Bureau. The longest continuous records in or near the area are for Tuscaloosa (from 1881), Greensboro (1885), Birmingham (1882), Demopolis (1887), and St. Bernard (1907). Rainfall stations in the area having 5 or more years of record are listed in table 3, and the locations of stations in current operation (January 1957) are shown by figure 3.

Rainfall records for west-central Alabama are included in the Alabama section of the U. S. Weather Bureau publication **Climatological Data,** which is published both by months and as an annual summary. Compilations of monthly rainfall and other weather data are contained in **Climatic Summary of the United States, Section 100, Northern and Western Alabama** published by the Weather Bureau for the period ending in 1931, with a later supplement extending the compilations through 1952. In addition, station climatological summaries for the period of record have been published for Birmingham (1956), Greensboro (1951),

TABLE 3.—RAINFALL STATIONS IN WEST-CENTRAL ALABAMA HAVING 5 OR MORE YEARS OF RECORD

County and station	Agency	Elevation above sea level (feet)	Period of record
Blount County			
Oneonta, b	USWB	857	1937-
Cullman County			
Garden City, a	USWB	500	1937-
St. Bernard, b	USWB	802	1907-
Fayette County			
Berry, a	USWB	452	1940-
Fayette, b	USWB	350	c1884-93
			c1922-37
			1937-
Winfield 2 SW	USWB	468	1937-
Greene County			
Eutaw (Lock 7), a	USWB	114	1938-
Hale County			
Greensboro, b	USWB	220	c1855-1884
			1885-
Newbern	USWB	—	1893-1915
Jefferson County			
Birmingham (city), b	USWB	694	1882-86
			1893-94
			1895-1945
Birmingham (airport), a, b	USWB	610	1937-
Magella	APC	654	1916-
Palmerdale 2 W	USWB	798	1948-
Sayre	USWB	304	1937-
Trafford, a	USWB	470	1941-
Lamar County			
Vernon, a	USWB	180	1940-
Marion County			
Bexar 2 SE, a	USWB	529	1945-
Hamilton	USWB	498	1938-

TABLE 3.—RAINFALL STATIONS IN WEST-CENTRAL ALABAMA HAVING 5 OR MORE YEARS OF RECORD—(Continued)

County and station	Agency	Elevation above sea level (feet)	Period of record
Pickens County			
Aliceville	USWB	160	1940-
Dancy	USWB	207	1927-
Pickensville	USWB	163	1940-
Reform	USWB	230	1938-
Sumter County			
Gainesville	USWB	130	1937-
Livingston, b	USWB	160	1936-
Tuscaloosa County			
Elrod	USWB	252	1940-
Lock 17	USWB	280	1938-
Samantha	C of E	—	1937-44
Tuscaloosa Lock & Dam	USWB	152	c1854-80, 1881-
Tuscaloosa (airport), b	USWB	170	1941-
University, a, b	U of A	225	1939-
Vance	USWB	485	1940-
Walker County			
Carbon Hill	USWB	430	1938-
Cordova, b	USWB	334	1932-
Gorgas	APC	300	1917-
Jasper	USWB	350	1890-1900, 1955-
Parrish	USWB	—	1938-44
Winston County			
Addison, a	USWB	795	1941-
Arley	USWB	500	1937-
Falls City Black Pond Tower	USFS	650	1938-
Haleyville, a, b	USWB	910	1936-

a Station now equipped with recording rain gage.
b Temperature observed at this station.
c Records broken.

USWB U. S. Weather Bureau
USFS U. S. Forest Service
C of E Corps of Engineers
U of A University of Alabama

Stations for which the period of record is not shown as terminated were in operation in January 1957.

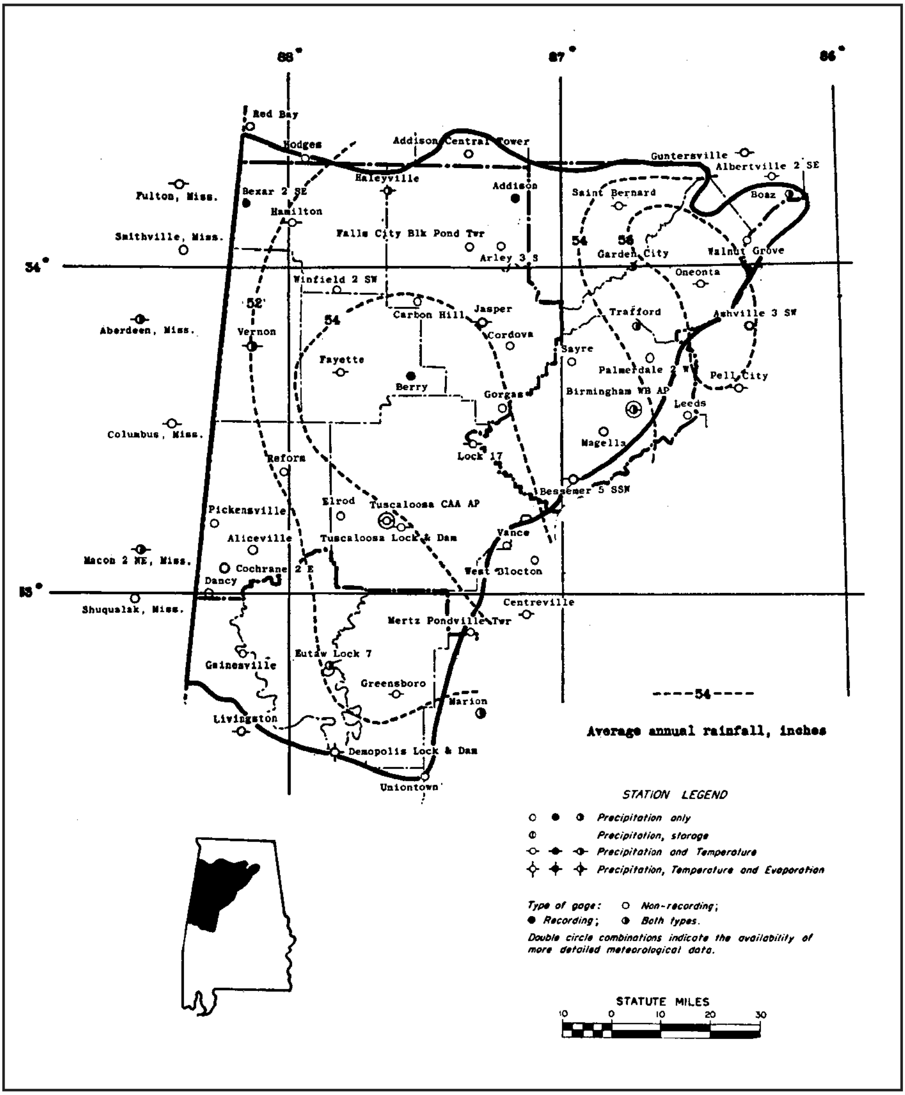

Figure 3.—Map of average annual rainfall in west-central Alabama, showing U. S. Weather Bureau stations.

and Tuscaloosa (1951). Because complete rainfall records for west-central Alabama are readily available from these published sources, no detailed rainfall tabulations are included in this report.

Variations in annual rainfall; areal and seasonal distribution.—Average yearly rainfall over west-central Alabama is about 53 inches as shown by table 4, which lists normal monthly and yearly rainfall at 14 Weather Bureau stations in the report area or adjacent to it. Isohyets of average yearly rainfall have been plotted on the map of figure 3. This plotting shows no conspicuous areal variation in yearly rainfall except in the extreme northeastern and most elevated part of the area (headwaters of Mulberry and Locusts Forks), where the mean yearly rainfall of 56 inches is noticeably above the area-wide mean. The increase in this section is due partly to a closer proximity to the general path of cyclonic disturbances passing farther north and partly to orographic influences.

Variation in annual rainfall from year to year can be illustrated by a study of rainfall records for a long-term station representative of the area, for example, Tuscaloosa Lock and Dam. Extremes of yearly rainfall at this station during the 78 years of record (1854, 1855; 1881-1956) ranged from 81.34 inches in 1929 to 32.87 inches in 1954. Average deviation from the mean yearly rainfall (52.23 inches) for this period was 7.00 inches, or about 13 percent of the mean.

On the average, the distribution of rainfall throughout the year is fairly uniform with 28 percent falling in spring (March, April, and May), 25 percent in summer, 17 percent in fall, and

TABLE 4.—*NORMAL MONTHLY AND YEARLY RAINFALL, IN INCHES, AT SELECTED WEATHER BUREAU STATIONS IN OR NEAR WEST-CENTRAL ALABAMA

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Albertville 1S, Ala.	5.15	4.88	6.29	4.66	4.21	4.24	5.01	4.41	3.17	3.27	3.72	5.36	54.37
Birmingham, Ala.	5.52	5.06	5.70	4.81	3.95	4.46	5.17	4.26	3.38	2.42	3.31	5.14	53.18
Columbus, Miss.	4.79	4.90	6.16	4.65	4.69	3.83	4.51	4.11	2.87	3.11	3.93	6.33	53.88
Cordova, Ala.	5.19	5.09	5.70	4.84	3.98	4.12	5.55	4.33	2.59	3.07	3.41	5.57	53.44
Demopolis Lock 4, Ala.	4.95	5.37	5.64	4.65	3.99	3.90	4.95	3.93	3.04	2.48	2.93	5.50	51.33
Fayette, Ala.	5.20	5.49	6.18	5.00	4.28	4.48	5.65	4.24	2.99	2.69	3.75	4.97	54.92
Greensboro, Ala.	4.95	5.13	5.67	4.67	4.44	3.67	5.27	4.39	3.08	2.64	3.14	5.61	52.66
Hamilton, Ala.	6.34	6.08	6.98	3.39	3.20	4.07	5.32	4.32	2.67	1.49	4.03	4.13	52.02
Livingston, Ala.	4.53	4.66	5.24	4.50	3.64	4.40	5.45	3.62	2.42	2.33	2.99	5.41	49.19
Macon, Miss.	4.88	4.84	5.66	5.16	4.96	3.85	4.30	3.60	3.11	2.94	3.62	5.66	52.58
Oneonta, Ala.	5.26	5.40	6.01	5.02	4.44	4.39	6.41	5.34	2.97	3.04	3.01	5.62	56.91
St. Bernard, Ala.	5.51	4.92	5.97	4.84	4.49	4.27	5.32	4.66	2.79	3.74	3.72	5.53	55.76
Tuscaloosa, Ala.	5.07	5.03	5.90	4.90	4.14	4.07	5.49	4.28	2.83	2.90	3.58	5.79	53.98
Uniontown, Ala.	4.93	5.17	5.24	4.26	3.54	3.53	5.27	4.19	2.78	2.36	2.92	5.23	49.42
Average, inches	5.16	5.14	5.88	4.67	4.14	4.09	5.26	4.27	2.91	2.75	3.43	5.42	53.12
Percent of yearly average	9.7	9.7	11.1	8.8	7.8	7.7	9.9	8.0	5.5	5.2	6.4	10.2	100.0

* Normals established by U. S. Weather Bureau based on period 1921-50.

30 percent in winter. On the average, March, with 5.9 inches of rainfall, and July with 5.3 inches, are the wettest months; October, with 2.8 inches, is the driest. March rainfall is usually the result of warm air over-riding colder air in advance of low-pressure systems, while July rainfall is more of a diurnal nature, chiefly in the form of isolated air mass thunderstorms.

Intensity and frequency of rainfall.—The relationships among intensity, duration, and frequency of rainfall are often important considerations in problems of drainage and flood-control engineering. For large watersheds of perhaps several thousand square miles, the depth-area relationship of a particular storm may be the dominant flood-producing factor. As the size of the watershed decreases, however, the time pattern or chronologic arrangement of rainfall intensities within the storm becomes increasingly important. Rain seldom falls at a uniform rate throughout a storm. Peak intensities may occur early, as in convective-type storms (thunderstorms), or in the later stages, as in storms of the frontal type. For watersheds of only a few square miles, the highest rates of runoff are produced by rainfall of high intensity and short duration, particularly when such rainfall occurs during the later phases of the storm. As there are few systematic records of streamflow for these small basins, peak rates of runoff for design purposes sometimes must be appraised on the basis of rainfall-runoff relationship or by other hydrologic tools, which produce approximate results.

Table 5 shows maximum depths of rainfall observed at Birmingham for selected durations from 5 minutes to 24 hours for each month of the year during the period 1903-48. The maximum rainfall for each duration listed occurred in July, August, or September, indicating that the thunderstorms of the summer and fall bring more intense rainfall than the more general and prolonged rains of the winter and spring.

Table 6 shows an estimated depth-frequency relationship for rainfalls of selected duration in west-central Alabama. Except for the last column, the figures in this table are for Birmingham, Alabama, and were taken from curves published by the U. S. Weather Bureau (1955). As an interesting comparison with an individual station in the area, the last column (figures in parenthese) shows 24-hour rainfalls estimated from 58 years of record 1894-1951, for Tuscaloosa Lock and Dam.

TABLE 5.—MAXIMUM RAINFALL, IN INCHES, FOR SELECTED DURATIONS, BIRMINGHAM, ALA.

Duration	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
5 min.	0.45	0.48	0.51	0.56	0.59	0.56	0.57	0.69	0.67	0.52	0.55	0.50	0.69
10 min.	.67	.63	.80	.96	1.04	1.00	1.09	1.04	1.18	.76	.80	.74	1.18
15 min.	.79	.73	1.13	1.04	1.24	1.19	1.49	1.34	1.60	.89	.84	.89	1.60
30 min.	1.18	1.08	1.43	1.56	1.76	1.47	1.93	2.48	2.00	1.54	1.29	1.64	2.48
1 hr.	1.69	1.67	1.66	1.69	2.01	2.25	2.23	3.83	2.65	1.98	2.05	2.37	3.83
2 hrs.	2.04	2.29	2.12	1.95	2.35	3.09	2.45	3.89	2.88	2.24	2.84	3.45	3.89
24 hrs.	4.26	5.60	4.72	5.66	4.29	4.11	8.84	4.15	7.59	5.60	5.02	7.76	8.84

Note: 24-hour rainfall from the record September 1895 to December 1948; others from September 1903 to December 1948.

Representative great storms of record.—Major flood-producing storms may occur in west-central Alabama during any month of the year, but are most prevalent from December through April. Storms during these months are usually associated with frontal movements accompanying the extratropical cyclones that pass over the United States with more or less regularity in a general eastwardly direction. Although most of these disturbances do not cause heavy rainfall, some of them may extend over the entire area and bring heavy rainfall lasting from 2 to 4 days. Typical of such storms were those of January 1949 and March 1951.

The storm of Jan. 3-5, 1949, induced by the movement of a low-pressure system northeastward from New Mexico and the Texas panhandle, brought heavy rains to west-central Alabama, especially over a strip extending northeastward from Demopolis and over most of the area north of the Black Warrior River. The greatest 3-day total was reported at Winfield (11.25 inches). Notable 24-hour rainfalls were reported at Oneonta (6.70 inches) and at Trafford (6.55 inches). The storm caused extensive flooding throughout the area and produced the highest stages known since

TABLE 6.—FREQUENCY OF INTENSE RAINFALL, WEST-CENTRAL ALABAMA

Recurrence interval (years)	Rainfall, inches			
	15 min.	1 hr.	8 hrs.	24 hrs.
10	1.3	2.5	4.2	6.2 (5.0)
25	1.5	2.9	5.0	7.4 (6.6)
50	1.6	3.2	5.7	8.3 (8.0)
100	1.8	3.5	6.4	9.4 (9.7)

24-hour figures in parentheses for Tuscaloosa Lock and Dam.

1892 on the Tombigbee River between Columbus, Mississippi, and Gainesville, Alabama. Record-high stages occurred also on Luxapalila Creek near Fayette and on the Locust Fork at Trafford and at Sayre.

The storm of March 27-30, 1951, was caused by a deep layer of warm, moist, unstable air from the Gulf of Mexico over-running continental polar air extending in a front from Texas to the Great Lakes. During the 4 days of the storm practically the entire northwestern half of Alabama was deluged with 7 or more inches of rain, most of which fell in one day (the 28th). The greatest storm total in west-central Alabama (and in the State) was reported at Greensboro (10.01 inches). The heaviest 24-hour rainfalls were reported at Eutaw (8.20 inches), Greensboro (7.30 inches), and Trafford (6.22 inches). Severe flooding accompanied the storm, with record-breaking floods on Sipsey, Noxubee, and North Rivers. At Tuscaloosa the Black Warrior River reached the second highest stage since 1900.

Tropical cyclones or West Indian hurricanes, which are fairly common in the southern and eastern parts of the State during the fall, rarely penetrate into west-central Alabama. Occasionally, however, these storms move into the area; although shorn of their devastating winds by the long overland journey, they may still bring torrential rains. The storm of July 5-10, 1916, resulted from a tropical hurricane that formed in the Caribbean and moved northward and eastward, crossing Alabama on July 8-10. Practically the entire State received 9 or more inches of rain. Highest storm totals in west-central Alabama were reported at Birmingham (14.53 inches) and at Cordova (14.40 inches), although other Alabama stations outside the area reported even higher totals (Robertsdale, 22.6 inches; Clanton, 18.6 inches). This storm caused the highest known flood on North River near Samantha and the highest stage on the Black Warrior River at Tuscaloosa since 1900.

The few individual storms described here are mentioned merely as representative of the many severe storms known to have occurred in west-central Alabama. Rainfall data for other great storms in the area are available in publications of the U. S. Weather Bureau and from studies of storm rainfall made by other agencies (Corps of Engineers, 1945; Miami Conservancy District, 1936).

Evapotranspiration

In the preceding section, rainfall was described as the basic source of water supply in west-central Alabama. While this statement is true, not all of the rainfall is directly available to streamflow and to surface-water supplies; inevitably, a large part of it is consumed by evaporation and transpiration, and part of it is temporarily stored as ground water. Thus, streamflow is the residual of rainfall after deducting evapotranspiration losses.

Evapotranspiration is a term used to denote the total water emoved from a given land area during any specified period of time by evaporation from water surfaces, moist soil, and plant surfaces; and by transpiration from and the growth of vegetation. Evapotranspiration is frequently referred to as "consumptive use"—a term originated in the West to describe water completely consumed in irrigation.

The principal climatic factors affecting evapotranspiration are precipitation, which provides the water, and temperature, which provides the energy, for the process. The effects of temperature are further modified by humidity and wind.

Because of the complex relationships among the many factors that affect it, evapotranspiration has resisted accurate measurement, and is consequently less well known than most hydrologic parameters. No accurate method of measuring total evaporation from a large natural land area has been devised.

The basic relationship between evapotranspiration and other hydrologic parameters for a given drainage basin and a given time interval can be expressed in the form of a simplified hydrologic inventory by the equation:

$$E = P - R \pm dS$$

Here E, P, R, and dS are respectively, evapotranspiration, precipitation, net runoff, and change in surface- and ground-water storage. For convenience, these quantities can be taken as average annual values in inches, in which case the time interval is one year.

The terms P and R of this equation are more or less susceptible of direct measurement. The change in total basin storage, dS, is not directly measurable and for short periods is often too large to ignore. If the basin considered were impervious and watertight except for surface streams, it would be possible to eliminate dS by choosing a period at the beginning and end of which the total water content of the basin was the same.[1] Natural watersheds, of course, are not impervious, so dS can never be entirely disregarded, but over a period of several years the average yearly value of dS becomes smaller in comparison with P and R, thus making possible an approximate solution of the inventory equation for the average yearly value of E.

[1] An effort in this direction is the use of the so-called water year (October 1 to September 30) which begins and ends at a time when total basin-water content is normally low

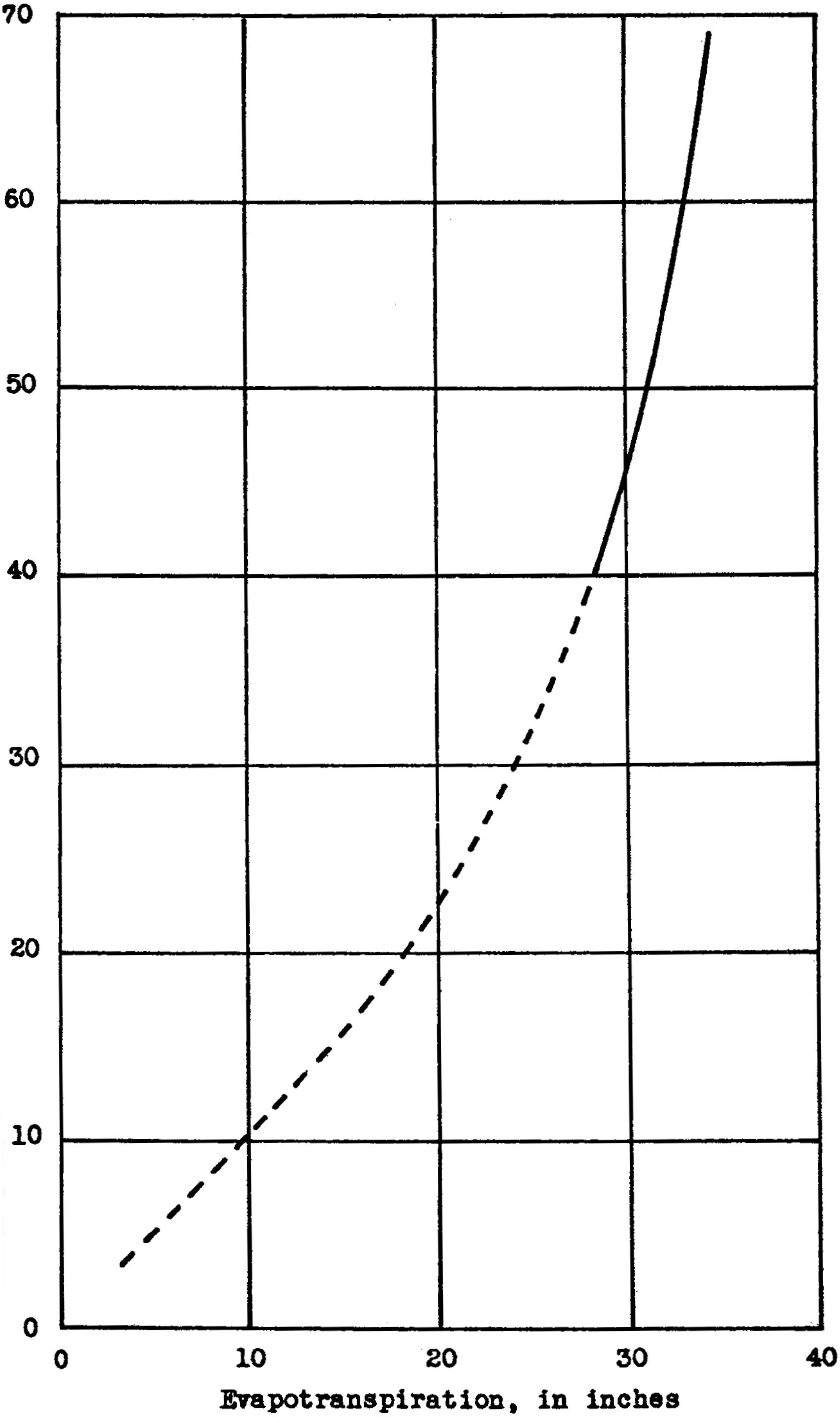

Figure 4.—Average variation of annual evapotranspiration with rainfall in west-central Alabama.

In west-central Alabama, average yearly evapotranspiration amounts to about 32 inches, or 60 percent of the average yearly rainfall. The average relationship between annual evapotranspiration and rainfall in the area, based on data for 9 watersheds over a period of 11 years, is shown by figure 4.

Evaporation from free water surfaces.—Of the several components of total evaporation, that from free water surfaces is most susceptible of direct measurement. The difficulty in making direct measurements of evaporation from large water surfaces has led to the use of small water surfaces in tanks or pans such as those used by the U. S. Weather Bureau, the theory being that evaporation from the pan can be directly related to that from an adjacent large water area. Recent studies (Kohler, 1952) have shown that annual lake or reservoir evaporation at Lake Hefner in Oklahoma can be estimated within 10 to 15 percent (on the average) by applying an annual coefficient to pan evaporation, provided lake depth and climatic regime are taken into account in selecting the coefficient. The effects of these factors on the pan coefficient are difficult to evaluate, however, and for periods shorter than a year, or for some other place, the coefficient may vary considerably. Despite these uncertainties, pan records continue to be used in the absence of better data.

The U. S. Weather Bureau made observations of evaporation loss at Demopolis, in the report area, from 1951 to 1953 and resumed them in August 1956. Evaporation records at Lake Martin, continuous since March 1951, should also be applicable to west-central Alabama. The records for these stations are summarized in table 7. Evaporation losses were measured in a Weather Bureau Class-A land pan and are greater than corresponding losses from a lake or reservoir. A coefficient of 0.7 is generally used for reducing annual evaporation from this type pan to annual evaporation from larger bodies of water. On a monthly basis, however, the use of this coefficient may lead to large errors; for example, at Lake Hefner monthly coefficients varied from 0.13 to 1.32.

Temperature

The temperature regime plays an important part in determining the water resources of a region because of the control it exercises over evapotranspiration losses. In a humid region such as west-central Alabama, the amount of these losses is related

TABLE 7.—AVERAGE EVAPORATION, IN INCHES, FROM U. S. WEATHER BUREAU CLASS-A LAND PANS

Month	Demopolis, Ala. 1951-53; 1956	Lake Martin, Ala. 1951-56
January	2.57	1.82
February	2.99	2.27
March	4.09	4.41
April	5.12	5.52
May	5.88	6.90
June	6.29	7.07
July	6.18	7.09
August	6.38	6.97
September	5.24	5.76
October	3.87	4.50
November	2.78	2.64
December	2.36	2.07
Year	53.75	57.02

directly to temperature; the higher the temperature, the greater the loss.

The relationship between mean annual temperature and evapotranspiration as developed by Langbein (1949) from data for the eastern United States is shown in figure 5. The plotted point in this figure represents the average evapotranspiration loss and mean annual temperature for the upper basin of the Black Warrior River. Its small departure from the curve would seem to indicate that the general relationship of figure 5 is also fairly well representative of conditions in west-central Alabama.

Mean annual temperature in west-central Alabama is about 63°F, ranging from 61°F in the northern part of the area to 64°F in the southern part. The annual mean temperature at any particular place rarely varies by more than 5 degrees from year to year.

The average temperature for July, the warmest month, is 80°F; for January, the coldest month, 45°F. Extremes of temperature recorded in the area are 108°F and —17°F. Severely cold weather is infrequent, and freezing temperatures usually do not continue more than 48 hours, even in the northern part of the area. The frost-free season ranges from 200 days in the northern part to 240 days in the southern.

Weather stations in west-central Alabama for which temperature records are available are indicated in table 3. Tempera-

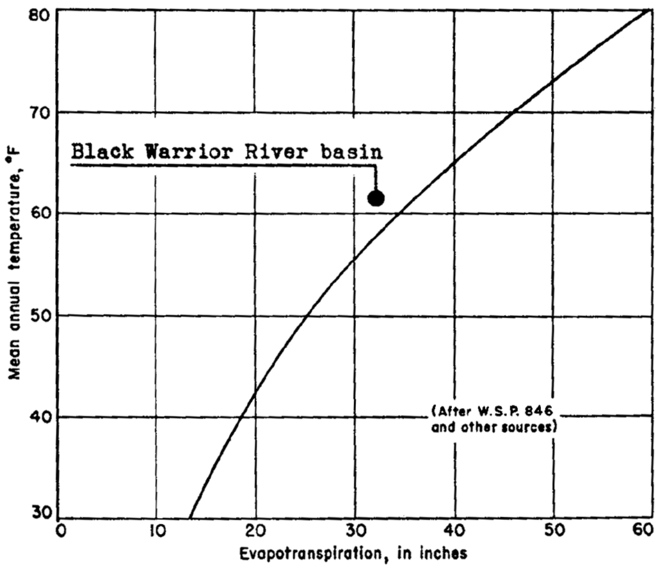

Figure 5.—Average variation of annual evapotranspiration with mean annual temperature in eastern United States.

ture data for selected stations representative of the area are given in table 8.

Water temperature.—For some industrial uses, the temperature of the water supply is of considerable importance. Water flowing in streams, continually mixed by the turbulence of flow, tends to assume the temperature of the air to which it is exposed, but, because of the great specific heat of water, the response to changes in air temperature is slow. There is thus little daily change in the temperature of flowing streams; throughout the year stream temperature lags behind the average air temperature by an amount depending largely upon the rapidity and extent of seasonal changes in air temperature.

No continuous records of daily stream temperatures for west-central Alabama are available. The nearest source of such data is Selma, where a continuous record of the temperature of the Alabama River has been obtained since October 1955. During this short period, the monthly mean river temperature lagged the monthly mean air temperature from 1 to 5 degrees except during the summer, when the monthly mean and water temperatures were essentially the same.

During the period 1944-47, water temperatures of many streams in west-central Alabama were observed at the time discharge measurements were made (about every 6 weeks) by the Geological Survey. In general, these observed water temperatures follow closely the mean air temperature for the 10 days preceding the observation.

TABLE 8. — TEMPERATURE DATA FOR SELECTED STATIONS IN WEST-CENTRAL ALABAMA

Station	Length of Record (years)	Extremes (degrees) Max.	Min.	Average (degrees F) Jan.	July	Year
Birmingham	42	108	—10	46.7	80.2	63.8
Cordova	31	108	—14	46.2	79.8	62.6
Fayette	23	110	0	44.6	80.4	62.4
Greensboro	72	107	— 5	47.3	80.7	64.6
Haleyville	16	105	— 3	44.6	78.6	61.7
Livingston	50	106	— 7	46.4	81.1	64.0
Oneonta	39	109	—15	43.5	77.6	60.9
St. Bernard	44	110	—17	43.3	78.4	60.9
Tuscaloosa	60	108	— 7	45.2	81.3	63.8

These observations and the temperature record for the Alabama River at Selma are not included in this report, but are available at the district office of the U. S. Geological Survey at Montgomery.

Humidity and wind.—The human body, which is cooled by the evaporation of perspiration, is a sensitive indicator of evaporation rate. The discomforts of a still, sultry day and the refreshing effect of a breeze or of conditioned air, so familiar to everyone, are bodily sensations that plainly demonstrate the roles of humidity and wind in the process of evaporation.

The relative humidity of the air is a measure of the extent to which it can hold additional water: the higher the humidity, the less additional water vapor the air can contain, a relative humidity of 100 percent corresponding to a condition of complete saturation. Humidity follows daily and seasonal cycles, generally being lowest when temperature is highest, and vice versa.

At Tuscaloosa, the average daily range in relative humidity is from 85 percent around sunrise to 55 percent in the afternoon. Seasonal averages are: spring, 67 percent; summer, 76 percent; fall and winter, 74 percent; and for the year, 72 percent.

Wind or air movement speeds evaporation by replacing moisture-laden air in contact with water or moist surfaces with air having a lower water content. High winds, except for their local effects, are not of much hydrologic importance because of their short duration. More significant are the long-time mean values of air movement or prevailing winds, for these reflects the general drift of large weather-forming air masses. The direction of prevailing winds in west-central Alabama varies with the season and to some extent with the locality, but is generally from the north during winter and from the south during summer. Average wind velocity throughout the year is about 7 miles per hour.

The highest wind velocity (fastest mile) recorded in west-central Alabama by the U. S. Weather Bureau is 65 miles per hour at Birmingham. Higher winds accompany tornadoes, which are not uncommon in the area, but these tornadic winds have never been measured. Except for tornadoes, however, winds exceeding 45 miles per hour seldom occur.

Land Characteristics

The physical characteristics of the land surface and the underlying rocks influence the surface-water resources of a region. They determine how water from precipitation that is not immediately evaporated is divided between (1) water absorbed by the ground (infiltration) and (2) water remaining on the surface (runoff). In some watersheds the soil mantle and underlying rocks have a large capacity for accepting and storing precipitation as ground water which is released to the streams at a relatively steady rate. Streamflow from these watersheds may be well sustained during fair-weather periods or even during prolonged drought periods. On the other hand, watersheds having a shallow soil mantle over relatively impermeable rocks will have sharply concentrated flood peaks followed by low or even no flow during dry periods.

The slope of the land surface also is an important factor in determining the proportions of infiltration and runoff. On gentle slopes water may remain on the surface until the ground can absorb it, while on steeper slopes runoff may be so quick that there is little opportunity for infiltration.

Thus, runoff is everywhere influenced by soil development, topography, and geology.

Topography and General Geology

The general topography of west-central Alabama is shown by Plate 1. More detailed topography, including relief, is shown on topographic maps available from the U. S. Geological Survey for about 40 percent of the report area.[1] Aerial photographs of the area are available from the U. S. Departmentment of Agriculture; when viewed under the stereoscope these photographs reveal a wealth of three-dimensional detail.

West-central Alabama has two principal physiographic divisions whose common boundary is the Fall Line, which extends generally northward and eastward from Tuscaloosa. The area east of the Fall Line (except for a narrow strip along its southeastern boundary) is the southernmost part of the Cumberland Plateau, which extends northeastward to southern Kentucky, and is a section of the larger Appalachian Plateau province (Fenneman, 1938, p. 284). The area south and west of the Fall Line is a part of the East Gulf Coastal Plain, a section of the Coastal Plain province, which, with the Continental Shelf, constitutes another major physiographic division of the United States —the Atlantic Plain.

The major physiographic divisions of west-central Alabama recognized by Fenneman and by Johnston (1930, p. 10) are shown on the map of figure 6, and are described briefly in the following paragraphs.

Cumberland Plateau.—The Cumberland Plateau section of west-central Alabama is represented by the Warrior Basin, Sand Mountain, Blount Mountain, Murphree Valley, and the southern extremity of Sequatchie Valley. The Warrior Basin district was originally a peneplain that was later pushed up to form a vast

[1] Index maps showing the extent of coverage of Alabama by both topographic and geologic maps are available from the U. S. Geological Survey.

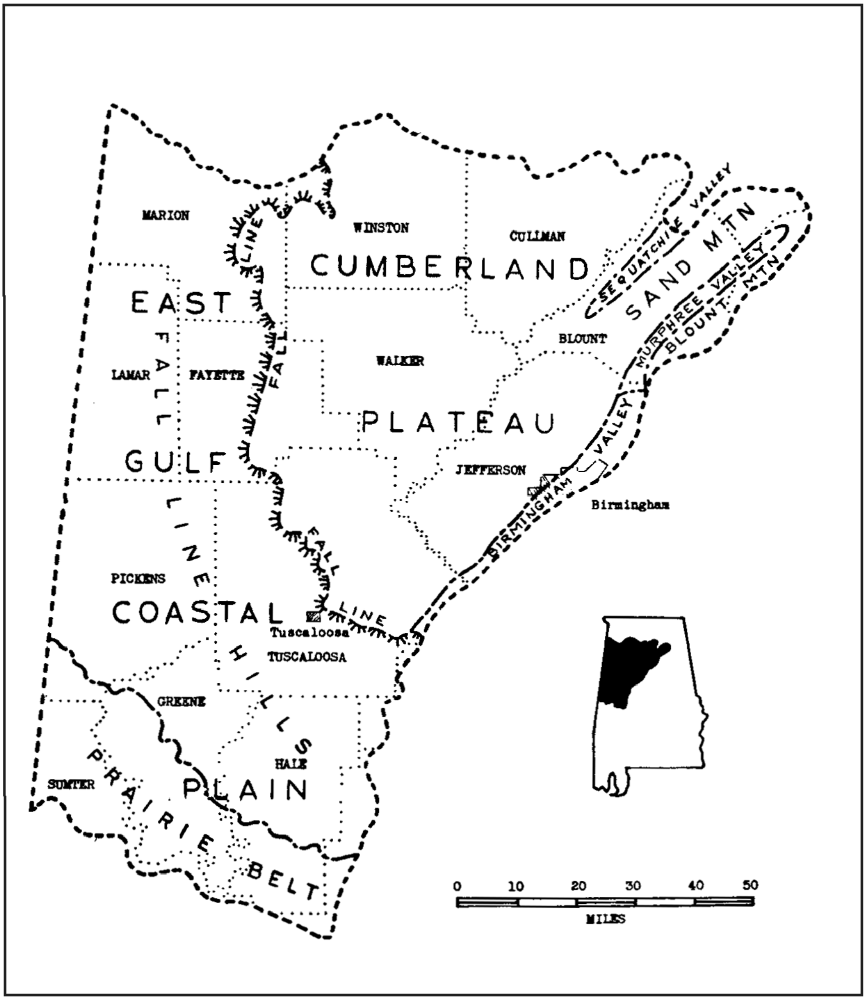

Figure 6.—Physiographic divisions of west-central Alabama.

tableland. The original surface of this tableland was comparatively smooth but sloped southward about 10 feet to the mile, from altitudes of 1,500 to 2,000 along its northern boundary to 500 feet at the inner margin of the Coastal Plain (Fall Line). Subsequent erosion has so roughened the original plateau surface that only a few flat-topped remnants of it remain in the northern part. The streams of the area flow through steep-sided valleys many of which, in the southern part, are gorgelike. The Black Warrior River where it leaves the plateau section near Tuscaloosa, flows between sandstone cliffs more than 100 feet in height.

The plateau surface was developed largely on massive Pennsylvanian sandstones and shales (Pottsville formation). The region escaped violent upheaval and most of the rocks still lie nearly horizontal. In a few places, however, sandstones and shales were compressed and lifted into arches (anticlines) and here erosion was much speeded. Eventually the protective arch of thick sandstone was weathered away, exposing the limestones and dolomites underneath. In these more soluble rocks erosion was much faster and there developed long, narrow valleys following the axis of the folds. Sequatchie Valley and Murphree Valley are of this type (anticlinal valleys).

Murphree Valley extends about 40 miles southwestward from Etowah County, through Blount, and into Jefferson County, with an average width between 2½ and 3 miles. South of Oneonta, interior ridges divide the valley into three parts, and north of Oneonta, into two; all are drained by tributary streams of the Black Warrior River.

Sequatchie Valley, a distinctive topographic feature in northern Alabama and Tennessee, is not a prominent feature in west-central Alabama where it is known locally as Browns or Bluntsville Valley. The divide between the Tennessee and Warrior River basins, which forms the boundary of the report area, also marks the head of the actual valley, but geologic maps extend the boundaries of Sequatchie Valley southwestward until the older rocks of the valley floor disappear under the younger Pottsville formation near Blount Springs. At the southern end, uplift of the original anticline was not great enough to make undercutting of the underlying rocks an effective process, and the "valley" here is, in fact, higher than the adjoining Warrior Basin.

Blount Mountain, whose eastern escarpment marks the boundary of the report area, is a detached remnant of the old plateau rising 150 to 600 feet above the valleys to the east and west. At its northern end, where it merges with Sand Mountain, the summits of Blount Mountain reach an altitude of 1,400 feet; at its southern end, about 1,250 feet. The old plateau surface has been considerably dissected by erosion, but in general it is saucer-shaped, with higher altitudes along its margin and an interior drainage by Locust and Blackburn Forks. The valleys of these streams in their upper courses have gently sloped sides, but become steep-sided and gorgelike where the streams leave the mountain.

Birmingham Valley (that part of the Birmingham-Big Canoe Valley drained by the Black Warrior River) is included in the report area. Although Birmingham Valley is not a part of the Cumberland Plateau, for convenience it is here described under that heading. Rather, it is the westernmost district of the Valley and Ridge province of the Appalachian Highlands. Described by Johnston (1930, p. 7) as a faulted anticlinal valley of moderate relief, Birmingham Valley lies between the Plateau section to the west and Shades Mountain (and its northward continuation, Blackjack Ridge) to the east. Within the valley thus defined lie three subordinate valley separated by prominent ridges. These valleys are, from west to east: Opossum Valley, 1 mile wide; Jones Valley, 1 to 2 miles wide; and Shades Valley, ½ to 1 mile wide. Opossum and Jones Valleys, separated by a chert ridge extending from Blount Mountain to Birmingham, are developed in Cambrian and Ordovician limestones and dolomites. Between Jones and Shades Valleys, Red Mountain rises 400 feet above the valley floors, reaching an altitude of about 1,100 feet. This ridge is formed by the Red Mountain formation of Silurian age (sandstones, shales, and hematite beds) and its capping of chert. The boundary of the report area follows the crest of Red Mountain. Shades Valley, to the east, is drained by the Cahaba River and is not included in the area covered by this report.

Coastal Plain.—The inner margin of the East Gulf Coastal Plain is commonly called the Fall Line and is so indicated in figure 6, but this term is borrowed from another part of the coastal plain (the Embayed Section) where the Fall Line marks a sharp contrast in landscapes. In west-central Alabama, the term loses much of its appropriateness. Except for the Black

Warrior River, few of the streams in the area display any marked change in character where they cross the Fall Line. As a matter of fact, north of Tuscaloosa the Fall Line corresponds generally with the basin divide between the Tombigbee and Black Warrior Rivers, and no large streams cross it. In this section, the Fall Line as shown in figure 6 is much generalized and is more accurately described as a ragged transition belt about 15 miles wide in which there is a commingling of plateau and coastal plain formations and topography.

Extending about 40 miles west and south of the Fall Line and including the hilly transition zone is a belt of moderate relief termed the Fall Line Hills by Fenneman (op. cit.) but sometimes referred to as the Central Pine Belt (Harper, 1913). This region is underlain by Cretaceous sands, clays, and gravels (Tuscaloosa group and Eutaw formation) which, though poorly consolidated, are capable of supporting steep slopes. Thus, the topography is often fairly rugged, especially near the streams. Altitudes reach 500 to 600 feet in the northern part of this belt, but decline southward toward the Prairie Belt.

The Prairie Belt section of west-central Alabama is only a part of the great prairie of over 4,000 square miles extending in a broad crescent through central Alabama and into Mississippi. It is an undulating plain of low relief reaching altitudes of about 200 feet in the interstream areas. The underlying rock is the Selma group, a soft Cretaceous limestone with variable amounts of sand and clay impurities. The weathered chalk and decayed vegetable matter produce a rich black soil (the prairie section is often called the "black belt"), but as it washes easily from slopes, much of this rich soil has been lost through erosion.

Soils and Land Use

The soil plays an important part in the hydrologic cycle. It has been likened in effect to a thin, flat sponge spread over the rocky surface of the land. It absorbs precipitation and, like a sponge, will not allow water to gravitate through it until it is saturated. Moreover, soil is one of the few hydrologic factors that man can manipulate to some extent. For this reason it has been intensively studied to determine the best methods of treatment for obtaining specific results.

Probably the earliest detailed description of the soils of west-central Alabama is contained in Dr. Eugene A. Smith's report of 1883.[1] Since that time the soils of the area have received close attention, and reports of recent soil surveys of the individual counties are now available from the Alabama Department of Agriculture and Industries.

Because of the close relationship between a soil and the parent rock from which the soil is derived, the major soil provinces in west-central Alabama correspond closely with the physiographic regions outlined in figure 6.

The soils of the Cumberland Plateau section are residual in origin, having been formed by the weathering of the underlying shales and sandstones. In the more elevated section in Cullman County and in Blount County (Sand Mountain), where the old plateau surface is less dissected, soils are derived mostly from sandstones and are typically light yellowish sandy loams with gray sandy clay subsoils. These soils are generally deficient in organic matter and wash easily where terracing or other protective measures are not used. On the other hand, they respond well to fertilizers, are easy to till, and when properly cultivated are well suited for cotton, corn, fruit, and truck crops. In the southern part of the plateau section (Coal Measures) where the topography is much more rough and broken, soils are derived mostly from shales and are predominanlty gray to brown silt loams with dense clay subsoils. Although these soils are naturally richer than those farther north, most of this area is too hilly and rough to be used for anything but woodland. Throughout the area, however, are scattered small tillable patches of good sandy loams. In the anticlinal valleys, bottomland soils are mostly silt and clay loams, brown to red in color, which were derived from the limestones of the valley floors. These soils are well suited for most crops.

Soils of the Fall Line Hill section or Central Pine Belt are derived from unconsolidated beds of vari-colored clays, sand, and gravel that were deposited in the coastal waters of Cretaceous time. When these sediments were being deposited, they underwent considerable change through the sorting action of stream currents, waves, and tides; and since their elevation above

[1] "Report for the years 1881 and 1882, embracing an account of the agricultural features of the State," Geological Survey of Alabama, 1883; a remarkably complete geographical description of Alabama by natural regions and by counties.

sea level they have been further modified by erosion, oxidation, and the action of plant life. A wide variety of soils results from these conditions, but the predominant type is a gray fine sandy loam with yellowish to brown friable sandy clay subsoil. The rolling ridgetops of sandy loam are used for cropland; slopes tend to be gravelly, however, and are used mostly for timberland and rangeland. Along the Tombigbee and Black Warrior Rivers and other large streams are belts of alluvial soils derived from both old and recent deposits deposited by the streams during periods of overflow. In the lower bottoms, these alluvial soils are very rich, but cultivation is limited by frequent inundation. The higher bottoms, however, are easily tilled and well suited to all crops of the region.

Typical soils of the Prairie Belt section are stiff calcareous clays of grayish to yellowish color when uncultivated but of dark to nearly black color when mixed with vegetable matter in cultivation. They are sticky when wet and hard when dry. Natural surface drainage is good but internal drainage is poor, due to the impervious nature of the subsoil; thus rain runs off quickly and erosion is serious on slopes not protected by vegetation. More than 90 percent of these soils are tillable, and are natural grasslands. The Prairie Belt is now considered the center of livestock production in the State, although before the advent of the boll weevil (about 1914), the Prairie Belt was one of the main cotton-producing regions.

The principal land uses of west-central Alabama are shown on the generalized map in figure 7, which is based on information furnished by the Alabama Department of Agriculture and Industries. The coal-stripping area[1] includes not only areas of past and present strip-mining operations, but also areas where such operations may possibly be carried on in the future. The Warrior Coal Basin is part of a large geosyncline having a northeast-southwest trend and a pitch to the southwest. Several major anticlinal folds interrupt the general folding, bringing the coal seams near or to the surface along the general trend of the geosyncline. Stripmining along the coal outcrops is feasible in many places. With large modern power shovels, heavy shale and hard sandstone beds can be removed to reach the coal, and in some places stripping has been continued down-dip until depths of overburden of as much as 75 feet have been reached.

[1] Information on coal-stripping in the report area was furnished by Hugh D. Pallister, Consulting Geologist, Alabama Geological Survey.

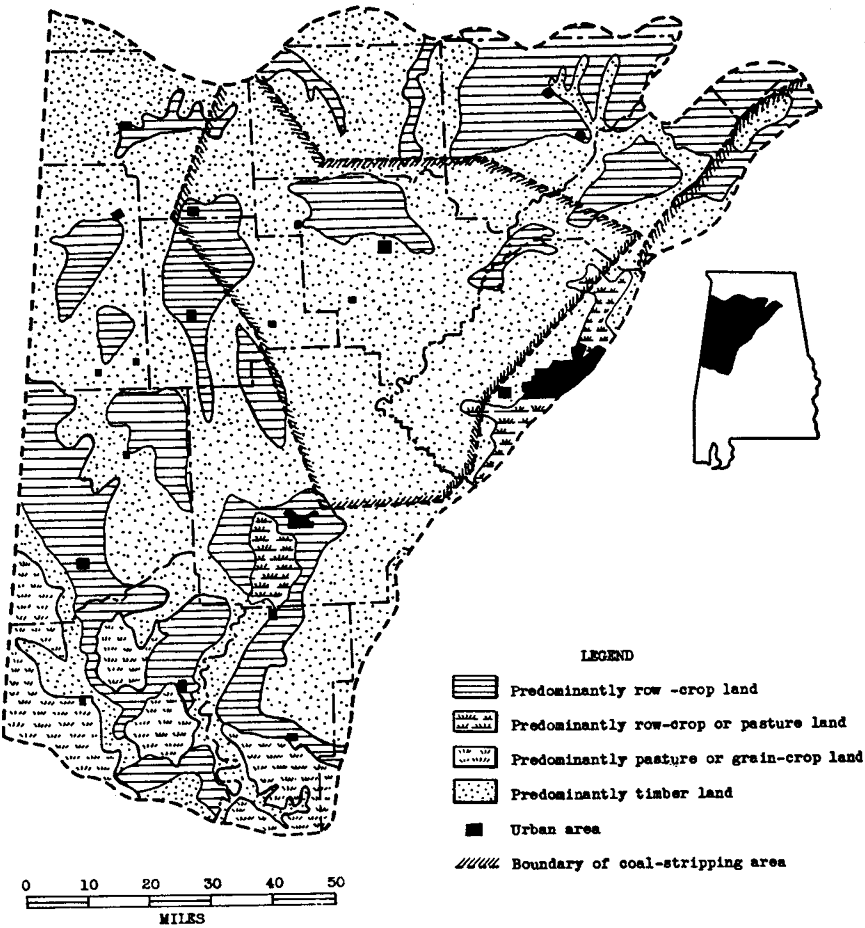

Figure 7.—Principal land uses in west-central Alabama.

STREAMFLOW RECORDS

Characteristics of Runoff

Streamflow consists of direct runoff that reaches the stream during and immediately following rainstorms, and subsurface runoff that represents effluent seepage of water stored in the ground. Streamflow and runoff are synonymous when the streamflow is unaffected by artificial diversions, storage, or other works of man in the stream channels.

Although runoff is a direct result of precipitation, it is not to be regarded as a percentage of precipitation but rather as a residual of precipitation after certain demands of nature for water have been satisfied. Because annual runoff is a remainder, it fluctuates to a greater extent, percentagewise, than precipitation. The amount of runoff produced by each storm is still more variable and reflects, for a given basin, numerous details of rainfall rates and volumes, temperature, soil moisture, ground-water storage, and amount and kind of vegetal cover. For the most part these details are so far beyond man's control and are so intricately related that he cannot predict them either individually or as a combined effect except on the basis of past experience. Fortunately, the flow of a stream, which at any time represents the integrated effect of all factors affecting runoff, can be measured fairly accurately. By measuring streamflow continuously over a long period of time, it is possible to arrive at a basis for making fairly reliable estimates of future streamflow.

In any geographic region the seasons of high and low runoff recur in a general pattern which can be predicted after the runoff has been studied for a reasonable period. The typical seasonal pattern of runoff in west-central Alabama is shown in figure 8 by the hydrograph of daily flow of Sipsey River near Pleasant Ridge for the water year 1953. Each phase of the yearly cycle is clearly shown: the characteristic low flow of October, the month of lightest average rainfall; the increase of flow in November and December as evapotranspiration demands are lowered and winter rains begin; the flood season of January to early May when heavy general rains fell on saturated soil; the steady recession of flow in May or June as the evapotranspiration demand reached its peak; the replenishment of soil moisture by local thunderstorms in July and August; and finally, the re-

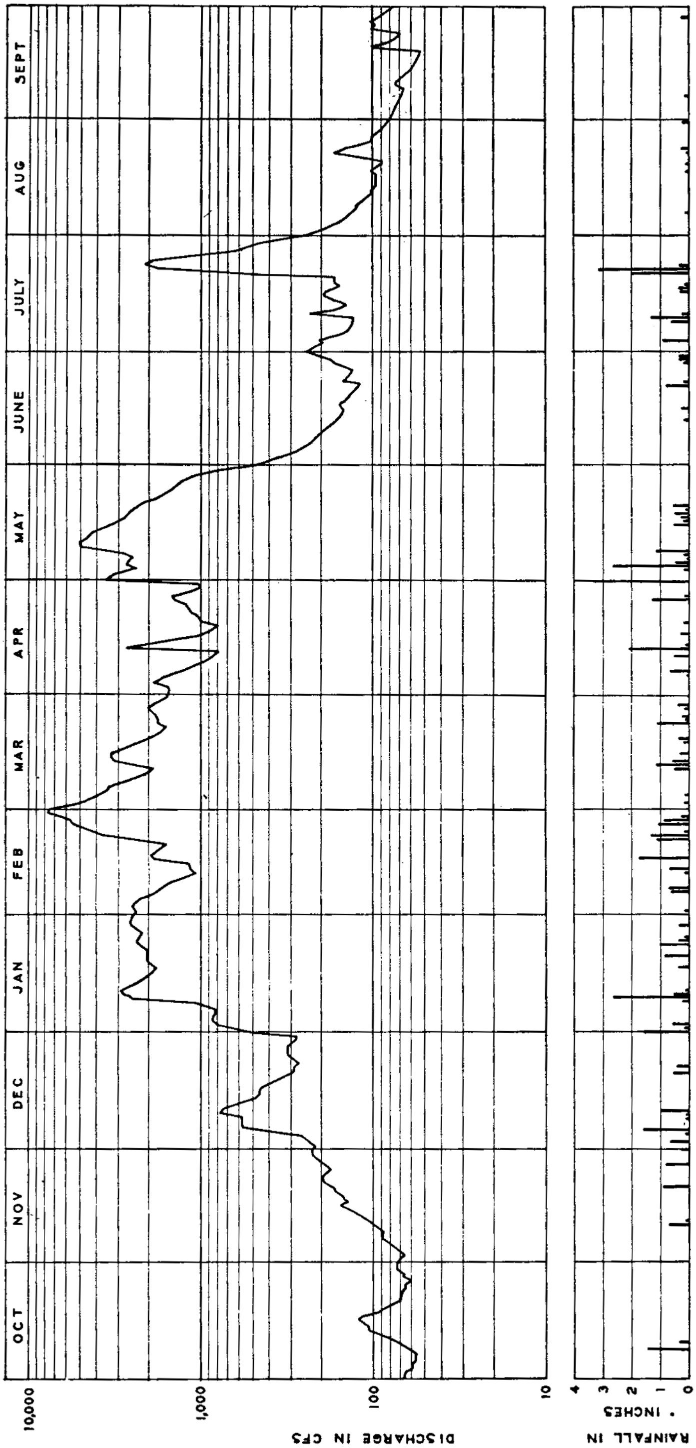

Figure 8.—Hydrograph of daily discharge of Sipsey River near Pleasant Ridge, Ala., with daily rainfall at Aliceville, for water year 1953.

turn to low flow in September as the period of lighter rainfall begins.

The hydrograph of figure 8 was selected because it illustrates fairly well all phases of the average pattern of runoff. The term "average" is used here to denote the general trend of the runoff pattern over many years; strictly speaking, it is not an altogether satisfactory term because it implies a composite pattern of runoff that is rarely encountered completely in any single year. Most individual years show minor variations from the average pattern in some phase or another, and occasionally there are marked variations, as in 1916 when a major flood occurred in July.

For any particular year the runoff patterns for nearly all streams in west-central Alabama will show a general resemblance in that major variations in flow will occur concurrently. For many streams, however, this resemblance is qualitative only. Although the discharges of two streams may vary at the same time and in the same direction, they may not vary by proportionate amounts. For example, table 9 compares for the same water year the maximum, minimum, and average discharges of two streams draining watersheds of practically equal areas in west-central Alabama.

TABLE 9.—COMPARISON OF DISCHARGES FOR TWO STREAMS OF WEST-CENTRAL ALABAMA, WATER YEAR 1953

Stream	Drainage area (sq. mile)	Discharge (cfs)			Ratio max/min
		Maximum	Minimum	Average	
Luxapalila Creek near Fayette, Station 4	127	5,060	37.0	191	137
Lost Creek near Oakman, Station 24	130	3,850	.4	190	9,625

On the basis of their average discharges, whch are nearly the same, these two streams might be expected to be alike in runoff charcateristics. However, the extremes of flow—particularly the minimum discharges—are greatly differently. This difference can be better appreciated if the range in flow of each stream is expressed as a ratio of maximum to minimum discharge, as has been done in the last column of the table. For one stream, this ratio is a little over 100; for the other stream, it is nearly 10,000. Thus, in variability of flow the two streams are obviously very different.

As stated previously, two types of factors are involved in the hydrologic cycle: those stemming from climate, and those related to the land. As the basins of these two streams were exposed to essentially the same climatologic conditions, their difference in runoff characteristics can be ascribed to the land factors. The streams are only 15 to 35 miles apart, but in a region of diversified geology and topography, striking differences in flow regimen are sometimes found in adjoining basins.

Stream Gaging

The runoff characteristics of a region can be determined only by gaging the flow of its streams. As it is not economically feasible to gage the flow of every stream at every site where discharge records are needed, stream gaging perforce becomes a sampling process. The foregoing explanation, although incomplete, serves to distinguish two basic aims of the sampling process. The first is to define the long-term characteristics of streamflow as reflected by variations in flow of a particular stream from one year to another (time sampling); the second is to define the areal characteristics of streamflow as reflected by the flow of different streams during any particular year (areal sampling).

Time sampling requires many years of uninterrupted stream gaging to provide information on long-term trends, the duration of flow, and the frequency expectance of floods and droughts. On the other hand, a few years of areal sampling are ordinarily adequate to define the characteristics of the individual streams, their pattern of rise and fall, and the relative amounts of direct storm runoff and sustained base flow.

In recent years much study has been devoted to obtaining the proper balance between the two types of sampling, and methods of correlating the results of both types have been devised which greatly enlarge on the information provided by either alone. These correlation methods have made possible the analyses of various important aspects of streamflow on a regional basis. For example, the magnitude and frequency of floods in Alabama are treated in a publication by the U. S. Geological Survey (Peirce, 1954) and a similar study of droughts is in progress.

Streamflow records are essential in the study and design of any development involving the use or control of surface water. They provide a sound basis for the study and design of any such development and reduce the investment risk to a minimum. Streamflow records are used in the investigation, design, or operation of public and industrial water supplies, water-power projects, navigation improvements, bridges and culverts, flood-control projects, and drainage projects. These records are used also by the courts in the settlement of disputes arising from the use, regulation, or control of water.

Definition of Terms

Stream-gaging terms as used in this report are defined as follows:

Cubic foot per second (cfs) is the discharge of a stream having a cross-sectional area of 1 square foot and an average velocity of 1 foot per second.[1]

Cubic feet per second per square mile (cfsm) 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. Cfsm is computed by dividing the discharge in cfs by the drainage area in square miles. It is a very useful unit for making comparisons of different streams because it eliminates the size factor by reducing, in effect, all drainage basins to the same size, i.e., 1 square mile.

Runoff in inches is the depth to which an area would be covered if all the water draining from it in a given period were uniformly distributed over its surface. The term is used to compare runoff with rainfall, which is also usually expressed in inches.

Gage height is the elevation of the water surface above the arbitrary datum or zero of the gage.

Stage-discharge relation is the relation between gage height and the rate (in cfs) at which water is flowing in a channel.

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[1] "One cubic foot per second of water, or 450 gallons per minute, will fill a gutter a foot wide and three inches deep flowing at the speed of an ordinary walk—three miles an hour. Two fire hoses will throw that amount; so will a 10-horsepower 4-inch centrifugal pump under a 40-foot head. That continuous amount will supply the average needs of a city of 5,000 people. It will supply two inches of irrigation water to 12 acres in 24 hours. It will supply the following industrial production:

Kraft paper—20 tons per day	Tanned leather—40 tons per day
Canned peaches—10.000 cases per day	Meat packing—[illegible] hogs per day
Explosives—3 tons per day	Steam power—3,000 kilowatts"

—From Information Circular 16, Georgia Department of Mines, Mining, and Geology.

Rating curve is the graphical representation of the stage-discharge relation in which the gage height (in feet) is usually plotted as the ordinate against the rate of discharge (in cfs) as abscissa.

Drainage area of a stream at a specified point is the area, measured in a horizontal plane, which is so enclosed by a topographic divide that direct surface runoff from precipitation normally would drain by gravity into the stream above the specified point.

Regulation is any variation in streamflow resulting from man-made works, including diversion. The term is used to denote variations which affect the average discharge for periods of a day or longer.

Diurnal fluctation is a periodic daily variation in streamflow, natural or artifical, whose effect on average discharge is ordinarily limited to periods shorter than 1 day.

Methods of Stream Gaging

The base data collected at gaging stations consist primarily of records of gage height and measurements of discharge. Records of gage height are obtained from water-stage recorders or from direct readings on non-recording gages such as staff or wire-weight gages. Measurements of discharge are usually made by means of a current meter, using methods and equipment developed by the U. S. Geological Survey through many years of experience.

For each gaging station, rating tables indicating the discharge at any gage height are prepared from rating curves based on the discharge measurements. Because the river bed at most gaging stations sometimes changes, the stage-discharge relation does not remain constant, and periodic discharge measurements are necessary in order to define the relation at all times. Daily discharge is obtained by applying gage heights to the rating tables.

Description of Data

The gaging stations for which streamflow records are compiled in this report are listed in downstream order in table 10; the bar chart indicates the period covered by the records. The locations of the gaging stations are identified on plate 1 (in pocket attached to back cover) by the index numbers assigned in table 10.

The streamflow data have been compiled by water years. The water year extends from October 1 to September 30 and is designated by listing the calendar year in which it ends. For most of the gaging stations the data consist of a description of the station, a table of monthly and yearly mean discharge, a summary of yearly discharge, and a flow-duration table. Records of daily discharge are not given, but are available in the annual water-supply papers (Surface Water Supply of the U. S.—Part 2B) published by the U. S. Geological Survey, or from the Survey's district office in Montgomery, Ala.

Station description.—The station description gives the location of the gaging station, drainage area, types and datum of gages, average discharge, extremes of discharge, and general remarks concerning the data.

The latitude and longitude of the gage, the location with respect to landline surveys of the General Land Office, and the distances from nearby physical landmarks, were determined from the best available maps.

The drainage area was determined also from the best available maps. In 1956, the drainage areas for all gaging stations in Alabama were redetermined in connection with a nationwide effort sponsored by the Federal Inter-agency River Basin Committee to coordinate figures of drainage area used by Federal agencies.[1] The figures of drainage area used in this report are the coordinated figures, and many of them differ slightly from the figures published previously in the water-supply papers and other special reports.

The gage described first is the latest one used. Changes in location, type of gage, or datum are then given in chronological order for all gages used earlier.

The location or datum of all earlier gages is given with reference to the gage first described. The datum of the gage is the elevation of the zero of the gage above mean sea level. Where information as to datum is not available, the altitude of the gage

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[1] See "Drainage Area Data for Alabama Streams," an open-file report prepared by the U. S. Geological Survey, Montgomery, Ala., in cooperation with the Alabama State Highway Department, 1957.

is given. This may have been determined from topographic maps or barometric levels.

The average discharge for a station is the average of all complete water years and is published only if there are five or more complete water years of record. The years used to determine the average are indicated and are not necessarily consecutive.

Under "Extremes" are given the maximum discharge and gage height for the period indicated, the minimum discharge if there is little or no regulation, or the minimum daily discharge if there is extensive regulation. Unless otherwise qualified, the maximum discharge corresponds to the crest stage obtained by means of a water-stage recorder, a crest-stage indicator, or a nonrecording gage read at the time of the crest. If the maximum gage height did not occur at the same time as the maximum discharge, it is given separately.

Under "Remarks," information is given on factors that affect the basin yield and runoff characteristics. These include upstream regulation, diversion, and utilization.

Gaging station records usually are collected by the U. S. Geological Survey in cooperation with State and other Federal agencies. Cooperative funds or services for the collection of the records presented in this report were furnished by the Alabama Geological Survey and the Corps of Engineers, U. S. Army. At a few gaging stations, records have been collected by others, and for these stations the extent of participation is acknowledged under "Cooperation."

Tables of monthly and yearly discharge.—These tables show the average monthly and yearly discharge in cubic feet per second. The discharges shown are those passing the station and are unadjusted for storage or diversion upstream.

Tables of yearly discharge.—These tables give a yearly summary of the streamflow data. The column headed "W.S.P." lists the number of the water-supply paper in which the figures of daily discharge are published. If a part of the record has been revised and published, this column shows the number of the report containing the revised records as well as the number of the original report. The maximum momentary discharge and the date of its occurrence when obtainable are given for each water year; if known, the minimum daily discharge is also given. The yearly mean discharge given in this table is the same as that given in the last column of the monthly table. The remaining data are the runoff in cfs per square mile and in inches for both the water year and the calendar year.

Data in this report are in agreement with the latest U. S. Geological Survey compilation reports of streamflow records in 1950, to be published in Water Supply Paper 1304 and include in addition streamflow data for the years 1951 to 1954, where available. Figures of discharge that were revised as a result of the review made in connection with Water Supply Paper 1304 are so indicated, except those for runoff in inches which have been changed simply to conform with a revised figure of drainage area. Figures that represent corrections of typographical or computational errors where no figures of daily discharge have been revised or changed are indicated as "corrected." Estimates of discharge made to complete months or years for this report are noted as estimated and as "not previously published."

Flow-duration tables.—These tables were prepared by arranging the daily discharges in order of magnitude and dividing them according to percentages of time during which specific flows were equaled or exceeded. The flow-duration table is particularly useful for comparing the runoff characteristics of different streams and for making preliminary studies of water supply and of waste disposal. The possible sources of water supply can be narrowed down by analyzing flow-duration characteristics, after which a more detailed study of remaining sources can be made, using hydrographs, mass curves, and storage requirement curves as well as information on chemical quality and temperature of the various sources.

For the purpose of comparing the flow regimen of different streams, the flow-duration tables should preferably be based on the same period of time. When possible, the flow-duration tables included in this report were prepared for the water years 1940-55, which is the longest period of record available at a majority of the gaging stations. For stations having 5 or more years of record within this base period, the flow-duration tables were adjusted to the full base period on the basis of records for nearby streams. The flow-duration table is not included for stations having less than 5 years of record. For two stations (Nos. 16 and 38) flow-duration tables for the longer period 1929-55 are also shown.

TABLE 10.—INVENTORY OF STREAMFLOW RECORDS SUMMARIZED IN THIS REPORT.

Index No.	Gaging Station	Drainage area (sq mi)
1	Buttahatchee River below Hamilton, Ala.	284
2	Buttahatchee River near Hamilton, Ala.	316
3	Buttahatchee River near Sulligent, Ala.	472
4	Luxapalila Creek near Fayette, Ala.	127
5	Luxapalila Creek at Millport, Ala.	241
6	Coal Fire Creek near Pickensville, Ala.	131
7	Tombigbee River near Cochrane, Ala.	5,990
8	Lubbub Creek near Carrollton, Ala.	116
9	Sipsey River at Fayette, Ala.	276
10	Sipsey River at Moores Bridge, Ala.	403
11	Sipsey River near Elrod, Ala.	518
12	Sipsey River near Pleasant Ridge, Ala.	753
13	Noxubee River near Geiger, Ala.	1,140
14	Tombigbee River at Gainesville, Ala.	8,700
15	Tombigbee River at Epes, Ala.	8,970
16	Mulberry Fork near Garden City, Ala.	368
17	Sipsey Fork near Falls City, Ala.	365

Period for which streamflow records are compiled in this report

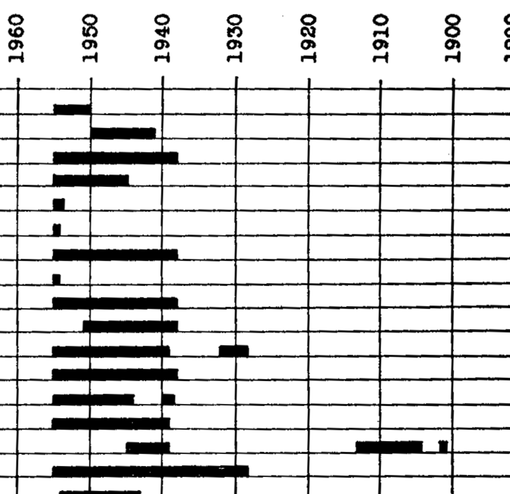
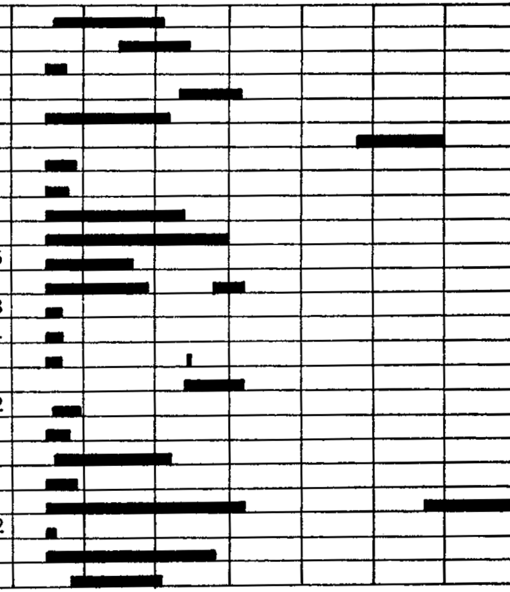


TABLE 10.—INVENTORY OF STREAMFLOW RECORDS SUMMARIZED IN THIS REPORT—(Continued)

18	Clear Creek at Falls City, Ala.	147
19	Sipsey Fork near Arley, Ala.	529
20	Sipsey Fork near Jasper, Ala.	971
21	Sipsey Fork near Sipsey, Ala.	994
22	Blackwater Creek near Manchester, Ala.	188
23	Mulberry Fork near Cordova, Ala.	1,927
24	Lost Creek near Oakman, Ala.	130
25	Locust Fork below Snead, Ala.	147
26	Locust Fork near Cleveland, Ala.	309
27	Locust Fork at Trafford, Ala.	625
28	Turkey Creek at Morris, Ala.	81.5
29	Locust Fork at Sayre, Ala.	887
30	Fivemile Creek at Ketona, Ala.	22.8
31	Village Creek near Adamsville, Ala.	84.1
32	Valley Creek near Oak Grove, Ala.	145
33	Black Warrior River at Lock 17, near Bessemer, Ala.	3,990
34	Yellow Creek near Tuscaloosa, Ala.	24.2
35	Hurricane Creek near Holt, Ala.	108
36	North River near Samantha, Ala.	219
37	North River near Tuscaloosa, Ala.	366
38	Black Warrior River at Tuscaloosa, Ala.	4,828
39	Fivemile Creek near Greensboro, Ala.	72.2
40	Black Warrior River near Eutaw, Ala.	5,797
41	Prairie Creek near Gallion, Ala.	169



MOBILE RIVER BASIN

1. Buttahatchee River below Hamilton, Ala.

Location.—Lat. 34°06', long. 87°58', on line between secs. 14 and 15, T. 11 S., R. 14 W., on downstream side of bridge on U. S. Highway 78, half a mile downstream from Woods Creek and 2 miles south of Hamilton.

Drainage area.—284 square miles.

Gage.—Water-stage recorder. Datum of gage is 360.50 feet above mean sea level, datum of 1929 (levels by Corps of Engineers). July 7, 1953, to July 10, 1954, staff gage 300 feet upstream at same datum.

Extremes.—1951-55: Maximum discharge, 24,200 cfs Mar. 29, 1951 (gage height, 26.3 feet); minimum, 19 cfs Sept. 2-5, 15, 1954 (gage height, 0.78 feet).

Remarks.—Occasional diurnal fluctation at low flow.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF BUTTAHATCHEE RIVER BELOW HAMILTON, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1951	---	----	----	913	1,791	1,994	1,091	295	172	206	61.0	70.9	---
1952	70.5	153	2,154	852	611	945	382	152	77.2	46.8	122	71.4	472
1953	66.7	112	184	754	1,718	695	767	958	104	128	49.7	59.4	458
1954	42.1	68.6	181	1,365	338	317	757	358	92.4	70.2	43.0	48.1	307
1955	44.2	85.6	934	568	1,123	1,267	771	268	131	302	92.5	41.2	466

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF BUTTAHATCHEE RIVER BELOW HAMILTON, ALA.

Year	W.S.P.	Water year ending Setember 30						Calendar year	
		Momentary maximum		Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
		Discharge	Date						
1951	1204	24,200	Mar. 29, 1951	--	---	---	----	743	35.54
1952	1234	20,200	Dec. 8, 1951	30	472	1.66	22.63	302	14.46
1953	1274	15,600	Apr. 30, 1953	36	458	1.61	21.90	452	21.62
1954	1334	15,100	Jan. 22, 1954	19	307	1.08	14.68	373	17.81
1955	1384	17,200	Mar. 21, 1955	32	466	1.64	22.28	--	----

MOBILE RIVER BASIN

2. Buttahatchee River near Hamilton, Ala.

Location.—Lat. 34°03', long. 88°01', in sec. 4, T. 12 S., R. 14 W., at Stuck Springs, ¾ mile downstream from county line, 7 miles downstream from Woods Creek, and 7 miles south of Hamilton.

Drainage area.—316 square miles.

Gage.—Water-stage recorder. Datum of gage is 333.84 feet above mean sea level, datum of 1929, supplementary adjustment of 1944 (Corps of Engineers bench mark).

Average discharge.—9 years (1941-50), 532 cfs.

Extremes.—1941-50: Maximum discharge, 22,800 cfs Jan. 6, 1950 (gage height, 28.4 feet); minimum, 22 cfs Aug. 28, 1943.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF BUTTAHATCHEE RIVER NEAR HAMILTON, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1942	93.6	165	392	325	682	728	283	136	71.8	169	326	73.6	285
1943	60.5	87.2	556	264	530	932	472	171	91.4	91.5	66.6	72.9	282
1944	41.1	84.4	118	238	1,041	2,239	1,254	470	107	70.0	138	145	494
1945	62.1	92.6	324	736	1,440	1,378	672	334	212	113	171	65.3	461
1946	73.8	212	536	2,176	2,187	1,014	331	295	173	512	194	115	644
1947	94.8	414	379	1,825	596	1,074	1,532	374	419	140	150	77.5	589
1948	61.2	200	279	274	2,180	1,734	870	201	106	131	72.8	74.0	508
1949	64.7	654	572	3,358	1,304	1,281	841	549	279	250	153	257	796
1950	120	137	330	2,110	1,847	1,672	420	579	448	271	414	514	733
1951	121	211	---	----	----	----	----	---	----	----	----	----	---

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF BUTTAHATCHEE RIVER NEAR HAMILTON, ALA.

	Water year ending September 30							Calendar year	
	Momentary maximum								
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1942	952	4,740	Feb. 16, 1942	40	285	0.902	12.24	290	12.45
1943	972	*8,200	Dec. 28, 1942	24	282	.892	12.12	243	10.44
1944	1002	20,600	Mar. 28, 1944	29	494	1.56	21.26	513	22.12
1945	1032	15,200	Feb. 22, 1945	47	461	1.46	19.81	490	21.05
1946	1052	21,300	Jan. 8, 1946	53	644	2.04	27.68	649	27.89
1947	1082	12,500	Apr. 11, 1947	48	589	1.86	25.31	560	24.06
1948	1112	17,300	Feb. 12, 1948	41	508	1.61	21.88	571	24.58
1949	1142	22,100	Jan. 5, 1949	59	796	2.53	34.20	738	31.68
1950	1172	22,800	Jan. 6, 1950	78	733	2.32	31.49	a737	a31.66

*—Revised.

a—Not previously published.

DURATION OF FLOW, 1940-55, BUTTAHATCHEE RIVER NEAR HAMILTON, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	4,300	13.6
2	2,950	9.34
3	2,350	7.44
5	1,700	5.38
7	1,360	4.30
10	1,050	3.32
15	780	2.47
20	620	1.96
25	520	1.65
30	415	1.31
35	340	1.08
40	285	.902
50	195	.617
60	140	.443
70	100	.316
75	88	.278
80	78	.246
85	68	.215
90	60	.190
93	54	.171
95	50	.158
97	45	.142
98	42	.133
99	38	.120

MOBILE RIVER BASIN

3. Buttahatchee River near Sulligent, Ala.

Location.—Lat. 33°55', long. 88°09', in NE¼ sec. 19, T. 13 S., R. 15 W., at bridge on State Highway 19, 1 mile upstream from Bogue Creek, 1½ miles northwest of Sulligent, and 2 miles downstream from Beaver Creek.

Drainage area.—472 square miles.

Gage.—Wire-weight gage read twice daily. Datum of gage is 287.58 feet above mean sea level, datum of 1929, supplementary adjustment of 1941. Prior to June 1, 1942, staff gage at site 500 feet upstream at datum 1.00 foot higher.

Average discharge.—16 years (1939-55), 743 cfs.

Extremes.—1939-55: Maximum discharge, 33,000 cfs Jan. 8, 1946; maximum gage height, 16.4 feet Jan. 7, 1950; minimum discharge observed, 32 cfs Sept. 15, 16, 1954 (gage height, 2.30 feet).

Remarks.—Discharge figures since November 1948 include flow of small unnamed tributary entering river from left bank a short distance downstream from station.

DURATION OF FLOW, 1940-55, BUTTAHATCHEE RIVER NEAR SULLIGENT, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	6,600	14.0
2	4,500	9.53
3	3,600	7.63
5	2,600	5.51
7	2,100	4.45
10	1,600	3.39
15	1,200	2.54
20	950	2.01
25	800	1.69
30	630	1.33
35	520	1.10
40	430	.911
50	300	.636
60	220	.466
70	160	.339
75	140	.297
80	125	.265
85	108	.229
90	93	.197
93	83	.176
95	76	.161
97	67	.142
98	61	.129
99	53	.112

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND OF BUTTAHATCHEE RIVER NEAR SULLIGENT, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1939	---	---	---	---	---	1,302	1,232	918	1,620	626	267	178	---
1940	171	151	224	347	1,365	1,399	786	307	200	1,272	240	123	547
1941	109	330	807	1,028	544	988	727	186	151	669	311	127	499
1942	158	236	514	421	927	1,046	405	214	107	198	343	127	389
1943	104	139	745	357	684	1,339	612	241	130	115	83.8	94.8	386
1944	59.2	121	164	298	1,251	3,233	2,153	729	165	100	181	261	724
1945	97.9	140	457	1,035	2,000	1,888	948	505	308	181	238	105	651
1946	104	265	675	3,058	3,055	1,442	461	379	249	684	217	179	886
1947	163	608	621	2,649	1,011	1,604	2,146	561	911	242	243	175	910
1948	107	355	540	452	3,558	3,405	1,512	334	185	210	116	116	812
1949	101	1,038	1,022	6,362	2,605	1,521	1,538	822	412	333	238	369	1,359
1950	195	252	552	3,168	2,759	2,421	711	871	633	409	471	918	1,105
1951	212	411	559	1,264	3,160	3,034	1,953	503	258	325	117	120	979
1952	117	297	2,993	1,376	1,092	1,473	693	274	149	104	156	115	739
1953	114	206	329	1,185	2,243	1,146	812	1,853	204	242	97.5	98.4	702
1954	74.3	111	336	1,801	634	604	1,218	649	173	103	64.0	77.9	487
1955	64.5	166	911	1,032	1,829	1,828	1,285	470	226	505	168	72.2	707

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF BUTTAHATCHEE RIVER NEAR SULLIGENT, ALA.

		Water year ending September 30						Calendar year	
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Runoff in inches	Mean
1939	1002	a3,470	May 23, 1939	a116	---	---	---	---	---
1940	1002	3,640	Mar. 4, 1940	95	547	1.16	15.79	606	17.48
1941	1002	3,390	Mar. 8, 1941	95	499	1.06	14.36	471	13.55
1942	1002	b3,470	Feb. 18, 1942	58	389	.824	11.18	396	11.37
1943	1002	6,920	Dec. 29, 1942	45	386	.818	11.10	332	9.53
1944	1002	26,000	Mar. 29, 1944	47	724	1.53	20.88	754	21.74
1945	1032	11,200	Feb. 23, 1945	74	651	1.38	18.71	680	19.55
1946	1052	33,000	Jan. 8, 1946	76	886	1.88	25.49	915	26.32
1947	1082	11,800	Apr. 12, 1947	94	910	1.93	26.16	877	25.22
1948	1112	25,400	Feb. 13, 1948	67	812	1.72	23.43	909	26.21
1949	1142	27,000	Jan. 5, 1949	88	1,359	2.88	39.07	1,262	36.30
1950	1172	32,800	Jan. 7, 1950	136	1,105	2.34	31.80	1,120	32.23
1951	1204	29,700	Mar. 29, 1951	72	979	2.07	28.15	1,168	33.59
1952	1234	16,000	Dec. 9, 1951	76	739	1.57	21.32	506	14.59
1953	1274	11,400	May 1, 1953	63	702	1.49	20.21	692	19.90
1954	1334	12,700	Jan. 23, 1953	32	487	1.03	14.01	539	15.52
1955	1384	17,700	Dec. 30, 1954	54	707	1.50	20.32	---	---

a March to September

b Corrected

MOBILE RIVER BASIN

4. Luxapalila Creek near Fayette, Ala.

Location.—Lat. 33°43', long. 87°52', in SW¼ sec. 26, T. 15 S., R. 13 W., at bridge on State Highway 18, 3 miles northwest of Fayette.

Drainage area.—127 square miles.

Gage.—Water-stage recorder. Datum of gage is 322.33 feet above mean sea level, datum of 1929, supplementary adjustment of 1944 (levels by Corps of Engineers). Prior to Apr. 22, 1944, staff gage, and Apr. 22, 1944, to May 15, 1945, wire-weight gage, at same site and datum.

Average discharge.—10 years (1945-55), 221 cfs.

Extremes.—1945-55: Maximum discharge, 9,910 cfs Jan. 5, 1949 (gage height, 13.8 feet); minimum, 24 cfs Sept. 15, 16, 20, 21, 1954.

DURATION OF FLOW, 1940-55, LUXAPALILA CREEK NEAR FAYETTE, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	1,700	13.4
2	1,140	8.98
3	830	6.54
5	620	4.88
7	480	3.78
10	400	3.15
15	280	2.20
20	225	1.77
25	185	1.46
30	150	1.18
35	130	1.02
40	115	.906
50	92	.724
60	77	.606
70	66	.520
75	61	.480
80	58	.457
85	54	.425
90	50	.394
93	47	.370
95	45	.354
97	42	.331
98	38	.299
99	34	.268

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF LUXAPALILA CREEK NEAR FAYETTE, ALA.

Year	W.S.P.	Water year ending September 30: Momentary maximum: Discharge	Momentary maximum: Date	Minimum day	Mean	Per square mile	Runoff in inches	Calendar year: Mean	Runoff in inches
1945	1032	a4,710	Feb. 22, 1945	b40	---	---	---	---	---
1946	1052	9,310	Jan. 8, 1946	45	241	1.90	25.81	263	28.06
1947	1082	4,600	Apr. 11, 1947	48	243	1.91	25.92	227	24.25
1948	1112	5,060	Feb. 12, 1948	45	218	1.72	23.32	256	27.45
1949	1142	9,910	Jan. 5, 1949	52	339	2.67	36.19	297	31.75
1950	1172	7,880	Jan. 6, 1950	57	293	2.31	31.31	290	30.95
1951	1204	8,150	Mar. 29, 1951	50	233	1.83	24.88	256	27.38
1952	1234	4,710	Mar. 11, 1952	40	171	1.35	18.28	142	15.26
1953	1274	5,060	Feb. 21, 1953	38	191	1.50	20.41	189	20.17
1954	1334	3,860	Jan. 22, 1954	26	128	1.01	13.65	130	13.89
1955	1384	4,280	Mar. 22, 1955	36	153	1.20	16.38	---	---

a Not previously published.
b May to September

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF LUXAPALILA CREEK NEAR FAYETTE, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1945	---	---	---	---	---	---	---	a179	69.6	121	75.9	50.1	---
1946	57.5	70.1	182	836	683	325	116	116	135	149	149	103	241
1947	78.6	268	218	632	237	432	414	130	272	86.4	91.1	53.5	243
1948	56.4	143	178	191	781	665	259	75.9	62.8	89.4	60.4	74.8	218
1949	55.5	466	322	1,337	531	471	254	181	145	96.4	97.4	118	339
1950	75.1	86.1	180	709	799	711	171	157	142	120	181	215	293
1951	74.8	93.3	133	314	587	738	374	130	109	115	61.1	90.2	233
1952	59.7	106	413	341	283	358	151	95.5	66.5	49.8	69.7	53.6	171
1953	53.7	71.4	118	339	553	295	228	404	62.1	93.0	48.8	50.0	191
1954	47.1	54.8	114	404	146	160	276	164	59.2	41.9	31.4	34.2	128
1955	39.7	64.6	139	224	403	290	274	93.5	63.3	161	64.4	40.8	153

a Not previously published; partly estimated on basis of records for Sipsey River near Fayette and Buttahatchee River near Hamilton.

MOBILE RIVER BASIN

5. Luxapalila Creek at Millport, Ala.

Location.—Lat. 33°34', long. 88°05', in SW¼ sec. 14, T. 17 S., R. 15 W., at bridge on State Highway 17, ¼ mile downstream from Driver Creek, and 1 mile north of Millport.

Drainage area.—241 square miles.

Gage.—Water-stage recorder. Datum of gage is 243.65 feet above mean sea level, datum of 1929, supplementary adjustment of 1944.

Extremes.—1954-55: Maximum discharge, 4,020 cfs Feb. 6, 1955 (gage height, 10.20 feet); minimum, 40 cfs Oct. 5, 11, 1954.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF LUXAPALILA CREEK AT MILLPORT, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1954	---	---	---	---	---	---	---	---	---	---	42.7	44.3	---
1955	49.4	90.4	182	336	692	470	541	149	90.5	235	84.5	48.2	244

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF LUXAPALILA CREEK AT MILLPORT, ALA.

Year	W.S.P.	Water year ending September 30: Momentary maximum: Discharge	Water year ending September 30: Momentary maximum: Date	Water year ending September 30: Minimum day	Water year ending September 30: Mean	Water year ending September 30: Per square mile	Water year ending September 30: Runoff in inches	Calendar year: Mean	Calendar year: Runoff in inches
1955	1384	4,020	Feb. 6, 1955	41	244	1.01	13.75	---	---

MOBILE RIVER BASIN

6. Coal Fire Creek near Pickensville, Ala.

Location.—Lat. 33°16', long. 88°18', in NE¼ sec. 25, T. 20 S., R. 17 W., at bridge on State Highway 14, 4½ miles north of Pickensville, and 4½ miles upstream from mouth.

Drainage area.—131 square miles.

Gage.—Water-stage recorder. Datum of gage is 148.50 feet above mean sea level, datum of 1929.

Extremes.—1954-55: Maximum discharge, 734 cfs Feb. 24, 1955 (gage height, 6.53 feet); minimum, 2.0 cfs Sept. 25, 1955 (gage height, 0.42 feet).

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF COAL FIRE CREEK NEAR PICKENSVILLE, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1955	20.9	35.4	52.9	166	398	192	319	44.5	27.5	40.1	22.1	7.43	108

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF COAL FIRE CREEK NEAR PICKENSVILLE, ALA.

Year	W.S.P.	Water year ending September 30						Calendar year	
		Momentary maximum Discharge	Momentary maximum Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1955	1384	734	Feb. 24, 1955	2.2	108	0.824	11.20	---	---

MOBILE RIVER BASIN

7. Tombigbee River near Cochrane, Ala.

Location.—Lat. 33°05', long. 88°14', in sec. 7, T. 24 N., R. 2 W., at bridge on State Highway 17, 200 feet upstream from Alabama, Tennessee and Northern Railroad bridge, 1¼ miles northeast of Cochrane, 2¼ miles downstream from Boguechitto Creek, and 7 miles southwest of Aliceville.

Drainage area.—5,990 square miles, approximately.

Gage.—Water-stage recorder. Datum of gage is 89.85 feet above mean sea level, datum of 1929, supplementary adjustment of 1946. Prior to July 10, 1939, staff gage at site 200 feet downstream at same datum. Since Jan. 30, 1940, auxiliary staff gage read twice daily at Vienna Ferry, 12 miles downstream.

Average discharge.—16 years (1939-55), 8,040 cfs.

Extremes.—1939-55: Maximum discharge, 163,000 cfs. Jan. 9, 1949; maximum gage height, 46.9 feet Jan. 9, 1949; minimum discharge, 165 cfs Sept. 21, 1954 (gage height, 2.34 feet).

Maximum stage known, 50.2 feet, present datum, in April 1892, from reports of U. S. Weather Bureau.

Cooperation.—Base data collected by Corps of Engineers.

DURATION OF FLOW, 1940-55, TOMBIGBEE RIVER NEAR COCHRANE, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	60,000	10.0
2	48,000	8.01
3	41,000	6.84
5	33,000	5.51
7	28,000	4.67
10	23,000	3.84
15	18,000	3.00
20	13,000	2.17
25	9,500	1.59
30	7,100	1.19
35	5,400	.901
40	4,300	.718
50	2,700	.451
60	1,800	.300
70	1,200	.200
75	1,000	.167
80	820	.137
85	690	.115
90	580	.0968
93	520	.0868
95	470	.0785
97	410	.0684
98	370	.0618
99	310	.0518

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF TOMBIGBEE RIVER NEAR COCHRANE, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1939	a 500	a1,100	a1,300	8,584	28,450	15,490	18,100	8,380	23,300	4,231	1,865	841	9,172
1940	833	836	1,530	2,906	15,860	15,150	12,240	2,977	3,185	24,660	1,916	1,054	6,908
1941	610	5,002	10,930	7,975	6,453	10,680	5,695	1,428	688	4,316	2,404	827	4,761
1942	827	3,888	6,331	4,277	9,985	14,450	5,231	1,949	1,124	1,005	1,833	826	4,281
1943	484	807	3,785	5,485	5,561	15,560	5,617	2,344	877	670	409	920	3,543
1944	345	1,217	934	3,011	11,050	20,640	34,010	11,140	1,461	775	1,529	1,516	7,257
1945	623	797	3,423	14,150	22,250	29,480	10,340	5,794	2,304	1,965	2,295	757	7,777
1946	1,080	2,564	7,665	34,710	40,610	19,590	8,329	7,918	6,762	11,720	4,681	1,330	12,100
1947	1,081	8,841	6,432	36,650	9,739	17,040	22,820	4,862	6,350	2,786	1,259	1,107	9,917
1948	653	3,212	5,540	6,355	41,890	30,220	14,950	2,693	1,485	1,247	1,167	1,080	9,073
1949	836	12,090	23,700	54,020	27,340	14,100	17,850	9,263	4,736	2,870	2,072	2,365	14,220
1950	1,293	2,105	4,112	33,350	33,500	27,110	6,265	6,648	4,436	3,101	3,893	18,470	11,890
1951	2,071	4,714	9,186	20,750	36,420	21,330	38,550	4,328	3,187	2,782	976	823	11,900
1952	762	2,118	18,410	15,360	12,890	16,120	8,758	2,454	1,146	634	850	566	6,677
1953	521	965	1,861	9,291	20,600	21,120	7,945	22,980	1,426	2,408	746	515	7,476
1954	419	537	1,650	12,000	7,332	5,385	9,318	6,256	985	667	324	235	3,741
1955	345	584	1,620	7,636	14,010	21,380	24,520	5,444	3,842	4,673	1,502	524	7,115

a Not previously published; discharge estimated or partly estimated on basis of records for station at Gainesville.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF TOMBIGBEE RIVER NEAR COCHRANE, ALA.

Year	W.S.P.	Water year ending September 30						Calendar year	
		Momentary maximum		Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
		Discharge	Date						
1939	872	35,000	Mar. 3, 1939	---	a9,172	a1.53	a20.78	9,198	20.84
1940	892	42,600	July 8, 9, 1940	567	6,908	1.15	15.71	8,027	18.25
1941	922	22,600	Mar. 11, 1941	479	4,761	.795	10.77	4,297	9.72
1942	952	22,400	Mar. 23, 24, 1942	479	4,281	.715	9.69	3,782	8.56
1943	972	31,600	Mar. 1, 8, 1943	273	3,543	.591	8.04	3,323	7.55
1944	1002	108,000	Apr. 3, 1944	306	7,257	1.21	16.48	7,457	16.93
1945	1032	54,800	Mar. 10, 1945	393	7,777	1.30	17.63	8,322	18.87
1946	1052	92,800	Feb. 15, 1946	527	12,100	2.02	27.42	12,510	28.35
1947	1082	52,700	Jan. 9, 1947	626	9,917	1.66	22.48	9,342	21.18
1948	1112	107,000	Feb. 19, 1948	569	9,073	1.51	20.62	11,350	25.79
1949	1142	163,000	Jan. 9, 1949	668	14,220	2.37	32.20	11,770	26.66
1950	1172	76,500	Jan. 12, 1950	970	11,890	1.98	26.96	12,600	28.58
1951	1204	124,000	Apr. 2, 1951	560	11,900	1.99	26.96	12,360	27.99
1952	1234	37,700	Dec. 28, 1951	425	6,677	1.11	15.16	5,157	11.72
1953	1274	52,000	Feb. 28, 1953	365	7,476	1.25	16.94	7,414	16.80
1954	1334	30,200	Jan. 28, 1954	172	3,741	.625	8.47	3,736	8.46
1955	1384	77,000	Mar. 29, 1955	247	7,115	1.19	16.14	---	---

a Not previously published.

MOBILE RIVER BASIN

8. Lubbub Creek near Carrollton, Ala.

Location.—Lat. 33°15', long. 88°05', in E½ sec. 10, T. 21 S., R. 15 W., at county highway bridge, 1 mile southeast of Carrollton and 4 miles upstream from Little Lubbub Creek.

Drainage area.—116 square miles.

Gage.—Water-stage recorder. Datum of gage is 174.24 feet above mean sea level, datum of 1929.

Extremes.—1954-55: Maximum discharge, 1,560 cfs Feb. 7, 1955 (gage height, 8.70 feet); minimum, 0.5 cfs Oct. 4, 5, 1954 (gage height, 0.46 foot).

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF LUBBUB CREEK NEAR CARROLLTON, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1954	---	---	---	---	---	---	---	---	---	---	---	0.737	---
1955	4.93	20.4	50.7	173	461	206	342	31.4	14.8	49.7	25.3	1.84	112

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF LUBBUB CREEK NEAR CARROLLTON, ALA.

Year	W.S.P.	Water year ending September 30						Calendar year	
		Momentary maximum		Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
		Discharge	Date						
1955	1384	1,560	Feb. 7, 1955	0.7	112	0.965	13.15	---	---

MOBILE RIVER BASIN

9. Sipsey River at Fayette, Ala.

Location.—Lat. 33°40', long. 87°49', in SW¼ sec. 8, T. 16 S., R. 12 W., at county highway bridge, 1 mile southeast of Fayette and 1½ miles downstream from Southern Railroad bridge.

Drainage area.—276 square miles.

Gage.—Water-stage recorder. Datum of gage is 296.72 feet above mean sea level, datum of 1929, supplementary adjustment of 1941 (levels by Corps of Engineers). Prior to Feb. 2, 1945, chain gage, Feb. 2, 1945, to June 8, 1949, wire-weight gage, and June 9, 1949, to Nov. 17, 1951, water-stage recorder at site 300 feet downstream at same datum.

Average discharge.—16 years (1939-55), 404 cfs.

Extremes.—1939-55: Maximum discharge, 20,500 cfs Jan. 7, 1950, and Mar. 29, 1951; maximum gage height, 21.75 feet Jan. 8, 1946; minimum discharge observed, 7.0 cfs Sept. 15, 1954.

Remarks.—An average of about 0.5 cfs is diverted upstream from the gage for municipal water supply for the city of Fayette. The greater part of this diversion is returned as sewage a short distance downstream from the gage.

DURATION OF FLOW, 1940-55, SIPSEY RIVER AT FAYETTE, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	3,800	13.8
2	2,400	8.70
3	1,900	6.88
5	1,500	5.43
7	1,200	4.35
10	1,000	3.62
15	700	2.54
20	540	1.96
25	410	1.49
30	320	1.16
35	250	.906
40	200	.725
50	130	.471
60	90	.326
70	64	.232
75	54	.196
80	46	.167
85	38	.138
90	31	.112
93	26	.094
95	23	.083
97	20	.072
98	17	.062
99	14	.051

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY RIVER AT FAYETTE, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1939	---	---	---	---	a2,418	883	690	412	900	129	190	68.5	---
1940	52.3	52.2	76.5	257	1,311	833	806	117	86.1	1,064	68.4	38.5	394
1941	34.1	80.1	261	428	242	513	259	63.0	31.8	126	190	38.8	189
1942	66.8	95.2	265	210	466	687	173	69.2	41.4	49.3	106	43.1	188
1943	32.3	53.5	442	189	435	966	351	116	64.0	42.8	27.9	33.3	229
1944	18.3	40.7	54.0	121	674	1,592	1,242	432	93.4	60.9	137	128	381
1945	41.1	48.1	227	746	1,569	1,247	633	400	82.2	194	129	55.5	441
1946	82.0	111	492	2,133	2,272	787	245	296	196	240	258	266	606
1947	111	757	417	1,916	562	1,114	850	290	285	89.3	72.5	47.7	543
1948	42.6	150	249	300	1,924	1,203	635	131	66.2	79.5	47.5	44.1	400
1949	34.3	896	901	2,674	1,197	819	570	345	254	181	113	184	679
1950	70.5	82.5	303	1,917	1,323	1,515	333	291	210	226	166	471	573
1951	73.1	110	218	635	1,455	1,927	886	182	83.1	113	43.6	64.6	477
1952	42.4	141	1,100	830	621	852	323	125	65.3	28.6	58.4	39.2	353
1953	31.1	49.2	156	903	1,503	735	411	945	66.0	104	32.5	28.6	408
1954	23.7	35.2	133	1,132	280	423	622	312	47.3	31.8	17.5	20.3	257
1955	16.8	51.4	164	542	1,126	778	843	143	71.0	308	76.1	15.8	339

a Not previously published; partly estimated on basis of discharge measurements, weather records and records for station at Moores Bridge.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY RIVER AT FAYETTE, ALA.

Year	W.S.P.	Water year ending September 30: Momentary maximum: Discharge	Momentary maximum: Date	Minimum day	Mean	Per square mile	Runoff in inches	Calendar year: Mean	Calendar year: Runoff in inches
1939	1002	a10,600	Feb. 16, 1939	--	--	--	--	--	--
1940	1002	a5,120	Apr. 5, 1940	30	394	1.43	19.41	410	20.21
1941	1002	a1,960	Mar. 9, 1941	20	189	.685	9.31	194	9.53
1942	1002	a2,180	Mar. 19, 1942	22	188	.681	9.26	197	9.69
			Dec. 29, 1942						
1943	1002	a7,140	Mar. 14, 1943	13	229	.830	11.27	194	9.54
1944	1002	14,400	Mar. 29, 1944	13	381	1.38	18.81	398	19.65
1945	1032	9,110	Mar. 5, 1945	20	441	1.60	21.69	472	23.22
1946	1052	20,000	Jan. 8, 1946	40	606	2.20	29.79	655	32.21
1947	1082	6,600	Jan. 21, 1947	34	543	1.97	26.68	473	23.25
1948	1112	8,800	Feb. 14, 1948	27	400	1.45	19.73	515	25.42
1949	1142	17,900	Jan. 6, 1949	29	679	2.46	33.38	564	27.75
1950	1172	20,500	Jan. 7, 1950	54	573	2.08	28.19	568	27.97
1951	1204	20,500	Mar. 29, 1951	17	477	1.73	23.45	552	27.12
1952	1234	5,600	Mar. 12, 1952	15	353	1.28	17.41	265	13.05
1953	1274	10,100	Feb. 22, 1953	18	408	1.48	20.06	404	19.87
1954	1334	7,200	Jan. 23, 1954	7.4	257	.931	12.63	260	12.81
1955	1384	8,100	Mar. 23, 1955	11	339	1.23	16.70	--	--

a Maximum observed discharge.

MOBILE RIVER BASIN

10. Sipsey River at Moores Bridge, Ala.

Location.—Lat. 33°27', long. 87°46', in NW¼ sec. 35, T. 18 S., R. 12 W., at bridge on State Mighway 171, 1 mile east of Moores Bridge, and 6 miles downstream from Bear Creek.

Drainage area.—403 square miles.

Gage.—Wire-weight gage. Datum of gage is 240.95 feet above mean sea level, datum of 1929 (levels by Corps of Engineers). Prior to Dec. 23, 1946, staff gage at same site and datum.

Average discharge.—12 years (1939-51), 681 cfs.

Extremes.—1939-51: Maximum discharge, 23,600 cfs Jan. 10, 1946 (gage height, 16.78 feet, from floodmark); minimum observed, 29 cfs Oct. 9-13, 1943.

Cooperation.—Base data collected by Corps of Engineers prior to May 1948.

DURATION OF FLOW, 1940-55, SIPSEY RIVER AT MOORES BRIDGE, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	5,800	14.4
2	3,800	9.43
3	2,800	6.95
5	2,250	5.58
7	1,850	4.59
10	1,600	3.97
15	1,300	3.23
20	1,000	2.48
25	800	1.99
30	620	1.54
35	480	1.19
40	370	.918
50	230	.571
60	150	.372
70	105	.261
75	88	.218
80	74	.183
85	63	.156
90	54	.134
93	48	.122
95	45	.112
97	41	.102
98	38	.094
99	33	.082

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY RIVER AT MOORES BRIDGE, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1939	--	---	---	---	3,269	1,605	1,158	613	1,350	221	375	157	---
1940	91.3	84.3	159	456	1,761	1,307	1,048	231	150	1,848	115	53.6	605
1941	55.2	140	414	733	518	916	489	103	52.7	224	579	72.6	358
1942	101	149	521	450	781	1,232	376	117	191	86.1	269	78.8	361
1943	52.4	101	450	703	763	1,974	646	205	90.8	127	56.3	59.5	435
1944	35.8	71.8	92.5	196	840	2,085	1,852	866	125	66.6	174	140	544
1945	60.4	70.1	229	1,107	2,451	1,875	936	749	126	207	142	77.6	659
1946	138	212	784	3,152	3,445	1,337	513	574	379	418	401	387	965
1947	160	1,170	536	2,926	863	1,684	1,321	474	546	181	117	78.2	839
1948	58.4	278	473	496	3,087	1,886	1,103	206	94.1	108	80.2	61.2	651
1949	52.7	1,145	1,953	3,538	2,016	1,303	1,201	636	319	233	150	241	1,061
1950	114	169	496	2,866	2,186	2,363	625	552	286	262	202	935	915
1951	155	220	428	965	2,317	2,645	1,921	336	140	172	81.5	87.4	779

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY RIVER AT MOORES BRIDGE, ALA.

		Water year ending September 30							Calendar year	
		Momentary maximum		Minimum						
Year	W.S.P.	Discharge	Date	day	Mean	Per square mile	Runoff in inches		Mean	Runoff in inches
1939	1002	a9,350	Feb. 5, 1939	--	---	---	---		---	---
1940	1002	6,520	July 13, 1940	43	605	1.50	20.44		628	21.23
1941	1002	5,140	Aug. 2, 1941	38	358	.888	12.08		372	12.54
1942	1002	4,320	Mar. 22, 1942	43	361	.896	12.16		347	11.69
1943	1002	8,390	Mar. 15, 1943	31	435	1.08	14.66		401	13.52
1944	1002	a14,400	Mar. 30, 1944	29	544	1.35	18.39		557	18.83
1945	1032	8,390	Feb. 16 and Mar. 7, 1945	39	659	1.64	22.17		724	24.37
1946	1052	23,600	Jan. 10, 1946	64	965	2.39	32.49		1,024	34.50
1947	1082	7,190	Jan. 22, 1947	48	839	2.08	28.26		751	25.32
1948	1112	10,200	Feb. 15, 1948	40	651	1.62	21.98		847	28.60
1949	1142	17,500	Jan. 7, 1949	43	1,061	2.63	35.77		863	29.08
1950	1172	21,100	Jan. 8, 1950	82	915	2.27	30.85		917	30.91
1951	1204	21,700	Mar. 30, 1951	35	779	1.93	26.23		---	---

a Revised.

MOBILE RIVER BASIN

11. Sipsey River near Elrod, Ala.

Location.—Lat. 33°15', long 87°46', in NE¼ sec. 3, T. 21 S., R. 12 W., at bridge on U. S. Highway 82, ¼ mile upstream from Gulf, Mobile & Ohio Railroad bridge, 1 mile east of Elrod, and 2 miles downstream from Box Creek.

Drainage area.—518 square miles.

Gage.—Water-stage recorder. Datum of gage is 197.81 feet above mean sea level, datum of 1929, supplementary adjustment of 1944. Prior to Mar. 31, 1932, chain gage at railroad bridge ¼ mile downstream at datum 1.93 feet higher.

Average discharge.—19 years (1928-31, 1939-55), 750 cfs.

Extremes.—1928-32, 1939-55: Maximum discharge, 21,000 cfs Jan. 9, 1950, and Mar. 31, 1951 (gage height, 18.1 feet); minimum, 12 cfs Sept. 20, 1954.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	5,600	10.8
2	4,100	7,92
3	3,400	6.56
5	2,600	5.02
7	2,300	4.44
10	2,000	3.86
15	1,500	2.90
20	1,200	2.32
25	940	1.81
30	760	1.47
35	590	1.14
40	470	.907
50	300	.579
60	200	.386
70	140	.270
75	110	.212
80	92	.178
85	78	.151
90	65	.125
93	57	.110
95	50	.097
97	41	.079
98	35	.068
99	27	.052

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY RIVER NEAR ELROD, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1928	--	---	---	---	---	---	---	---	---	---	---	331	---
1929	197	345	342	822	1,120	2,330	878	1,440	401	184	a76.5	a175	a691
1930	162	3,160	1,280	1,050	921	1,660	712	1,760	378	81.3	168	177	957
1931	134	706	636	997	658	633	1,350	383	113	143	171	46.1	495
1932	57.8	90.2	1,660	2,020	3,760	800	---	---	---	---	---	---	---
1940	95	105	197	489	1,992	1,390	1,502	296	224	2,026	148	69.3	707
1941	70.2	184	516	827	774	1,050	659	130	65.6	249	1,030	91.9	470
1942	116	216	552	629	943	1,465	562	172	450	130	400	100	476
1943	66.1	121	432	1,055	1,024	2,132	936	319	112	118	80.6	77.1	538
1944	46.1	97.7	126	280	949	2,458	2,557	1,141	158	82.2	192	180	687
1945	72.2	88.0	266	1,251	2,432	2,083	1,206	888	149	205	159	92.5	731
1946	192	278	882	3,403	3,899	1,788	728	763	462	509	432	398	1,129
1947	229	1,414	733	3,193	1,008	1,873	1,663	592	559	307	159	103	987
1948	81.1	359	695	568	3,390	2,225	1,592	253	118	125	103	82.0	788
1949	78.7	1,176	2,582	4,048	2,586	1,473	1,475	936	349	288	192	316	1,286
1950	145	253	549	3,280	2,503	2,563	788	708	319	283	250	1,307	1,072
1951	238	310	542	1,146	2,569	2,945	2,674	484	185	203	105	108	947
1952	101	285	1,569	1,388	1,344	1,496	628	214	135	54.4	117	93.3	618
1953	61.2	107	306	1,518	2,296	1,624	742	1,777	128	180	70.8	50.3	731
1954	40.0	69.3	276	1,487	655	598	1,073	561	88.6	49.6	28.4	26.6	412
1955	25.2	72.5	146	790	1,428	1,304	1,539	268	151	437	158	32.6	523

a Revised.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY RIVER NEAR ELROD, ALA.

Year	W.S.P.	Water year ending September 30: Momentary maximum: Discharge	Momentary maximum: Date	Minimum day	Mean	Per square mile	Runoff in inches	Calendar year: Mean	Calendar year: Runoff in inches
1928	662	---	---	--	---	---	---	---	---
	1434								
1929	682	---	---	a40	a692	1.34	a18.11	a999	a26.18
1930	697	15,500	Nov. 17, 1929	41	957	1.85	25.06	698	18.29
1931	712	4,690	Apr. 5, 1931	33	495	.956	12.98	524	13.76
1932	727	b7,090	Feb. 22, 1932	29	---	---	---	---	---
1940	892	8,260	July 13, 1940	53	707	1.36	18.58	738	19.41
1941	922	6,560	Aug. 1, 1941	50	470	.907	12.34	480	12.58
1942	952	3,630	Mar. 23, 1942	56	476	.919	12.47	453	11.89
1943	972	7,760	Mar. 17, 1943	35	538	1.04	14.11	508	13.33
1944	1002	12,200	Mar. 31, 1944	38	687	1.33	18.05	700	18.40
1945	1032	7,400	Feb. 17, 1945	49	731	1.41	19.17	809	21.22
1946	1052	18,600	Jan. 11, 1946	76	1,129	2.18	29.60	1,213	31.80
1947	1082	6,400	Jan. 23, 1947	66	987	1.91	25.85	884	23.16
1948	1112	9,200	Feb. 16, 1948	51	788	1.52	20.70	1,015	26.66
1949	1142	17,100	Jan. 7, 1949	66	1,286	2.48	33.71	1,043	27.33
1950	1172	21,000	Jan. 9, 1950	104	1,072	2.07	28.08	1,084	28.41
1951	1204	21,000	Mar. 31, 1951	52	947	1.83	24.82	1,021	26.74
1952	1234	5,400	Dec. 26, 1951	32	618	1.19	16.25	494	12.97
1953	1274	9,400	Feb. 25, 1953	32	731	1.41	19.15	723	18.96
1954	1334	6,400	Jan. 26, 1954	13	412	.795	10.80	400	10.48
1955	1384	4,230	Mar. 27, 1955	23	523	1.01	13.71	---	---

a Revised.
b Maximum for period October to March.

MOBILE RIVER BASIN

12. Sipsey River near Pleasant Ridge, Ala.

Location.—Lat. 32°02', long. 88°07', in S½ sec. 20, T. 24 N., R. 1 W., at bridge on State Highway 14, 450 feet downstream from Hughes Creek, 2½ miles northwest of Pleasant Ridge, 6 miles upstream from mouth, and 6 miles south of Aliceville.

Drainage area.—753 square miles.

Gage.—Wire-weight gage read twice daily. Datum of gage is 105.13 feet above mean sea level, datum of 1929, supplementary adjustment of 1946. Prior to Dec. 21, 1942, staff gage at site 300 feet upstream at same datum. Auxiliary staff gage read twice daily on Tombigbee River at Vienna Ferry, 2 miles upstream from mouth of Sipsey River.

Average discharge.—12 years (1943-55), 1,153 cfs.

Extremes.—1939-55: Maximum discharge, 21,900 cfs Apr. 2, 1951; minimum daily discharge determined, 17 cfs Sept. 13, 1954.

Cooperation.—Base data collected by Corps of Engineers.

DURATION OF FLOW, 1940-55, SIPSEY RIVER NEAR PLEASANT RIDGE, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	7,000	9.30
2	5,600	7.44
3	4,800	6.37
5	3,900	5.18
7	3,300	4.38
10	2,750	3.65
15	2,100	2.79
20	1,700	2.26
25	1,400	1.86
30	1,150	1.53
35	950	1.26
40	750	.996
50	440	.584
60	270	.359
70	180	.239
75	150	.199
80	125	.166
85	105	.139
90	85	.113
93	72	.0956
95	62	.0823
97	52	.0691
98	45	.0598
99	35	.0465

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND OF SIPSEY RIVER NEAR PLEASANT RIDGE, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1939	---	---	---	---	4,819	3,463	1,738	843	2,479	534	553	415	---
1940	a126	a140	304	755	2,996	2,024	2,140	579	413	2,858	a307	a91	a1,054
1941	a93	311	908	1,057	1,262	1,544	947	a226	a86	a369	1,611	a125	a711
1942	a160	a298	726	828	1,205	2,129	929	a253	a869	a203	a457	a217	a687
1943	a85	a160	532	1,291	1,037	2,935	1,302	a558	a173	a181	a208	a137	a717
1944	57.3	121	170	464	1,547	2,942	3,809	1,668	235	94.5	274	232	963
1945	95.2	117	395	1,446	3,237	3,436	1,746	1,173	225	228	198	118	1,022
1946	228	302	1,088	4,525	5,628	2,853	1,136	1,191	720	898	700	437	1,620
1947	311	1,389	1,208	4,500	1,484	2,543	2,352	863	910	652	231	160	1,385
1948	104	534	1,035	876	4,407	3,369	2,477	423	206	180	153	92.2	1,140
1949	99.5	1,379	3,438	5,205	3,963	2,265	2,502	1,545	506	401	263	491	1,828
1950	187	320	633	3,986	3,192	3,152	1,202	1,097	417	338	325	1,487	1,352
1951	403	448	841	1,468	3,129	2,920	4,897	903	299	237	128	120	1,300
1952	125	356	1,499	1,739	1,754	1,963	1,080	309	187	66.8	176	128	780
1953	75.5	140	405	1,899	2,862	2,625	1,356	2,592	188	459	117	74.5	1,058
1954	55.1	81.5	473	1,850	1,215	912	1,458	800	115	66.5	36.6	27.4	588
1955	32.2	85.8	192	963	2,423	1,887	2,765	428	217	464	264	52.0	802

a Not previously published; estimated or partly estimated on basis of weather records and records for station near Elrod.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY RIVER NEAR PLEASANT RIDGE, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1939	1032	a8,190	Feb. 10, 1939	--	--	--	--	--	--
1940	1032	7,020	July 16, 1940	--	b1,054	b1.40	b19.07	b1,117	b20.19
1941	1032	a5,150	Aug. 5, 1941	--	b711	b.944	b12.81	b700	b12.61
1942	1032	a3,460	Mar. 28, 1942	--	b687	b.912	b12.38	b652	b11.77
1943	1032	12,800	Mar. 21, 1943	--	b717	b.952	b12.92	b681	b12.27
1944	1032	10,400	Apr. 3, 1944	46	963	1.28	17.40	985	17.79
1945	1032	9,110	Feb. 22, 1945	57	1,022	1.36	18.41	1,107	19.96
1946	1052	15,000	Jan. 13, 1946	72	1,620	2.15	29.22	1,727	31.14
1947	1082	7,410	Jan. 21, 1947	87	1,385	1.84	24.97	1,282	23.11
1948	1112	9,050	Feb. 15, 1948	50	1,140	1.51	20.62	1,413	25.54
1949	1142	16,900	Jan. 10, 1949	74	1,828	2.43	32.94	1,510	27.22
1950	1172	19,100	Jan. 11, 1950	156	1,352	1.80	24.37	1,398	25.21
1951	1204	21,900	Apr. 2, 1951	72	1,300	1.73	23.44	1,324	23.89
1952	1234	4,740	Dec. 30, 1951	35	780	1.04	14.11	666	12.04
1953	1274	8,160	Feb. 27, 1953	52	1,058	1.41	19.09	1,057	19.06
1954	1334	5,630	Jan. 29, 1954	17	588	.781	10.59	562	10.14
1955	1384	4,520	Apr. 15, 1955	27	802	1.07	14.45	--	--

a Maximum observed discharge.
b Not previously published.

MOBILE RIVER BASIN

13. Noxubee River near Geiger, Ala.

Location.—Lat. 32°55', long. 88°18', in SE¼ sec. 33, T. 23 N., R. 8 W., at bridge on State Highway 17, ½ mile upstream from Woodards Creek, 1 mile upstream from Alabama, Tennessee & Northern Railroad bridge, and 4 miles north of Geiger.

Drainage area.—1,140 square miles, approximately.

Gage.—Water-stage recorder. Datum of gage is 86.08 feet above mean sea level, datum of 1929, supplementary adjustment of 1946. Prior to Sept. 30, 1940, staff gage at site of former highway bridge 1 mile downstream at datum 1.44 feet lower. July 26, 1944, to June 5, 1949, wire-weight gage at present site and datum. Auxiliary water-stage recorder on Tombigbee River at Gainesville, 1½ miles downstream from mouth of Noxubee River.

Average discharge.—12 years (1939-40, 1944-55), 1,539 cfs.

Extremes.—1939-40, 1944-55: Maximum discharge, 37,600 cfs Mar. 31, 1951 (gage height, 42.7 feet); minimum, 13 cfs July 7, 1954.

Remarks.—Figures of discharge include flow of Noxubee cutoff channel at bridge on State Highway 17, 1 mile north of gage.

Cooperation.—Base data collected by Corps. of Engineers.

DURATION OF FLOW, 1940-55, NOXUBEE RIVER NEAR GEIGER, ALA.

Percent of time	Discharge cfs	Discharge cfsm
1	13,000	11.4
2	11,000	9.65
3	9,200	8.07
5	7,400	6.49
7	6,200	5.44
10	5,000	4.39
15	3,300	2.89
20	2,000	1.75
25	1,200	1.05
30	820	.719
35	580	.509
40	440	.386
50	270	.237
60	170	.149
70	115	.101
75	95	.0833
80	78	.684
85	64	.0561
90	52	.0456
93	45	.0395
95	40	.0351
97	36	.0316
98	33	.0289
99	30	.0263

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF NOXUBEE RIVER NEAR GEIGER, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1939	--	--	--	--	--	a3,460	2,542	999	2,787	629	281	132	--
1940	106	92.8	211	388	4,158	2,208	2,181	911	739	7,432	443	200	1,584
1944	--	--	--	--	--	--	--	--	--	--	532	100	--
1945	51.1	76.0	608	1,506	7,137	4,454	1,727	427	147	416	97.7	59.7	1,355
1946	91.0	121	540	4,367	8,095	3,528	1,158	1,428	1,232	1,633	2,064	123	1,997
1947	85.4	1,243	800	7,631	1,334	2,734	4,085	594	1,481	334	110	75.7	1,712
1948	56.1	576	1,339	1,179	6,586	5,580	2,591	174	131	209	311	251	1,562
1949	110	2,933	6,238	9,782	5,786	3,237	2,312	2,570	802	424	254	331	2,889
1950	140	238	456	6,830	7,090	3,256	562	1,332	230	446	668	3,067	1,996
1951	528	582	1,490	3,292	6,315	5,779	5,673	364	815	144	117	93.4	2,068
1952	81.1	141	877	774	1,114	2,124	1,373	185	103	62.8	69.4	48.0	578
1953	39.3	54.5	115	1,401	3,234	2,574	1,298	4,901	115	799	85.1	84.0	1,218
1954	49.5	54.8	242	1,631	702	825	2,111	1,335	92.8	103	34.1	27.5	600
1955	31.0	49.5	159	633	2,856	1,985	3,744	723	272	522	153	39.7	914

a Not previously published.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF NOXUBEE RIVER NEAR GEIGER, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1939	1032	—	—	—	—	—	—	—	—
1940	1032	22,800	July 10, 1940	60	1,584	1.38	18.74	—	—
1944	1032	—	—	—	—	—	—	—	—
1945	1032	19,700	Feb. 24, 1945	41	1,355	1.19	16.11	1,356	16.14
1946	1052	20,300	Feb. 14, 1946	56	1,997	1.75	23.78	2,111	25.14
1947	1082	12,000	Jan. 21, 1947	58	1,712	1.50	20.40	1,700	20.25
1948	1112	14,500	Feb. 16, 1948	49	1,562	1.37	18.65	2,175	25.97
1949	1142	27,900	Jan. 8, 1949	63	2,889	2.53	34.40	2,179	25.94
1950	1172	22,400	Jan. 11, 1950	100	1,996	1.75	23.77	2,145	25.55
1951	1204	37,600	Mar. 31, 1951	65	2,068	1.81	24.63	1,942	23.13
1952	1234	5,980	Mar. 12, 1952	40	578	.507	6.90	503	6.00
1953	1274	11,900	May 6, 1953	34	1,218	1.07	14.50	1,229	14.63
1954	1334	8,550	Apr. 17, 1954	22	600	.526	7.13	591	7.03
1955	1384	8,270	Apr. 14, 1955	24	914	.802	10.88	—	—

MOBILE RIVER BASIN

14. Tombigbee River at Gainesville, Ala.

Location.—Lat. 32°49', long 88°09', in SE¼ sec. 2, T. 21 N., R. 2 W., at bridge on State Highway 39 at Gainesville, 2 miles downstream from Noxubee River.

Drainage area.—8,700 square miles, approximately.

Gage.—Water-stage recorder. Datum of gage is 63.29 feet above mean sea level, datum of 1929, supplementary adjustment of 1946. Prior to Feb. 1, 1939, wire-weight gage at same site and datum. Since Oct. 15, 1939, auxiliary water-stage recorder at Epes, 19 miles downstream. Prior to Oct. 15, 1939, auxiliary staff gage 700 feet upstream from present auxiliary recorder.

Average discharge.—17 years (1938-55), 11,330 cfs.

Extremes.—1938-55: Maximum discharge, 168,000 cfs Jan. 11, 1949; maximum gage height, 53.9 feet Jan. 11, 1949; minimum daily discharge, 250 cfs Sept. 21-22, 1954.

Cooperation.—Base data collected by Corps of Engineers.

DURATION OF FLOW, 1940-55, TOMBIGBEE RIVER AT GAINESVILLE, ALA.

Percent of time	Discharge cfs	Discharge cfsm
1	77,000	8.85
2	64,000	7.36
3	57,000	6.55
5	47,000	5.40
7	40,000	4.60
10	34,000	3.91
15	25,000	2.87
20	18,500	2.13
25	13,500	1.55
30	10,000	1.15
35	7,800	.897
40	6,100	.701
50	4,000	.460
60	2,600	.299
70	1,750	.201
75	1,400	.161
80	1,200	.138
85	1,000	.115
90	820	.0943
93	710	.0816
95	640	.0736
97	560	.0644
98	510	.0586
99	450	.0517

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND OF TOMBIGBEE RIVER AT GAINESVILLE, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sept.	Annual
1939	705	1,628	1,842	11,340	40,690	25,780	23,880	10,590	29,890	5,941	3,018	1,374	12,820
1940	1,152	1,155	2,125	4,219	25,690	20,410	17,290	5,156	4,583	36,700	2,895	1,459	10,200
1941	931	5,614	15,240	10,370	11,160	15,860	8,441	1,854	878	5,815	4,695	1,137	6,828
1942	1,148	4,381	8,560	5,966	13,450	21,400	7,274	2,987	2,256	1,445	2,848	1,151	6,037
1943	667	1,126	5,290	7,752	7,776	24,700	8,829	3,572	1,285	1,217	835	1,278	5,365
1944	486	1,498	1,347	4,205	15,290	30,530	47,380	16,900	2,139	1,205	2,574	2,028	10,410
1945	844	1,012	4,357	18,190	32,390	41,340	15,240	8,208	2,852	2,619	2,692	1,069	10,790
1946	1,591	3,002	9,364	45,270	57,510	27,650	11,560	11,040	9,121	14,390	8,660	2,100	16,550
1947	1,578	11,600	8,987	50,040	14,650	23,460	30,040	7,047	9,735	4,483	1,737	1,554	13,740
1948	863	5,150	9,593	9,049	55,030	41,730	22,620	3,868	2,084	1,811	1,741	1,562	12,750
1949	1,069	15,750	36,550	68,800	42,420	20,720	26,170	15,550	7,112	4,128	2,702	3,519	20,270
1950	1,638	2,720	5,421	45,770	45,950	36,620	8,953	10,720	5,372	4,561	4,813	24,390	16,230
1951	3,465	6,090	12,860	26,270	47,320	30,460	56,130	6,542	4,747	3,268	1,376	1,083	16,380
1952	1,043	2,703	20,140	19,460	17,810	22,270	12,650	3,188	1,566	839	1,212	876	8,643
1953	715	1,256	2,586	14,480	26,000	32,130	12,240	33,050	1,875	4,535	1,015	680	10,830
1954	542	708	2,389	15,720	9,845	7,650	14,310	8,986	1,336	905	435	328	5,238
1955	465	810	2,323	9,435	20,660	23,670	37,110	6,711	4,737	5,794	2,220	723	9,450

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF TOMBIGBEE RIVER AT GAINESVILLE, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1939	872	53,500	Mar. 7, 1939	655	12,820	1.47	20.00	12,840	20.04
1940	892	62,500	July 11, 1940	783	10,200	1.17	15.96	11,650	18.24
1941	922	31,900	Mar. 9, 1941	686	6,828	.785	10.65	6,178	9.63
1942	952	35,800	Mar. 22, 1942	680	6,037	.693	9.42	5,451	8.51
1943	972	56,600	Mar. 22, 1943	389	5,365	.617	8.35	5,046	7.85
1944	1002	112,000	Apr. 5, 1944	441	10,410	1.20	16.29	10,650	16.68
1945	1032	64,000	Mar. 1, 1945	533	10,790	1.24	16.85	11,440	17.86
1946	1052	112,000	Feb. 17, 1946	760	16,550	1.90	25.81	17,220	26.87
1947	1082	60,400	Jan. 26, 27, 1947	830	13,740	1.58	21.43	13,200	20.58
1948	1112	119,000	Feb. 21, 1948	740	12,750	1.47	19.94	15,920	24.90
1949	1142	168,000	Jan. 11, 1949	790	20,270	2.33	31.64	16,610	25.93
1950	1172	101,000	Jan. 14, 1950	1,300	16,230	1.87	25.33	17,300	26.98
1951	1204	141,000	Apr. 3, 1951	666	16,380	1.88	25.55	16,510	25.77
1952	1234	40,600	Dec. 31, 1951	532	8,643	.993	13.52	7,010	10.95
1953	1274	60,700	Mar. 2, 1953	525	10,830	1.24	16.89	10,750	16.78
1954	1334	35,800	Apr. 18, 1954	250	5,238	.602	8.17	5,234	8.16
1955	1384	67,900	Apr. 1, 1955	—	9,450	1.09	14.74	—	—

MOBILE RIVER BASIN

15. Tombigbee River at Epes, Ala.

Location.—Lat. 32°41'45", long. 88°06'55", in NE¼ sec. 19, T. 20 N., R. 1 W., at bridge on U. S. Highway 11, 700 feet downstream from Southern Railway bridge, ½ mile northeast of Epes, and 0.6 mile downstream from Jones and Factory Creeks.

Drainage area.—8,970 square miles, approximately.

Gage.—Water-stage recorder. Datum of gage is 53.15 feet above mean sea level, datum of 1929 (Corps of Engineers benchmark). Earlier gages at the same datum were operated at the Southern Railway bridge, 700 feet upstream, as follows:
Jan. 1 to Dec. 31, 1901, staff gage; Jan. 1 ,1905, to Aug. 31, 1913, chain gage; Jan. 1 to Oct. 14, 1939, staff gage.
Subsequent to Jan. 29, 1940, auxiliary staff gage 6½ miles downstream at different datum.

Average discharge.—14 years (1905-12, 1938-45), 9,672 cfs.

Extremes.—1901, 1905-13, 1939-45: Maximum discharge, 108,000 cfs Apr. 6, 1944; maximum gage height, 51.1 feet Apr. 6, 1944; minimum discharge, 415 cfs Aug. 31, 1943.
Maximum stage known, 54.9 feet Jan. 3, 1927 (from information by Corps of Engineers) and Jan. 13, 1949.

Remarks.—Figures of momentary maximum discharge for water years 1905-13 are of doubtful accuracy and are not published herein.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF TOMBIGBEE RIVER AT EPES, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1901	—	—	—	25,579	20,999	16,198	18,102	6,880	4,585	1,295	—	3,205	—
1902	1,633	1,550	12,249	—	—	—	—	—	—	—	—	—	—
1905	—	—	—	13,190	37,330	18,190	10,810	11,500	3,096	4,313	6,212	2,000	—
1906	2,796	2,358	8,076	15,800	5,720	23,000	17,300	6,570	1,730	3,810	1,680	2,660	7,655
1907	14,900	4,550	7,670	8,800	17,600	20,000	7,000	28,900	9,660	2,390	1,470	880	10,310
1908	842	1,600	3,640	9,720	29,900	20,500	16,600	22,800	8,310	2,960	5,220	1,120	10,200
1909	776	867	7,780	6,510	22,600	43,100	22,500	20,900	34,100	7,050	2,070	873	14,020
1910	757	865	2,280	7,060	10,200	8,850	3,740	2,900	6,660	16,400	2,750	841	5,259
1911	926	775	2,010	13,000	11,200	7,510	28,000	8,370	1,810	5,510	4,060	1,420	7,006
1912	965	2,110	21,100	29,200	19,200	35,900	46,600	24,200	4,650	9,500	4,860	3,080	16,790
1913	3,210	2,180	15,200	27,700	33,800	38,600	15,000	8,450	3,210	2,300	1,540	—	—
1939	770	1,800	2,000	11,370	40,560	27,070	24,710	10,070	30,480	6,027	3,319	1,310	13,050
1940	1,152	1,182	2,165	4,665	27,010	21,460	18,340	5,610	4,721	37,230	2,981	1,518	10,630
1941	968	5,645	15,390	10,700	11,860	16,480	8,826	1,954	917	5,986	5,083	1,193	7,076
1942	1,137	4,440	8,945	6,253	13,570	22,320	7,695	3,025	2,274	1,504	2,947	1,247	6,245
1943	734	1,182	5,360	8,213	8,097	24,520	9,433	3,690	1,373	1,412	929	1,303	5,524
1944	528	1,485	1,337	4,496	15,340	30,470	48,580	16,980	2,230	1,304	2,711	2,175	10,580
1945	891	1,078	4,320	18,120	32,430	42,960	15,790	8,778	2,998	2,800	2,900	1,100	11,070

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF TOMBIGBEE RIVER AT EPES, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1905	168	—	—	—	—	—	—	9,825	14.87
1906	204	—	—	790	7,655	0.853	11.59	8,833	13.38
1907	242	—	—	640	10,310	1.15	15.61	8,527	12.91
1908	242	—	—	640	10,200	1.14	15.47	10,480	15.90
1909	262	—	—	640	14,020	1.56	21.24	13,550	20.53
1910	282	—	—	550	5,259	.586	7.96	5,244	7.94
1911	302	—	—	550	7,006	.781	10.62	8,741	13.23
1912	322	—	—	655	16,790	1.87	25.47	16,480	25.01
1913	352	—	—	—	—	—	—	—	—
1939	872	a53,600	Mar. 6, 1939	960	—	—	—	13,050	19.74
1940	892	57,100	July 16, 1940	840	10,630	1.19	16.13	12,100	18.35
1941	922	32,100	Mar. 10, 1941	715	7,076	.789	10.71	6,444	9.76
1942	952	41,100	Mar. 21, 1942	747	6,245	.696	9.45	5,639	8.53
1943	972	53,100	Mar. 22, 1943	420	5,524	.616	8.35	5,190	7.84
1944	1002	108,000	Apr. 6, 1944	462	10,580	1.18	16.05	10,830	16.43
1945	1032	b62,700	Mar. 1, 1945	—	11,070	1.23	16.74	—	—

a January to September.
b October to June.

MOBILE RIVER BASIN

16. Mulberry Fork near Garden City, Ala.

Location.—Lat. 34°00', long. 86°45', in NE¼ sec. 16, T. 12 S., R. 2 W., at bridge on U. S. Highway 31, 1,000 feet downstream from Louisville & Nashville Railroad bridge, 1 mile southwest of Garden City, and 5½ miles downstream from Mud Creek.

Drainage area.—368 square miles.

Gage.—Water-stage recorder. Datum of gage is 380.54 feet above mean sea level, datum of 1929. Prior to Dec. 3, 1934, chain gage, and Dec. 4, 1934, to Jan. 4, 1939, wire-weight gage at same site and datum.

Average discharge.—26 years (1928-31, 1932-55), 635 cfs.

Extremes.—1928-55: Maximum discharge, 46,600 cfs Feb. 4, 1936 (gage height, 24.0 feet, from floodmark); minimum observed, 3 cfs Sept. 28-30, Oct. 1, 3-6, 1931 (gage height, 1.88 feet).

DURATION OF FLOW, 1940-55, MULBERRY FORK NEAR GARDEN CITY, ALA.

Percent of time	Discharge cfs	Discharge cfsm
1	6,200	16.8
2	4,200	11.4
3	3,300	8.97
5	2,400	6.52
7	1,900	5.16
10	1,500	4.08
15	1,100	2.99
20	900	2.45
25	700	1.90
30	540	1.47
35	420	1.14
40	320	.870
50	180	.489
60	100	.272
70	54	.147
75	38	.103
80	26	.0707
85	18	.0489
90	12.8	.0348
93	10.0	.0272
95	8.6	.0234
97	7.1	.0193
98	6.3	.0171
99	5.4	.0147

DURATION OF FLOW, 1929-55, MULBERRY FORK NEAR GARDEN CITY, ALA.

Percent of time	Discharge cfs	Discharge cfsm
1	6,500	17.7
2	4,300	11.7
3	3,400	9.24
5	2,500	6.79
7	1,900	5.16
10	1,500	4.08
15	1,100	2.99
20	900	2.45
25	720	1.96
30	560	1.52
35	450	1.22
40	350	.951
50	200	.543
60	112	.304
70	59	.160
75	39	.106
80	28	.0761
85	19	.0516
90	12.8	.0348
93	10.0	.0272
95	8.6	.0234
97	7.1	.0193
98	6.3	.0171
99	5.5	.0149

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF MULBERRY FORK RIVER NEAR GARDEN CITY, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1928	—	—	—	—	—	—	—	—	—	334	444	557	—
1929	134	104	80.0	1,230	1,140	3,360	894	1,620	166	72.8	20.2	183	752
1930	270	3,590	1,060	754	693	1,350	351	1,050	169	104	68.3	84.0	794
1931	18.7	316	378	747	659	588	647	158	29.7	49.5	130	5.4	308
1932	51.8	94.8	1,850	1,770	2,650	649	a700	a380	a170	1,250	455	112	a840
1933	1,070	547	3,600	1,000	1,530	949	1,020	587	41	181	81	63	889
1934	9.29	22.4	105	889	285	1,643	449	146	583	613	508	59.8	446
1935	743	356	416	906	1,091	2,135	1,034	725	124	106	67.5	8.20	642
1936	29.8	246	256	2,861	2,122	998	2,050	71.6	36.9	460	162	40.9	772
1937	22.7	8.7	161	3,160	1,262	636	999	991	88.8	127	143	127	643
1938	248	62.7	194	589	302	1,435	1,943	154	121	459	527	25.5	506
1939	6.8	196	122	1,027	3,443	1,304	822	213	772	203	282	134	690
1940	19.3	11.6	45.0	353	1,693	1,498	1,072	162	107	1,600	58.5	40.6	552
1941	12.6	51.4	192	626	443	714	432	75.6	18.4	546	1,334	63.1	378
1942	115	123	816	630	1,130	1,366	276	74.2	32.9	53.3	465	68.0	427
1943	38.2	79.9	1,994	704	966	1,855	927	149	88.5	72.8	75.1	117	589
1944	9.6	19.2	48.0	380	2,290	2,669	1,583	404	167	57.9	48.4	64.0	638
1945	25.4	17.1	208	1,138	1,875	1,588	1,013	491	144	39.4	50.4	14.4	542
1946	13.1	67.1	640	2,985	2,862	1,145	502	731	418	683	46.3	378	854
1947	845	1,206	795	3,046	677	1,468	1,059	348	244	40.8	43.4	21.4	755
1948	62.8	180	327	415	3,304	1,283	1,209	131	137	41.5	76.3	10.1	586
1949	5.83	1,729	1,267	3,021	2,383	1,217	774	518	482	729	90.5	141	1,021
1950	409	333	567	2,200	1,621	2,384	308	260	590	502	216	269	803
1951	44.3	70.5	310	990	1,809	2,647	1,450	166	124	268	54.4	71.4	660
1952	117	660	2,441	1,645	1,030	1,546	281	119	453	34.9	266	130	729
1953	372	103	702	1,959	1,913	1,003	726	960	83.3	102	43.5	25.9	660
1954	7.36	7.27	405	1,949	534	767	537	268	277	55.7	16.8	7.67	404
1955	9.47	23.8	226	662	1,861	1,231	874	389	183	168	201	14.4	478

a Not previously published; estimated or partly estimated on basis of records for Flint Creek near Chase, Ala., and Black Warrior at Tuscaloosa, Ala.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF MULBERRY FORK NEAR GARDEN CITY, ALA.

Year	W.S.P.	Water year ending September 30						Calendar year	
		Momentary maximum		Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
		Discharge	Date						
1928	662	a18,600	Sept. 1, 1928	--	--	--	--	--	--
1929	682	26,000	Mar. 14, 1929	4.6	752	2.04	27.73	1,134	41.83
1930	697	30,400	Nov. 14, 1929	8	794	2.16	29.30	445	16.42
1931	712	6,250	Nov. 16, 1930	3	308	.837	11.38	418	15.41
1932	727	bc14,300	Dec. 14, 1931	b3	c840	c2.28	c31.09	c1,112	c41.12
1933	742	24,800	Oct. 16, 1932	8	889	2.42	32.78	459	16.94
1934	757	14,300	Mar. 3, 1934	6	446	1.21	16.45	562	20.73
1935	782	13,900	Mar. 12, 1935	6	642	1.74	23.67	559	20.60
1936	802	46,600	Feb. 4, 1936	5	772	2.10	28.56	744	27.53
1937	822	25,500	Apr. 29, 1937	6	643	1.75	23.71	669	24.68
1938	852	23,300	Apr. 8, 1938	6	506	1.38	18.69	491	18.10
1939	872	37,000	Feb. 28, 1939	6	690	1.88	25.46	670	24.71
1940	892	19,500	July 13, 1940	9	552	1.50	20.39	567	20.95
1941	922	35,000	Aug. 1, 1941	7	378	1.03	13.94	445	16.43
1942	952	11,800	Aug. 19, 1942	10	427	1.15	15.75	517	19.07
1943	972	44,400	Dec. 28, 1942	6	589	1.60	21.73	416	15.36
1944	1002	23,500	Mar. 28, 1944	7	638	1.73	23.59	653	24.13
1945	1032	18,700	Feb. 13, 1945	6	542	1.47	20.00	582	21.46
1946	1052	34,400	Jan. 8, 1946	6	854	2.32	31.52	967	35.69
1947	1082	23,500	Jan. 20, 1947	6.8	755	2.05	27.83	629	23.19
1948	1112	27,700	Feb. 12, 1948	4.3	586	1.59	21.66	787	29.12
1949	1142	35,200	Jan. 5, 1949	4.6	1,021	2.78	37.66	881	32.50
1950	1172	28,300	Mar. 13, 1950	16	803	2.18	29.62	729	26.87
1951	1204	35,200	Mar. 29, 1951	8.0	660	1.79	24.36	896	33.06
1952	1234	17,200	Dec. 21, 1951	5.0	729	1.98	26.95	558	20.60
1953	1274	18,200	Apr. 30, 1953	5.7	660	1.79	24.36	596	22.00
1954	1334	20,400	Jan. 16, 1954	4.6	404	1.10	14.88	390	14.38
1955	1384	20,400	Mar. 22, 1955	3.2	478	1.30	17.65	--	--

a For period June to September.
b For periods October to March and July to September.
c Not previously published.

MOBILE RIVER BASIN

17. Sipsey Fork near Falls City, Ala.

Location.—Lat. 34°03', long. 87°16', in NE¼ sec. 33, T. 11 S., R 7 W., at bridge on county road, 1¼ miles downstream from Clifty Fork, 1¾ miles north of Falls City, and 2¼ miles upstream from Clear Creek.

Drainage area.—365 square miles.

Gage.—Water-stage recorder. Altitude of gage is 360 feet (by barometer).

Average discharge.—11 years (1943-54), 640 cfs.

Extremes.—1943-54: Maximum discharge, 48,400 cfs Jan. 8, 1946 (gage height, 29.6 feet), from rating curve extended above 16,000 cfs; minimum, 3.4 cfs Sept. 15, 16, 1954.

DURATION OF FLOW, 1940-55, SIPSEY FORK NEAR FALLS CITY, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	5,700	15.6
2	3,800	10.4
3	2,900	7.95
5	2,100	5.75
7	1,650	4.52
10	1,250	3.42
15	880	2.41
20	660	1.81
25	510	1.40
30	400	1.10
35	310	.849
40	240	.658
50	140	.384
60	88	.244
70	59	.162
75	48	.132
80	39	.107
85	32	.0877
90	25	.0685
93	21	.0575
95	18	.0493
97	15	.0411
98	13	.0356
99	9.5	.0260

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY FORK RIVER NEAR FALLS CITY, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1944	20.1	38.3	76.8	192	1,703	2,548	1,617	556	253	59.7	137	119	605
1945	33.5	44.4	273	855	1,791	1,404	865	325	103	58.7	66.5	30.9	479
1946	24.7	91.1	508	3,328	2,974	1,033	415	554	232	339	234	536	844
1947	121	966	632	2,600	738	1,207	1,382	329	152	50.7	45.2	27.1	688
1948	29.0	126	208	182	2,802	1,950	989	194	55.9	46.1	34.5	32.9	545
1949	29.8	1,278	750	3,867	1,903	1,254	817	747	778	531	115	275	1,024
1950	69.0	87.8	384	2,553	2,060	2,100	411	504	382	305	248	426	789
1951	86.0	150	277	879	2,263	2,735	1,151	196	79.7	120	40.4	61.2	660
1952	47.3	182	2,341	1,336	891	1,410	317	130	73.8	22.5	76.2	26.8	574
1953	23.7	52.3	131	935	2,188	1,066	718	1,029	65.0	74.2	25.0	22.8	517
1954	17.2	22.3	116	1,614	289	402	845	353	84.1	21.1	11.9	14.4	317

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY FORK NEAR FALLS CITY, ALA.

Year	W.S.P.	Water year ending September 30: Momentary maximum: Discharge	Water year ending September 30: Momentary maximum: Date	Water year ending September 30: Minimum day	Water year ending September 30: Mean	Water year ending September 30: Per square mile	Water year ending September 30: Runoff in inches	Calendar year: Mean	Calendar year: Runoff in inches
1944	1002	19,700	Mar. 28, 1944	16	605	1.66	22.55	623	23.24
1945	1032	14,400	Feb. 13, 1945	16	479	1.31	17.82	502	18.67
1946	1052	48,400	Jan. 8, 1956	15	844	2.31	31.39	935	34.75
1947	1082	12,400	Apr. 11, 1947	14	688	1.88	25.56	575	21.37
1948	1112	27,000	Feb. 12, 1948	12	545	1.49	20.30	685	25.53
1949	1142	32,200	Jan. 5, 1949	22	1,024	2.81	38.08	899	33.42
1950	1172	33,600	Jan. 6, 1950	49	789	2.16	29.34	786	29.25
1951	1204	39,000	Mar. 29, 1951	18	660	1.81	24.57	835	31.06
1952	1234	15,300	Dec. 26, 1951	9.4	574	1.57	21.40	374	13.94
1953	1274	18,200	Feb. 21, 1953	11	517	1.42	19.22	513	19.07
1954	1334	17,500	Jan. 22, 1954	3.5	317	.868	11.79	355	13.21

MOBILE RIVER BASIN

18. Clear Creek at Falls City, Ala.

Location.—Lat. 34°02', long. 87°16', in NE¼ sec. 9, T. 12 S., R. 7 W., at bridge on county road, ¼ mile upstream from Clear Creek Falls, ½ mile south of Falls City, and 2 miles upstream from mouth.

Drainage area.—147 square miles.

Gage.—Water-stage recorder. Altitude of gage is 460 feet (by barometer). Prior to Dec. 4, 1939, staff gage at same site and datum.

Average discharge.—15 years (1939-54), 250 cfs.

Extremes.—1939-54: Maximum discharge, 13,000 cfs Jan. 8, 1946 (gage height, 10.97 feet), from rating curve extended above 6,800 cfs; minimum 4.1 cfs Sept. 17, 18, 1954 (gage height, 0.57 foot).

DURATION OF FLOW, 1940-55, CLEAR CREEK AT FALLS CITY, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	2,400	16.3
2	1,600	10.9
3	1,200	8.16
5	880	5.99
7	690	4.69
10	540	3.67
15	390	2.65
20	310	2.11
25	250	1.70
30	200	1.36
35	160	1.09
40	130	.884
50	95	.646
60	70	.476
70	50	.340
75	45	.306
80	38	.259
85	32	.218
90	27	.184
93	24	.163
95	22	.150
97	20	.136
98	17	.116
99	13	.0884

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF CLEAR CREEK AT FALLS CITY, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1940	51.6	47.7	67.5	154	604	489	325	121	113	825	82.6	45.7	243
1941	42.7	91.1	193	312	180	332	219	65.3	38.6	107	126	29.9	145
1942	38.8	52.4	147	139	289	407	132	65.8	41.2	29.8	133	32.2	125
1943	25.9	39.1	364	125	240	507	251	94.0	46.3	40.0	39.0	62.3	153
1944	24.1	38.5	50.2	112	597	981	698	249	135	57.3	127	125	265
1945	36.5	45.2	184	421	767	590	411	197	100	84.5	54.0	38.6	241
1946	33.5	78.8	258	1,271	1,135	443	165	202	100	289	112	283	360
1947	87.8	427	294	970	303	540	555	191	113	50.7	48.9	30.6	301
1948	29.3	105	137	124	1,083	745	399	119	60.7	48.1	42.9	31.4	240
1949	27.1	508	373	1,516	773	570	356	278	348	176	92.8	182	431
1950	63.8	61.6	207	1,019	941	839	207	218	175	177	112	200	349
1951	61.1	91.1	134	330	883	998	507	128	73.7	72.6	35.0	50.1	276
1952	42.2	110	855	495	366	527	172	83.7	49.2	27.0	81.3	34.1	238
1953	31.0	45.3	96.5	435	870	453	309	496	79.5	62.6	28.2	24.2	240
1954	20.0	28.6	79.7	637	178	206	339	174	65.7	22.2	20.8	28.1	150
1955	18.3	45.0	---	---	---	---	---	---	---	---	---	---	---

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF CLEAR CREEK AT FALLS CITY, ALA.

Year	W.S.P.	Water year ending September 30						Calendar year	
		Momentary maximum							
		Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1940	892	3,670	July 4, 1940	29	243	1.65	22.49	256	23.73
1941	922	2,870	Mar. 7, 1941	15	145	.986	13.38	137	12.70
1942	952	3,080	Mar. 17, 1942	14	125	.850	11.52	141	13.02
1943	972	5,350	Dec. 28, 1942	14	153	1.04	14.10	126	11.62
1944	1002	7,030	Mar. 29, 1944	18	265	1.80	24.49	277	25.69
1945	1032	4,600	Feb. 13, 1945	22	241	1.64	22.24	250	23.05
1946	1052	13,000	Jan. 8, 1946	24	360	2.45	33.26	397	36.62
1947	1082	3,480	Jan. 20, 1947	20	301	2.05	27.82	256	23.67
1948	1112	6,640	Feb. 13, 1948	16	240	1.63	22.22	293	27.12
1949	1142	9,670	Jan. 5, 1949	24	431	2.93	39.84	384	35.44
1950	1172	9,670	Jan. 6, 1950	39	349	2.37	32.22	345	31.85
1951	1204	11,700	Mar. 29, 1951	22	276	1.88	25.52	338	31.17
1952	1234	3,980	Dec. 21, 1951	18	238	1.62	22.02	167	15.49
1953	1274	5,480	Feb. 21, 1953	15	240	1.63	22.18	237	21.85
1954	1334	4,980	Jan. 22, 1954	4.8	150	1.02	13.85	---	----

MOBILE RIVER BASIN

19. Sipsey Fork near Arley, Ala.

Location.—Lat. 33°59', long. 87°13', in N½ sec. 19, T. 12 S., R. 6 W., at Duncan Bridge, 3 miles downstream from Clear Creek, and 5 miles south of Arley.

Drainage area.—529 square miles.

Gage.—Wire-weight gage.

Average discharge.—9 years (1936-45), 726 cfs.

Extremes.—1936-45: Maximum discharge, 33,600 cfs Feb. 4, 1936 (gage height, 51.0 feet, from graph based on gage readings), from rating curve extended above 24,000 cfs; minimum daily, 20 cfs Aug. 27, 1943.

DURATION OF FLOW, 1940-55, SIPSEY FORK NEAR ARLEY, ALA.

Percent of time	Discharge cfs	Discharge cfsm
1	8,300	15.7
2	5,800	11.0
3	4,600	8.70
5	3,300	6.24
7	2,600	4.91
10	2,000	3.78
15	1,300	2.46
20	970	1.83
25	730	1.38
30	570	1.08
35	450	.851
40	360	.681
50	230	.435
60	150	.284
70	105	.198
75	87	.164
80	74	.140
85	63	.119
90	52	.0983
93	46	.0870
95	42	.0794
97	37	.0699
98	33	.0624
99	29	.0548

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY FORK RIVER NEAR ARLEY, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1936	---	---	---	---	2,446	1,483	2,765	165	55.6	243	147	60.5	---
1937	55.2	77.1	446	3,363	1,708	933	1,515	1,603	188	165	138	252	867
1938	491	202	753	914	679	2,159	2,746	467	580	922	697	98.0	894
1939	59.4	248	190	1,518	4,923	1,711	1,465	857	2,017	239	418	180	1,123
1940	90.3	93.6	112	376	2,036	1,732	1,242	339	208	2,559	146	78.2	748
1941	88.2	212	490	1,067	610	1,142	753	155	66.7	172	268	54.0	423
1942	111	124	403	377	1,053	1,415	374	143	76.0	58.7	274	52.8	369
1943	47.3	91.1	1,360	310	862	1,803	1,111	267	92.3	84.5	67.8	139	519
1944	44.2	76.8	127	304	2,300	3,526	2,315	804	388	117	264	244	869
1945	70.0	89.6	457	1,277	2,557	1,992	1,276	522	203	143	120	69.5	720

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY FORK NEAR ARLEY, ALA.

Year	W.S.P.	Water year ending September 30						Calendar year	
		Momentary maximum		Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
		Discharge	Date						
1936	822	a33,600	Feb. 4, 1936	---	---	---	----	----	----
1937	822	21,500	Apr. 29, 1937	37	867	1.64	22.25	941	24.14
1938	852	19,500	Apr. 8, 1938	56	894	1.69	22.95	813	20.87
1939	872	28,000	Feb. 28, 1939	47	1,123	2.12	28.80	1,106	28.39
1940	892	a12,000	July 9, 1940	45	748	1.41	19.25	789	20.31
1941	922	6,070	Mar. 7, 1941	27	423	.800	10.85	410	10.52
1942	952	a10,800	Mar. 17, 1942	26	369	.698	9.45	442	11.32
1943	972	22,600	Dec. 28, 1942	20	519	.981	13.29	412	10.58
1944	1002	b26,700	Mar. 29, 1944	34	869	1.64	22.38	901	23.18
1945	1032	18,900	Feb. 13, 1945	38	720	1.36	18.47	----	----

a Revised.
b Corrected.

MOBILE RIVER BASIN

20. Sipsey Fork near Jasper, Ala.

Location.—Lat. 33°54'40", long. 87°05'00", in SE¼ sec. 17, T. 13 S., R. 5 W., at bridge on State Highway 69, 200 feet downstream from Mill Creek, 1/3 mile upstream from Boyd Creek, 3¾ miles downstream from Ryan Creek, 11 miles upstream from mouth, and 13.7 miles northeast of Jasper.

Drainage area.—971 square miles.

Gage.—Water-stage recorder. Prior to Sept. 13, 1953, wire-weight gage at same site and datum. Datum of gage is 253.77 feet above mean sea level, datum of 1929, supplementary adjustment of 1944.

Extremes.—1952-55: Maximum discharge, 43,900 cfs Mar. 22, 1955; minimum, 9.0 cfs Sept. 20, 1954.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY FORK NEAR JASPER, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1952	---	---	---	---	---	---	---	---	---	61.5	343	66.2	---
1953	71.6	108	440	3,066	5,276	2,540	1,564	2,697	223	313	74.2	48.4	1,346
1954	35.9	54.1	568	4,672	1,040	1,310	1,665	743	255	112	55.4	57.2	884
1955	34.5	103	1,130	1,673	4,524	3,682	2,293	651	327	810	173	37.5	1,266

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY FORK NEAR JASPER, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1953	1274	33,200	Feb. 21, 1953	30	1,346	1.39	18.83	1,349	18.87
1954	1334	34,000	Jan. 22, 1954	10	884	.910	12.35	935	13.08
1955	1384	43,900	Mar. 22, 1955	27	1,266	1.30	17.70	---	----

MOBILE RIVER BASIN

21. Sipsey Fork near Sipsey, Ala.

Location.—Lat. 33°52'14", long. 87°04'04", in NE¼ sec. 33, T. 13 S., R. 5 W., 200 feet downstream from Lieth Creek, 3½ miles northeast of Sipsey, and 5 miles above mouth.

Drainage area.—994 square miles.

Gage.—Staff gage. Datum of gage is 245.77 feet above mean sea level, datum of 1929, supplementary adjustment of 1944.

Average discharge.—9 years (1928-37), 1,654 cfs.

Extremes.—1928-37: Maximum discharge, 51,400 cfs Feb. 4, 1936; maximum gage height, 57.0 feet Feb. 4, 1936; minimum discharge, 23 cfs Oct. 4, 7, 1931.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY FORK NEAR SIPSEY, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1929	648	687	440	2,670	2,610	9,450	1,740	4,320	533	322	126	451	2,010
1930	399	8,380	2,680	1,580	1,490	2,710	903	3,720	a314	a113	327	491	a1,922
1931	114	1,270	1,120	1,690	1,740	2,140	2,160	587	153	172	215	56.2	946
1932	49.6	115	3,650	5,070	6,790	1,940	b2,300	b1,200	b500	2,150	525	438	b2,048
1933	3,890	1,810	8,070	2,400	3,720	2,580	3,040	1,120	241	403	295	266	2,320
1934	98.3	129	433	1,472	724	4,101	1,130	398	618	828	365	108	872
1935	1,123	461	832	2,088	1,959	5,536	2,117	1,768	496	155	128	43.8	1,394
1936	91.8	431	516	4,600	5,479	2,593	5,124	a417	a96.3	468	260	108	a1,664
1937	69.0	86.4	549	7,801	3,206	1,888	2,566	3,254	268	210	247	429	1,712

a Revised.

b Not previously published; estimated on basis of records for Black Warrior River at Tuscaloosa, Ala.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF SIPSEY FORK NEAR SIPSEY, ALA.

Year	W.S.P.	Water year ending September 30: Momentary maximum: Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Calendar year: Mean	Runoff in inches
1929	682	50,300	Mar. 23, 1929	41	2,010	2.02	27.42	2,808	38.35
1930	697 1434	50,400	Nov. 14, 1929	a42	a1,922	1.93	a26.23	a1,182	a16.12
1931	712	19,200	Nov. 16, 1930	27	946	.952	12.91	1,060	14.48
1932	727	c18,600	Mar. 31, 1932	23	b2,048	b2.06	28.04	b2,887	b39.53
1933	742	46,200	Oct. 17, 1932	80	2,320	2.33	31.66	1,210	16.51
1934	757	32,400	Mar. 3, 1934	58	872	.877	11.91	1,021	13.94
1935	782	31,200	Mar. 13, 1935	30	1,394	1.40	19.05	1,277	17.45
1936	802 1434	51,400	Feb. 4, 1936	a52	a1,664	1.67	a22.79	a1,637	a22.42
1937	822	34,900	Apr. 30, 1937	32	1,712	1.72	23.38	----	----

a Revised.
b Not previously published.
c For periods October to March and July to September.

MOBILE RIVER BASIN

22. Blackwater Creek near Manchester, Ala.

Location.—Lat. 33°54'30", long. 87°15'25", in SE¼ sec. 15, T. 13 S., R. 7 W., at highway bridge on county road, ¼ mile downstream from small unnamed tributary, 2 miles east of Manchester and 5½ miles north of Jasper.

Drainage area.—188 square miles.

Gage.—Water-stage recorder. Datum of gage is 401.04 feet above mean sea level, datum of 1929, unadjusted.

Average discharge.—17 years (1938-55), 296 cfs.

Extremes.—1938-55; Maximum discharge, 8,050 cfs Jan. 9, 1946 (gage height, 11.49 feet); minimum daily, 1.3 cfs (result of regulation) Oct. 25, 1938.

Remarks.—Occasional regulation at very low flow by mill dam 2 miles above station.

DURATION OF FLOW, 1940-55, BLACKWATER CREEK NEAR MANCHESTER, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	2,600	13.8
2	2,000	10.6
3	1,600	8.51
5	1,200	6.38
7	1,000	5.32
10	790	4.20
15	550	2.92
20	410	2.18
25	310	1.65
30	240	1.28
35	185	.984
40	145	.771
50	88	.468
60	54	.287
70	34	.181
75	27	.144
80	21	.112
85	17	.0904
90	12.5	.0665
93	10.4	.0553
95	9.0	.0479
97	7.6	.0404
98	6.8	.0362
99	5.3	.0282

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF BLACKWATER CREEK RIVER NEAR MANCHESTER, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1939	13.0	45.9	56.4	476	1,598	676	416	305	664	86.8	231	89.1	379
1940	36.7	22.6	51.2	236	872	563	436	119	85.5	961	42.3	22.2	286
1941	14.2	42.8	147	351	228	406	202	42.1	15.8	72.2	154	17.2	141
1942	26.8	39.5	207	183	376	531	140	44.8	19.4	23.5	139	37.0	146
1943	14.7	31.5	502	204	339	820	294	74.5	20.2	15.4	15.8	48.1	198
1944	7.29	15.5	30.1	104	624	1,069	953	267	73.9	28.7	77.3	74.6	275
1945	19.7	22.3	117	483	970	795	461	222	77.1	56.4	87.3	25.5	274
1946	23.6	63.8	361	1,517	1,349	544	178	224	98.5	272	171	392	428
1947	90.6	631	347	1,334	360	838	600	236	148	35.4	30.3	13.5	389
1948	10.2	71.0	144	169	1,342	819	502	90.5	74.3	29.8	15.4	10.8	268
1949	11.9	561	733	1,638	974	607	431	253	418	187	51.8	172	501
1950	48.9	48.0	220	1,260	1,113	1,091	211	191	139	259	179	389	426
1951	44.0	66.2	149	419	1,027	1,125	807	107	53.4	78.8	23.3	30.7	323
1952	18.3	140	939	611	535	616	182	70.5	31.3	12.8	75.6	14.5	271
1953	11.8	22.7	104	683	1,013	505	299	622	37.2	63.5	20.2	11.6	279
1954	5.20	9.66	83.5	806	213	272	368	162	42.6	11.3	16.5	20.3	168
1955	7.56	31.1	161	490	909	630	548	131	109	297	52.4	10.2	277

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF BLACKWATER CREEK NEAR MANCHESTER, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1939	872	a6,200	Feb. 28, 1939	1.3	379	2.02	27.38	379	27.35
1940	892	2,600	July 9, 1940	12	286	1.52	20.69	294	21.26
1941	922	1,520	Mar. 8, 1941	4.2	141	.750	10.17	147	10.59
1942	952	1,660	Mar. 18, 1942	7.0	146	.777	10.54	170	12.24
1943	972	3,140	Dec. 28, 1942	6.1	198	1.05	14.33	156	11.28
1944	1002	4,670	Mar. 30, 1944	5.9	275	1.46	19.91	284	20.57
1945	1032	3,110	Mar. 4, 1945	5.5	274	1.46	19.76	298	21.52
1946	1052	8,050	Jan. 9, 1946	10	428	2.28	30.87	479	34.57
1947	1082	3,250	Jan. 20, 1947	7.9	389	2.07	28.12	319	23.05
1948	1112	3,800	Feb. 14, 1948	7.0	268	1.43	19.42	359	25.96
1949	1142	6,070	Jan. 7, 1949	7.6	501	2.66	36.15	418	30.19
1950	1172	6,200	Jan. 8, 1950	25	426	2.27	30.77	421	30.40
1951	1204	7,350	Mar. 30, 1951	6.0	323	1.72	23.30	394	28.43
1952	1234	2,550	Dec. 20, 1951	4.4	271	1.44	19.63	190	13.77
1953	1274	3,050	May 4, 1953	5.0	279	1.48	20.12	276	19.88
1954	1334	2,850	Jan. 22, 1954	1.9	168	.894	12.11	176	12.73
1955	1384	3,220	Mar. 22, 1955	4.8	277	1.47	20.03	---	----

a Revised.

MOBILE RIVER BASIN

23. Mulberry Fork near Cordova, Ala.

Location.—Lat. 33°45'27", long. 87°10'13", in NW¼ sec. 9, T. 15 S., R. 6 W., at St. Louis and San Francisco Railroad bridge (formerly Kansas City, Memphis & Birmingham Railroad bridge), just downstream from Cane Creek, 1 mile east of Cordova, and 12 miles downstream from Sipsey Fork.

Drainage area.—1,927 square miles.

Gage.—Staff gage. Altitude of gage is 250 feet (from topographic map).

Average discharge.—12 years (1900-12), 3,279 cfs.

Extremes.—1900-12: Maximum daily discharge, 60,400 cfs Mar. 14, 1909 (gage height, 41.5 feet), from rating curve extended above 20,000 cfs. Minimum daily discharge, 28 cfs Sept. 29 to Oct. 10, 1904; Aug. 29, 1907; and Sept. 20-23, 1910.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF MULBERRY FORK NEAR CORDOVA, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1900	---	---	---	---	---	---	---	---	16,185	2,975	1,016	556	---
1901	1,732	1,487	2,154	8,713	6,616	6,637	6,967	2,539	1,582	631	4,155	1,415	3,705
1902	687	468	4,923	5,692	8599	13,764	5,366	630	193	99	170	105	3,369
1903	536	880	4,395	4,306	17,941	10,203	4,773	4,176	1,661	317	306	97	4,044
1904	148	198	252	613	720	3,818	2,606	409	378	516	693	78.0	871
1905	44.9	298	2,277	4,798	14,280	4,559	1,820	3,889	880	957	1,908	1,753	3,051
1906	1,120	1,070	4,571	9,860	2,040	13,700	3,620	1,530	680	2,400	1,350	2,700	3,353
1907	5,390	1,560	2,270	3,460	6,180	5,620	1,610	6,350	1,850	766	158	419	2,961
1908	321	698	1,640	3,770	11,200	9,740	3,490	6,810	1,460	616	424	111	3,304
1909	117	218	4,280	4,410	13,200	18,000	6,320	3,040	9,830	1,430	1,020	282	5,178
1910	236	226	700	2,740	3,680	3,210	788	2,400	2,380	4,740	1,090	190	1,860
1911	650	143	1,060	5,560	5,500	2,760	11,000	1,560	534	801	816	265	2,526
1912	520	377	8,880	8,140	8,430	13,200	14,500	2,880	928	2,170	1,250	582	5,126
1913	681	718	2,430	---	---	---	---	---	---	---	---	---	---

YEARLY DISCHAGE, IN CUBIC FEET PER SECOND, OF MULBERRY FORK NEAR CORDOVA, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1900	107	—	—	—	—	—	—	—	—
1901	107	a47,360	Jan. 12, 1901	60	3,705	1.92	26.11	3,778	26.55
1902	107	56,980	Mar. 30, 1902	74	3,369	1.75	23.74	3,369	23.57
1903	107	42,950	Feb. 17, 1903	78	4,044	2.10	28.49	3,698	25.38
1904	127	11,600	Mar. 28, 1904	28	871	.452	6.14	1,038	7.35
1905	168	43,150	Feb. 10, 1905	28	3,051	1.58	21.50	3,468	23.96
1906	204	49,400	Jan. 23, 1906	128	3,753	1.95	26.40	3,930	27.86
1907	242	30,100	Mar. 3, 1907	28	2,961	1.54	20.84	2,420	16.93
1908	242	38,400	Mar. 24, 1908	70	3,304	1.71	23.52	3,520	24.71
1909	302	60,400	Mar. 14, 1909	95	5,178	2.69	36.09	4,830	34.02
1910	302	18,200	Feb. 18, 1910	28	1,860	.965	13.12	1,920	13.53
1911	302	43,200	Jan. 3, 1911	110	2,526	1.31	17.80	3,200	22.54
1912	322	40,200	Apr. 18, 1912	100	5,126	2.66	36.36	4,640	32.80
1913	322	—	—	—	—	—	—	—	—

a Corrected.

MOBILE RIVER BASIN

24. Lost Creek near Oakman, Ala.

Location.—Lat. 33°45'50", long. 87°21'30", in SE¼ sec. 3, T. 15 S., R. 8 W., at bridge on State Highway 69, ¼ mile upstream from Wolf Branch, ¾ mile downstream from Pumpkin Creek, 4 miles northeast of Oakman, and 6½ miles southwest of Jasper.

Drainage area.—130 square miles.

Gage.—Water-stage recorder. Altitude of gage is 280 feet (from topographic map).

Extremes.—1951-55: Maximum discharge, 4,290 cfs Feb. 7, 1955 (gage height, 18.8 feet); minimum, no flow Oct. 25 to Nov. 7, 1953, Oct. 25, 27-28, 1954.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF LOST CREEK NEAR OAKMAN, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1952	---	a82.9	679	464	335	409	100	21.1	7.34	1.81	39.9	4.58	---
1953	3.04	3.01	81.4	545	734	297	214	393	9.86	25.6	4.13	1.78	190
1954	.671	.547	48.1	633	141	202	232	63.8	25.9	24.2	21.0	22.8	118
1955	2.11	7.48	68.9	290	723	321	393	65.0	41.6	232	29.1	2.70	178

a Nov. 17-30.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF LOST CREEK NEAR OAKMAN, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1952	1234	a3,550	Dec. 21, 1951	a7.6	—	—	—	122	12.83
1953	1274	3,850	Feb. 22, 1953	.5	190	1.46	19.83	186	19.49
1954	1334	3,910	Jan. 16, 1954	0	118	.908	12.36	121	12.62
1955	1384	4,290	Feb. 7, 1955	0	178	1.37	18.85	—	—

a Nov. 17 to Sept. 30.

MOBILE RIVER BASIN

25. Locust Fork below Snead, Ala.

Location.—Lat. 34°08', long. 86°23', in SE¼ sec. 25, T. 10 S., R. 2 E., at bridge on State Highway 75, ½ mile downstream from Mud Creek, and 2¼ miles northwest of Snead.

Drainage area.—147 square miles.

Gage.—Water-stage recorder. Datum of gage is 702.94 feet above mean sea level, datum of 1929.

Extremes.—1952-55: Maximum discharge, 7,750 cfs Jan. 16, 1954 (gage height, 25.1 feet); minimum, 2.2 cfs Sept. 22, 1955.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF LOCUST FORK BELOW SNEAD, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1952	---	---	---	---	---	---	---	---	---	---	49.0	35.1	---
1953	32.4	23.4	252	801	710	350	176	355	87.3	42.0	8.63	9.10	235
1954	5.51	8.11	110	829	222	344	189	43.3	66.3	13.4	8.30	4.12	154
1955	3.41	6.56	96.8	294	631	328	419	126	61.1	69.4	21.3	6.39	169

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF LOCUST FORK BELOW SNEAD, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1953	1274	4,720	Jan. 10, 1953	6.4	235	1.60	21.71	219	20.26
1954	1334	7,750	Jan. 16, 1954	3.4	154	1.05	14.21	153	14.09
1955	1384	4,240	Feb. 6, 1955	2.2	169	1.15	15.57	—	—

MOBILE RIVER BASIN

26. Locust Fork near Cleveland, Ala.

Location.—Lat. 34°02', long. 86°34', in NE¼ sec. 6, T. 12 S., R. 1 E., at bridge on U. S. Highway 231 and State Highway 53, 2 miles north of Cleveland, and 2½ miles downstream from Graves Creek.

Drainage area.—309 square miles.

Gage.—Water-stage recorder. Datum of gage is 536.94 feet above mean sea level, datum of 1929 (Corps of Engineers benchmark). Prior to Apr. 20, 1940, staff gage 200 feet upstream at same datum. Apr. 20, 1940, to Mar. 23, 1944, staff gage, and Mar. 24, 1944, to Apr. 11, 1945, wire-weight gage, at present site and datum.

Average discharge.—18 years (1937-55), 514 cfs.

Extremes.—1936-55: Maximum discharge observed, 47,000 cfs Dec. 28, 1942 (gage height, 19.2 feet, from gage then in use); minimum since Oct. 1, 1943, 2.3 cfs Sept. 14, 15, 16, 1954; minimum prior to Oct. 1, 1943, not determined.

DURATION OF FLOW, 1940-55, LOCUST FORK NEAR CLEVELAND, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	5,300	17.2
2	3,500	11.3
3	2,700	8.74
5	2,000	6.47
7	1,600	5.18
10	1,200	3.88
15	900	2.91
20	700	2.27
25	540	1.75
30	420	1.36
35	330	1.07
40	260	.841
50	150	.485
60	79	.256
70	43	.139
75	33	.107
80	25	.0809
85	19	.0615
90	14	.0453
93	10.5	.0340
95	8.6	.0278
97	7.0	.0227
98	6.0	.0194
99	5.0	.0162

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF LOCUST FORK NEAR CLEVELAND, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1937	---	---	400	3,084	1,108	525	508	1,067	139	92.2	147	45.8	---
1938	256	70.0	151	586	345	1,307	2,164	136	211	401	287	26.1	495
1939	7.0	144	84.8	709	2,165	1,328	588	224	270	103	232	50.0	481
1940	15.0	15.0	30.0	240	1,693	1,129	934	102	127	650	82.4	30.7	415
1941	20.0	59.7	286	472	288	361	290	70.4	19.0	236	1,030	50.5	267
1942	144	159	753	497	1,091	1,076	214	60.0	40.0	30.0	361	172	380
1943	54.1	77.2	2,448	789	1,003	1,465	851	148	96.6	139	58.6	35.9	597
1944	10.0	14.0	24.6	225	2,040	2,023	1,294	302	50.7	17.5	21.2	40.1	499
1945	18.9	10.5	72.7	718	1,731	1,453	686	338	75.6	43.8	19.4	8.63	423
1946	20.4	86.1	573	2,399	2,700	1,369	531	692	191	284	61.0	219	750
1947	81.1	966	677	3,158	510	1,261	829	210	112	70.9	30.5	13.8	663
1948	6.85	35.1	141	339	2,375	1,123	1,294	75.6	75.1	95.1	68.0	17.8	461
1949	12.5	2,123	1,131	2,883	1,986	808	781	445	164	134	30.5	75.5	873
1950	123	193	367	1,614	1,265	2,143	310	242	179	609	243	483	646
1951	45.4	55.9	356	745	1,122	2,382	1,177	136	191	389	119	66.0	563
1952	34.9	294	2,008	1,338	985	1,173	289	76.8	261	46.4	137	85.7	562
1953	118	58.3	542	1,658	1,568	822	443	757	173	115	15.1	26.9	520
1954	6.71	9.36	215	1,714	435	641	399	148	196	25.1	10.4	5.04	318
1955	5.31	8.98	142	519	1,272	715	819	338	136	144	43.8	11.9	340

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF LOCUST FORK NEAR CLEVELAND, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1937	1032	17,000	Jan. 3, 1937	—	---	---	----	600	26.33
1938	1032	21,600	Apr. 8, 1938	—	495	1.60	21.73	474	20.84
1939	1032	a12,600	Feb. 28, 1939	—	481	1.56	21.10	466	20.45
1940	1032	11,200	Apr. 4, 1940	—	415	1.34	18.28	441	19.42
1941	1032	a21,800	Aug. 1, 1941	—	267	.864	11.72	325	14.28
1942	1932 1032	b11,000	Feb. 17, 1942	—	380	1.23	16.67	509	22.36
1943	1112	47,000	Dec. 28, 1942	—	597	1.93	26.24	383	16.81
1944	1032	13,000	Feb. 27, 1944	—	499	1.61	21.96	503	22.16
1945	1032	13,800	Feb. 13, 1945	5.9	423	1.37	18.58	472	20.73
1946	1052	19,400	Feb. 10, 1946	5.5	750	2.43	32.96	836	36.75
1947	1082	15,400	Jan. 20, 1947	3.8	663	2.15	29.12	535	23.49
1948	1112	12,500	Feb. 14, 1948	5.1	461	1.49	20.31	717	31.55
1949	1142	35,100	Jan. 5, 1949	6.8	873	2.83	38.33	659	28.93
1950	1172	22,700	Mar. 13, 1950	16	646	2.09	28.39	628	27.56
1951	1204	26,700	Mar. 29, 1951	21	563	1.82	24.74	722	31.72
1952	1234	12,200	Dec. 21, 1951	16	562	1.82	24.75	426	18.74
1953	1274	8,800	Jan. 10, 1953	7.9	520	1.68	22.86	479	21.05
1954	1334	15,000	Jan. 16, 1954	2.3	318	1.03	13.96	312	13.68
1955	1384	9,120	Feb. 6, 1955	3.7	340	1.10	14.93	---	----

a Revised.
b Maximum discharge observed.

MOBILE RIVER BASIN

27. Locust Fork at Trafford, Ala.

Location.—Lat. 33°50', long. 86°45', in SW¼ sec. 9, T. 14 S., R. 2 W., on left bank 50 feet downstream from bridge on county highway, ¾ mile northwest of Trafford, 1½ miles east of Coaldale, and 2¾ miles upstream from Gurley Creek.

Drainage area.—625 square miles.

Gage.—Water-stage recorder. Datum of gage is 309.12 feet above mean sea level, datum of 1929 (Corps of Engineers bench-mark). Prior to Jan. 27, 1934, chain gage at same site and datum.

Average discharge.—24 years (1930-31, 1932-55), 1,003 cfs.

Extremes.—1930-55: Maximum discharge, 60,700 cfs Jan. 6, 1949 (gage height, 59.1 feet); minimum daily, 8 cfs Oct. 20, 1931.

Remarks.—Subsequent to 1938, diversion from 70 square miles above station at Inland Reservoir (usable capacity, 60,000 acre-feet) on Blackburn Fork for industrial water supply for city of Birmingham.

DURATION OF FLOW, 1940-55, LOCUST FORK NEAR TRAFFORD, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	9,400	15.0
2	6,500	10.4
3	5,100	8.16
5	3,700	5.92
7	3,000	4.80
10	2,400	3.84
15	1,700	2.72
20	1,300	2.08
25	1,000	1.60
30	750	1.20
35	580	.928
40	450	.720
50	260	.416
60	150	.240
70	94	.150
75	73	.117
80	58	.0928
85	46	.0736
90	36	.0576
93	31	.0496
95	27	.0432
97	23	.0368
98	21	.0336
99	17	.0272

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND (UNADJUSTED), OF LOCUST FORK AT TRAFFORD, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1931	143	1,300	854	1,310	792	825	1,200	179	63.7	88.0	146	36.2	575
1932	25.0	41.9	1,840	3,400	4,870	920	a1,100	a560	a250	1,840	580	193	a1,292
1933	1,180	795	5,300	1,520	2,390	1,700	1,530	629	93	150	155	216	1,300
1934	47.5	91.7	200	1,352	602	2,828	549	202	817	807	1,004	176	728
1935	2,605	544	755	1,337	1,493	3,679	2,345	1,197	342	83.4	96.5	32.3	1,211
1936	46.5	309	713	4,229	4,475	1,394	2,677	133	37.4	457	470	208	1,250
1937	117	49.2	702	6,370	1,941	1,096	1,248	2,157	206	150	335	163	1,214
1938	548	158	237	1,007	564	2,656	4,607	405	340	913	718	76.9	1,020
1939	25.1	351	195	1,297	3,300	2,348	1,148	326	528	245	500	122	849
1940	46.1	55.4	81.9	624	2,929	2,193	1,526	202	247	1,848	133	80.0	823
1941	74.0	122	552	1,091	655	1,011	736	165	55.0	481	2,270	118	614
1942	198	268	1,230	711	2,493	2,341	510	150	104	65.4	691	262	743
1943	98.3	140	4,451	1,443	1,787	3,078	1,677	275	118	171	143	67.0	1,122
1944	29.4	41.5	64.0	375	3,193	3,926	2,373	636	157	40.6	73.2	109	908
1945	46.5	38.1	178	1,256	3,129	2,567	1,320	768	172	139	73.4	30.6	795
1946	45.4	145	823	4,221	5,602	2,667	846	1,022	322	529	133	339	1,367
1947	172	1,590	1,172	6,354	916	2,593	1,655	428	223	91.1	92.3	34.5	1,284
1948	24.6	97.1	340	693	4,899	2,139	2,559	147	108	128	104	37.6	921
1949	36.5	4,556	2,097	6,476	4,133	1,656	1,529	918	316	270	74.8	174	1,837
1950	188	285	570	2,564	2,370	4,479	578	429	250	1,147	302	691	1,152
1951	81.4	100	534	1,293	2,117	5,287	2,577	284	219	545	156	114	1,105
1952	60.9	405	3,677	2,226	1,687	2,186	481	133	369	66.9	200	156	973
1953	271	116	955	3,090	2,934	1,396	754	1,642	216	195	39.7	44.2	963
1954	19.9	25.1	411	3,502	873	1,351	712	317	290	53.0	35.0	22.2	636
1955	18.4	46.2	364	1,084	2,534	1,425	1,756	497	191	179	96.1	33.2	672

a Not previously published.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF LOCUST FORK AT TRAFFORD, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1931	712	20,000	Nov. 17, 1930	12	575	.920	12.47	546	11.83
1932	727	ab22,200	Jan. 30, 1932	8	a1,292	a2.07	a28.14	a1,744	a37.99
1933	742	19,700	Dec. 12, 1932	24	1,300	2.08	28.30	715	15.55
1934	782	22,000	Mar. 4, 1934	14	728	1.16	15.79	1,029	22.34
1935	782	28,100	Oct. 11, 1934	15	1,211	1.94	26.32	971	21.10
1936	802	45,500	Feb. 4, 1936	11	1,250	2.00	27.21	1,234	26.87
1937	822	30,300	Jan. 3, 1937	24	1,214	1.94	26.38	1,220	26.50
1938	852	37,000	Apr. 9, 1938	31	1,020	--	--	988	--
1939	872	17,600	Feb. 28, 1939	21	849	--	--	817	--
1940	892	13,700	Apr. 4, 1940	28	823	--	--	871	--
1941	922	28,000	Aug. 1, 1941	28	614	--	--	694	--
1942	952	24,300	Feb. 17, 1942	28	743	--	--	997	--
1943	972	55,800	Dec. 29, 1942	28	1,122	--	--	736	--
1944	1002	24,300	Mar. 29, 1944	21	908	--	--	919	--
1945	1032	23,500	Feb. 13, 1945	18	795	--	--	859	--
1946	1052	38,000	Feb. 10, 1946	20	1,367	--	--	1,526	--
1947	1082	32,400	Jan. 16, 1947	18	1,284	--	--	1,078	--
1948	1112	22,600	Feb. 14, 1948	14	921	--	--	1,436	--
1949	1142	60,700	Jan. 6, 1949	25	1,837	--	--	1,369	--
1950	1172	43,000	Mar. 14, 1950	47	1,152	--	--	1,125	--
1951	1204	51,100	Mar. 29, 1951	31	1,105	--	--	1,395	--
1952	1234	18,000	Dec. 21, 1951	26	973	--	--	737	--
1953	1274	16,100	Jan. 10, 1953	17	963	--	--	888	--
1954	1334	30,000	Jan. 16, 1954	9.8	636	--	--	634	--
1955	1384	18,600	Feb. 7, 1955	13	672	--	--	--	--

a Not previously published.
b For periods October to March and July to September.
Note.—Figures of discharge since 1938 unadjusted for diversion and storage above station.

MOBILE RIVER BASIN

28. Turkey Creek at Morris, Ala.

Location.—Lat. 33°44'25", long. 86°48'45", in SW¼ sec. 12, T. 15 S., R. 3 W., at bridge on U. S. Highway 31 at Morris, ¾ mile downstream from Cunningham Creek, and 4 miles upstream from mouth.

Drainage area.—81.5 square miles.

Gage.—Staff gage and crest-stage indicator. Datum of gage is 345.18 feet above mean sea level, datum of 1929.

Average discharge.—11 years (1944-55), 132 cfs.

Extremes.—1944-55: Maximum discharge, 11,600 cfs Nov. 28, 1948 (gage height, 23.1 feet, from graph based on gage readings); minimum observed, 8.8 cfs Oct. 18, 19, 1953.

Remarks.—Occasional slight diversions by saw mills above station.

DURATION OF FLOW, 1940-55, TURKEY CREEK AT MORRIS, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	1,200	14.7
2	760	9.33
3	590	7.24
5	430	5.28
7	340	4.17
10	265	3.25
15	190	2.33
20	150	1.84
25	115	1.41
30	90	1.10
35	74	.908
40	60	.736
50	41	.503
60	29	.356
70	22	.270
75	19	.233
80	17	.209
85	15	.184
90	13.5	.166
93	13.0	.160
95	12.4	.152
97	11.8	.145
98	11.5	.141
99	11.0	.135

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF TURKEY CREEK AT MORRIS, ALA.

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	ANNUAL
1944	---	---	---	a60.0	273	433	298	98.5	43.5	21.7	29.3	17.6	---
1945	11.7	14.2	27.5	124	396	295	166	98.2	31.1	25.5	17.1	15.8	99.9
1946	32.3	66.5	169	487	725	287	74.1	123	70.1	85.3	72.1	57.0	184
1947	36.6	151	123	631	130	378	288	145	78.0	27.0	45.0	15.7	171
1948	13.8	39.0	99.1	156	506	340	334	45.2	25.9	28.1	29.5	14.2	134
1949	12.1	515	253	690	518	340	178	144	44.5	45.3	29.0	34.8	232
1950	28.3	24.1	41.7	146	163	427	64.2	51.5	28.2	65.5	37.8	38.1	93.0
1951	15.7	19.5	65.6	127	272	513	298	53.7	41.9	66.8	60.9	90.6	135
1952	27.0	68.6	386	224	175	268	96.1	34.1	24.6	18.9	28.8	15.7	114
1953	23.0	16.0	84.3	374	327	188	127	200	23.9	24.9	14.0	13.0	117
1954	10.4	11.8	62.2	287	98.9	152	92.3	68.7	28.5	17.5	13.8	14.0	71.6
1955	15.8	14.5	84.4	197	334	153	278	61.9	43.1	51.1	17.8	12.7	104

a Not previously published; partly estimated on basis of records for nearby streams.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF TURKEY CREEK AT MORRIS, ALA.

		Water year ending September 30							Calendar year	
		Momentary maximum								
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches		Mean	Runoff in inches
1944	1112	a3,510	Mar. 29, 1944	a12	--	--	--		110	18.36
1945	1112	6,250	Feb. 13, 1945	10	99.9	1.23	16.65		118	19.66
1946	1112	8,550	Feb. 10, 1946	12	184	2.26	30.68		188	31.25
1947	1112	8,750	Jan. 15, 1947	12	171	2.10	28.56		158	26.35
1948	1112	2,480	Feb. 9, 1948	10	134	1.64	22.43		186	31.11
1949	1142	11,600	Nov. 28, 1948	11	232	2.85	38.60		175	29.12
1950	1172	7,120	Mar. 13, 1950	12	93.0	1.14	15.50		93.6	15.60
1951	1204	9,500	Mar. 29, 1951	13	135	1.66	22.42		167	27.78
1952	1234	5,790	Dec. 20, 1951	12	114	1.40	19.09		84.1	14.05
1953	1274	6,180	Jan. 9, 1953	9.4	117	1.44	19.49		114	18.94
1954	1334	6,120	Jan. 16, 1954	8.8	71.6	.879	11.91		74.2	12.33
1955	1384	5,520	Feb. 6, 1955	9.4	104	1.28	17.24		--	--

a For period January to September.

MOBILE RIVER BASIN

29. Locust Fork at Sayre, Ala.

Location.—Lat. 33°42'35", long. 86°59'00", in NW¼ sec. 29, T. 15 S., R. 4 W., at bridge on county road at Sayre, 1½ miles downstream from Camp Creek.

Drainage area.—887 square miles.

Gage.—Water-stage recorder. Datum of gage is 258.64 feet above mean sea level, datum of 1929 (levels by Corps of Engineers). July 1928 to March 1932, chain gage 9 miles upstream at different datum. May 11, 1942, to Jan. 16, 1943, staff gage, and Jan. 17, 1943, to June 30, 1949, wire-weight gage at present site and datum.

Average discharge.—13 years (1928-31, 1945-55), 1,474 cfs.

Extremes.—1928-32, 1942-55: Maximum discharge, 55,300 cfs Jan. 7, 1949 (gage height, 47.9 feet); minimum, 17 cfs Sept. 28, Oct. 2, 1931.

Remarks.—Subsequent to 1938, diversion from 70 square miles above station at Inland Reservoir (usable capacity, 60,000 acre-feet) on Blackburn Fork for industrial water supply for city of Birmingham.

DURATION OF FLOW, 1940-55, LOCUST FORK AT SAYRE, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	15,000	16.9
2	8,400	9.47
3	6,400	7.22
5	4,700	5.30
7	3,900	4.40
10	3,200	3.61
15	2,450	2.76
20	1,800	2.03
25	1,350	1.52
30	1,100	1.24
35	840	.947
40	670	.755
50	410	.462
60	250	.282
70	150	.169
75	125	.141
80	100	.113
85	80	.0902
90	64	.0722
93	54	.0609
95	47	.0530
97	41	.0462
98	37	.0417
99	32	.0361

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF LOCUST FORK AT SAYRE, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1928	---	---	---	---	---	---	---	---	---	a577	530	775	---
1929	147	228	190	2,140	2,970	9,280	2,200	5,390	467	200	158	524	1,990
1930	604	9,450	1,810	1,680	1,750	3,370	1,000	1,760	288	138	147	284	1,850
1931	160	1,680	1,100	1,620	1,000	1,020	1,760	313	87.1	125	211	44.6	757
1932	29.8	49.3	2,300	4,470	7,190	1,170	---	---	---	---	---	---	---
1942	a300	a400	a1,700	a980	a3,200	a3,000	a720	a239	136	99.8	737	354	a977
1943	131	188	b5,343	1,717	2,174	4,758	2,465	389	a178	a251	a230	a110	a1,497
1944	a50	a65.4	a85.5	567	3,588	5,007	3,070	774	203	a65.9	a93.6	a178	a1,135
1945	a70	a62.0	a215	1,566	4,195	3,579	1,784	1,081	206	a168	a109	a55	a1,072
1946	89.4	218	1,233	5,463	7,124	3,533	1,007	1,321	471	866	289	598	1,822
1947	270	1,988	1,528	8,224	1,272	3,513	2,412	805	479	152	187	59.8	1,750
1948	45.2	155	662	1,048	6,340	2,891	3,498	243	159	173	180	64.3	1,264
1949	60.2	5,449	3,291	8,051	5,674	2,297	1,940	1,358	518	467	159	284	2,440
1950	209	392	712	3,175	2,948	5,519	810	560	326	1,290	420	823	1,429
1951	122	159	685	1,679	2,959	6,608	3,987	436	227	732	270	247	1,501
1952	98.6	538	4,621	2,530	2,101	2,941	721	199	422	94.3	229	197	1,228
1953	310	178	1,205	4,273	3,865	1,997	1,077	2,417	292	266	61.9	74.7	1,324
1954	34.2	45.8	589	4,414	1,164	1,826	1,008	541	368	105	67.4	46.0	853
1955	46.4	78.5	509	1,593	3,588	1,974	2,445	633	316	283	130	54.6	952

a Not previously published; estimated or partly estimated on basis of records for station at Trafford.
b Revised.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF LOCUST FORK AT SAYRE, ALA.

			Water year ending September 30						Calendar year	
			Momentary maximum							
Year		W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1928		662	---	------	---	---	---	---	---	---
1929		682	b38,200	Mar. 16, 1929	23	1,990	2.30	31.26	2,930	45.89
1930		697	53,300	Nov. 15, 1929	44	1,850	2.14	28.96	1,110	17.42
1931		712	18,800	Nov. 17, 1930	18	757	.875	11.86	714	11.20
1932		727	c24,500	Jan. 30, 1932	a19	---	---	---	---	---
1943	1002	1142	---	------	---	a977	a1.10	a14.96	a1,255	a19.21
1943		1142	49,400	Dec. 29, 1942	---	a1,497	a1.69	a22.91	a1,034	a15.81
1944		1002	27,500	Mar. 30, 1944	---	a1,135	a1.28	a17.42	a1,148	a17.62
1945		1032	22,800	Feb. 14, 1945	---	a1,072	a1.21	a16.41	a1,173	a17.95
1946		1052	37,500	Feb. 11, 1946	28	1,822	2.05	27.88	2,008	30.73
1947		1082	29,800	Jan. 16, 1947	35	1,750	1.97	26.79	1,507	23.06
1948		1112	20,900	Feb. 15, 1948	25	1,264	1.43	19.39	1,922	29.49
1949		1142	55,300	Jan. 7, 1949	43	2,440	2.75	37.36	1,818	27.84
1950		1172	39,400	Mar. 14, 1950	77	1,429	1.61	21.88	1,400	21.44
1951		1204	47,200	Mar. 30, 1951	66	1,501	1.69	22.97	1,865	28.54
1952		1234	23,500	Dec. 21, 1951	40	1,228	1.38	18.85	927	14.22
1953		1274	18,900	Jan. 10, 1953	35	1,324	1.49	20.26	1,238	18.94
1954		1334	27,600	Jan. 17, 1954	21	853	.962	13.07	850	13.02
1955		1384	20,200	Feb. 7, 1955	24	952	1.07	14.58	---	---

a Not previously published.
b Revised.
c For period October to March.

MOBILE RIVER BASIN

30. Fivemile Creek at Ketona, Ala.

Location.—Lat. 33°36'05", long. 86°45'20", in NW¼ sec. 33, T. 16 S., R. 2 W., at highway bridge on county road at Ketona, 150 feet northwest of State Highway 38, 0.6 mile downstream from Barton Branch, 0.9 mile downstream from Tarrant Spring Branch, and 2 miles northeast of Tarrant City.

Drainage area.—22.8 square miles.

Gage.—Water-stage recorder. Datum of gage is 546.70 feet above mean sea level, datum of 1929.

Extremes.—1953-55: Maximum discharge, 1,030 cfs Feb. 6, 1955 (gage height, 5.98 feet); minimum daily, 4.8 cfs Nov. 2, 1954.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF FIVEMILE CREEK AT KETONA, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1953	---	---	---	---	---	---	---	---	---	---	9.75	8.99	---
1954	7.80	9.18	22.8	64.0	31.0	33.9	24.7	16.9	12.0	9.68	9.14	6.79	20.6
1955	6.41	8.71	22.4	38.1	72.1	44.4	64.8	21.5	14.6	14.8	9.36	7.06	26.7

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF FIVEMILE CREEK AT KETONA, ALA.

	Water year ending September 30								Calendar year	
		Momentary maximum								
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1954	1334	964	Jan. 16, 1954	6.3	20.6	0.904	12.28	20.5	12.17
1955	1384	1,030	Feb. 6, 1955	4.8	26.7	1.17	15.87	--	--

MOBILE RIVER BASIN

31. Village Creek near Adamsville, Ala.

Location.—Lat. 33°36'20", long. 87°00'25", in E½ sec. 36, T. 16 S., R. 5 W., at county highway bridge, ¼ mile upstream from Canoe Creek, 3½ miles west of Adamsville, and 8 miles upstream from mouth.

Drainage area.—84.1 square miles.

Gage.—Water-stage recorder. Altitude of gage is 340 feet (by barometer).

Extremes.—1953-55: Maximum discharge, 6,020 cfs Feb. 6, 1955 (gage height, 13.38 feet); minimum, no flow for many days each year.

A stage of about 21 feet has been reached on several occasions, from information by local residents.

Remarks.—Considerable regulation by Tennessee Coal, Iron, and Railroad Company reservoir (usable capacity, 1.7 billion gallons) about 8 miles upstream. Diversion for industrial use in the Birmingham area affects low flows.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF VILLAGE CREEK NEAR ADAMSVILLE, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1954	1.55	1.93	149	269	101	111	121	77.9	46.9	11.4	13.1	0.083	75.5
1955	.145	9.86	73.8	161	384	157	245	63.8	22.4	111	37.2	.087	104

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF VILLAGE CREEK NEAR ADAMSVILLE, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1954	1334	4,410	Jan. 16, 1954	0	75.5	a	a	69.6	--
1955	1384	6,020	Feb. 6, 1955	0	104	a	a	--	--

a Not computed because of diversion into and from basin in the Birmingham area.

MOBILE RIVER BASIN

32. Valley Creek near Oak Grove, Ala.

Location.—Lat. 33°26'50", long. 87°07'20", in NW¼ sec. 25, T. 18 S., R. 6 W., at bridge on county road, 1,000 feet downstream from Raccoon Branch, 1½ miles east of Oak Grove, and 1½ miles west of Bessemer.

Drainage area.—145 square miles.

Gage.—Water-stage recorder. Altitude of gage is 320 feet (by barometer). May to July 1936, chain gage 500 feet downstream from present site at same datum.

Extremes.—1936, 1953-55: Maximum discharge, 8,570 cfs Jan. 16, 1954 (gage height, 20.7 feet); minimum discharge observed, 53 cfs July 6, 1936 (gage height, 1.07 feet).

Maximum stage known, 29.6 feet in July 1916 (discharge not determined).

Remarks.—Low flows consist largely of municipal sewage and industrial waste.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF VALLEY CREEK NEAR OAK GROVE, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1936								a79.1	71.6	b75.9			
1953	---	---	---	---	---	---	---	---	---	---	152	133	---
1954	123	125	441	692	283	343	258	205	151	150	143	121	254
1955	112	147	215	412	794	553	640	249	159	321	172	133	322

a May 16-31 b July 1-12

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF VALLEY CREEK NEAR OAK GROVE, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1954	1334	8,570	Jan. 16, 1954	94	254	a	a	---	---
1955	1384	8,520	Feb. 6, 1955	73	322	a	a	235	---

a Not computed because of diversions into drainage basin in Birmingham area.

MOBILE RIVER BASIN

33. Black Warrior River at Lock 17, near Bessemer, Ala.

Location.—Lat. 33°27', long. 87°21', in T. 18 S., R. 8 W., at Lock and Dam 17, 1½ miles downstream from Big Yellow Creek, and 23 miles west of Bessemer.

Drainage area.—3,990 square miles.

Gage.—Staff gage. Datum of gage is 173.11 feet above mean sea level (Corps of Engineers benchmark).

Average discharge.—8 years (1928-36), 6,378 cfs.

Extremes.—1928-36: Maximum discharge, 133,000 cfs Nov. 15, 1929 (gage height, 79.94 feet from graph based on gage readings), from rating curve extended above 22,000 cfs on basis of computations of flow over dam; minimum daily, 20 cfs Oct. 1-10, 20-29, 1931 (leakage through lock and dam).

Maximum stage known, 80.3 feet July 9, 1916 (discharge not determined).

Remarks.—Flow regulated by operation of Lock 17. Figures of discharge include leakage through dam and diversion through lock valves and small power plant.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF BLACK WARRIOR RIVER AT LOCK 17, NEAR BESSEMER, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1928	---	---	---	---	---	---	---	---	---	2,985	1,796	3,113	---
1929	1,121	1,588	978	9,989	11,070	38,050	7,168	18,810	1,731	970	419	1,424	7,802
1930	1,721	32,570	10,030	7,422	6,839	13,590	4,144	9,858	1,109	447	815	1,202	7,460
1931	370	6,286	4,005	6,896	4,975	5,666	7,879	1,469	409	430	686	94.1	3,245
1932	52.3	116	11,420	18,340	29,660	4,883	7,061	4,031	1,779	7,385	2,500	1,493	7,324
1933	12,070	7,590	32,560	9,567	14,770	9,791	9,888	3,457	663	1,007	873	888	8,584
1934	295	395	1,481	7,210	3,493	16,350	3,739	1,376	3,639	3,305	2,537	661	3,726
1935	10,080	2,041	3,614	7,878	8,011	23,050	12,450	7,152	1,871	545	491	172	6,459
1936	186	1,258	2,269	21,510	21,890	8,404	16,710	1,094	262	2,000	1,700	600	6,426

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF BLACK WARRIOR AT LOCK 17, NEAR BESSEMER, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1928	682	---	--------	--	---	---	---	---	---
1929	682	109,000	Mar. 15, 1929	75	7,802	1.96	26.52	11,170	37.99
1930	697	133,000	Nov. 15, 1929	97	7,460	1.87	25.39	4,673	15.91
1931	712	54,800	Nov. 16, 1930	28	3,245	.813	11.04	3,341	11.36
1932	727	64,600	Feb. 16, 1932	20	7,324	1.84	24.98	10,740	36.65
1933	742	a91,300	aOct. 17, 1932	246	8,584	2.15	29.20	4,354	14.81
1934	757	83,100	Mar. 4, 1934	162	3,726	.934	12.69	4,874	16.58
1935	782	78,300	Oct. 10, 1935	82	6,459	1.62	21.97	5,440	18.51
1936	802	118,000	Feb. 4, 1936	80	6,426	1.61	21.93	---	---

a Revised.

MOBILE RIVER BASIN

34. Yellow Creek near Tuscaloosa, Ala.

Location.—Lat. 33°18'20", long. 87°28'40", in NE¼ sec. 16, T. 20 S., R. 9 W., at bridge on county road, 8 miles upstream from mouth, and 8 miles northeast of Tuscaloosa.

Drainage area.—24.2 square miles.

Gage.—Water-stage recorder. Datum of gage is 246.42 feet above mean sea level (levels by engineering department, City of Tuscaloosa).

Extremes.—1951-54; Maximum discharge, 2,500 cfs Mar. 29, 1951 (gage height, 9.35 feet), from rating curve extended above 350 cfs; minimum daily, 4.5 cfs July 28, 29, 1952.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF YELLOW CREEK NEAR TUSCALOOSA, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1951	---	---	---	---	65.2	114	88.5	32.9	22.2	15.7	13.3	20.9	---
1952	11.7	20.2	72.7	40.9	37.5	56.3	37.5	21.9	12.5	7.47	13.9	8.32	28.5
1953	7.57	12.4	29.5	80.6	76.0	51.4	52.4	56.5	17.1	24.5	8.18	7.94	35.2
1954	7.65	11.5	41.2	84.7	29.7	30.5	34.1	19.1	---	---	---	---	---

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF YELLOW CREEK NEAR TUSCALOOSA, ALA.

		Water year ending September 30							Calendar year	
		Momentary maximum								
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches		Mean	Runoff in inches
1951	1204	a2,500	Mar. 29, 1951	a8.6	---	---	---		---	---
1952	1234	500	Dec. 20, 1951	4.5	28.5	1.18	16.01		23.8	13.40
1953	1274	1,700	Jan. 9, 1953	5.0	35.2	1.45	19.72		36.1	20.23
1954	1334	b1,320	Jan. 15, 1954	b5.8	---	---	---		---	---

a For period January to September.
b For period October to May.

MOBILE RIVER BASIN

35. Hurricane Creek near Holt, Ala.

Location.—Lat. 33°12'45", long. 87°26'55", in S½ sec. 14, T. 21 S., R. 9 W., at bridge on county road, ½ mile downstream from Cottondale Creek, 2¾ miles southeast of Holt, and 6 miles upstream from mouth.

Drainage area.—108 square miles.

Gage.—Water-stage recorder. Datum of gage is 173.70 feet above mean sea level, datum of 1929.

Extremes.—1952-55: Maximum discharge, 7,660 cfs Feb. 6, 1955 (gage height, 13.71 feet) affected by failure of Canyon Lake Dam; maximum normal discharge, 6,700 cfs Feb. 6, 1955 (gage height, 12.5 feet); minimum discharge, 1.7 cfs Sept. 5, 1954.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF HURRICANE CREEK NEAR HOLT, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1952	---	---	---	---	---	---	---	---	---	---	50.5	8.73	---
1953	9.00	20.2	61.0	345	429	228	265	251	32.8	62.6	13.9	10.9	142
1954	10.2	12.4	222	375	132	192	133	66.9	12.4	21.5	4.91	2.85	99.0
1955	3.76	13.6	45.2	142	429	221	441	98.2	37.4	44.3	17.5	6.78	122

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF HURRICANE CREEK NEAR HOLT, ALA.

Year	W.S.P.	Water year ending September 30							Calendar year	
		Momentary maximum								
		Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches		Mean	Runoff in inches
1953	1274	4,530	Jan. 9, 1953	3.0	142	1.31	17.88		155	19.52
1954	1334	6,200	Jan. 16, 1954	1.8	99.0	.917	12.44		83.6	10.50
1955	1384	7,660	Feb. 6, 1955	2.9	122	1.13	15.40		---	---

MOBILE RIVER BASIN

36. North River near Samantha, Ala.

Location.—Lat. 33°28'45", long. 87°35'50", in SW¼ sec. 16, T. 18 S., R. 10 W., 100 feet downstream from county highway bridge, ½ mile east of Crumps Store, 1¼ miles upstream from Cripple Creek, and 4 miles north of Samantha.

Drainage area.—219 square miles.

Gage.—Water-stage recorder. Datum of gage is 232.39 feet above mean sea level, datum of 1929. Prior to Jan. 25, 1939, staff gage 40 feet downstream at same datum.

Average discharge.—15 years (1939-54), 340 cfs.

Extremes.—1939-54: Maximum discharge, 18,000 cfs Mar. 29, 1951 (gage height, 30.7 feet); minimum daily, 0.1 cfs Sept. 5-8, 13-15, 1954.

Floods of July 1916 and February 1936 reached a stage of about 31 feet, from information by local residents.

DURATION OF FLOW, 1940-55, NORTH RIVER NEAR SAMANTHA, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	3,800	17.35
2	2,600	11.87
3	2,100	9.59
5	1,500	6.85
7	1,100	5.02
10	800	3.65
15	560	2.56
20	430	1.96
25	340	1.55
30	260	1.19
35	200	.913
40	160	.731
50	96	.438
60	56	.256
70	30	.137
75	24	.110
80	17	.0776
85	13	.0594
90	8.8	.0402
93	7.1	.0324
95	6.0	.0274
97	4.2	.0192
98	3.0	.0137
99	.6	.00274

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF NORTH RIVER NEAR SAMANTHA, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1939	---	---	44.3	491	1,797	884	512	453	514	84.5	139	60.6	---
1940	17.9	21.3	65.5	288	1,122	578	526	124	96.2	1,033	89.3	10.9	a328
1941	16.7	55.8	305	323	264	480	346	41.8	10.0	45.8	156	39.4	173
1942	50.9	76.2	426	303	597	687	149	64.9	187	40.5	100	37.0	225
1943	13.4	24.9	484	164	479	1,128	462	109	27.2	103	24.7	15.3	252
1944	3.75	17.5	24.8	82.0	813	1,285	805	302	93.3	54.5	79.5	104	303
1945	24.3	26.7	176	567	1,166	845	483	418	35.8	133	62.4	21.0	325
1946	74.5	141	555	1,319	1,744	772	239	380	204	264	163	224	500
1947	53.6	649	381	1,337	297	859	652	239	364	113	27.3	12.9	416
1948	14.1	126	331	358	1,376	896	598	52.7	26.7	27.3	22.5	19.7	316
1949	10.8	1,085	850	1,474	1,068	788	353	486	187	57.9	36.5	59.2	535
1950	58.3	55.5	196	1,272	912	1,305	426	248	54.7	53.4	164	288	418
1951	43.0	73.0	212	546	1,060	1,928	896	138	62.2	56.9	17.7	55.9	421
1952	55.5	209	1,108	639	382	700	227	53.1	27.0	10.5	42.2	35.1	292
1953	6.17	20.0	163	978	1,234	667	524	767	52.9	115	16.2	11.5	375
1954	5.13	8.72	138	1,018	250	356	665	239	14.5	4.23	6.75	.34	226

a Corrected.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF NORTH RIVER NEAR SAMANTHA, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1939	872	a12,000	Feb. 28, 1939	--	---	---	---	410	25.43
1940	892	6,880	July 4, 1940	5.3	b328	1.50	20.41	351	21.84
1941	922	3,900	Mar. 7, 1941	4.3	173	.790	10.75	188	11.68
1942	952	6,200	Feb. 17, 1942	6.0	225	1.03	13.92	222	13.77
1943	972	c8,000	Dec. 28, 1942	.8	252	1.15	15.65	212	13.14
1944	1002	8,100	Mar. 29, 1944	1.6	303	1.38	18.86	318	19.81
1945	1032	6,040	Mar. 4, 1945	5.2	325	1.48	20.14	371	22.98
1946	1052	9,950	Feb. 10, 1946	14	500	2.28	30.97	525	32.54
1947	1082	6,590	Jan. 20, 1947	5.1	416	1.90	25.82	366	22.67
1948	1112	5,680	Feb. 9, 1948	3.2	316	1.44	19.67	439	27.29
1949	1142	10,400	Nov. 28, 1948	7.0	535	2.44	33.16	399	24.71
1950	1172	14,000	Mar. 13, 1950	9.9	418	1.91	25.89	419	25.99
1951	1204	18,000	Mar. 29, 1951	3.8	421	1.92	26.07	509	31.54
1952	1234	7,650	Dec. 21, 1951	3.7	292	1.33	18.15	192	11.95
1953	1274	6,380	Feb. 21, Apr. 30, 1953	2.9	375	1.71	23.26	372	23.06
1954	1334	8,160	Jan. 16, 1954	0.1	226	1.03	13.99	---	---

a Revised.
b Corrected.
c Doubtful gage-height record; discharge estimated on basis of adjacent record, rainfall-runoff studies, and records for nearby streams.

MOBILE RIVER BASIN

37. North River near Tuscaloosa, Ala.

Location.—Lat. 33°21'10", long. 87°33'25", in NW¼ sec. 35, T. 19 S., R. 10 W., at bridge on State Highway 69, 1,000 feet upstream from Tierce Creek, and 10 miles north of Tuscaloosa.

Drainage area.—366 square miles.

Gage.—Water-stage recorder. Altitude of gage is 160 feet (by barometer).

Extremes.—1951-55: Maximum discharge, 11,300 cfs Feb. 7, 1955; minimum, 8.4 cfs July 29, 1952.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF NORTH RIVER NEAR TUSCALOOSA, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1952	---	---	1,627	919	643	1,166	416	141	68.9	27.5	128	95.4	---
1953	36.5	72.0	312	1,438	1,736	988	794	1,116	95.7	230	49.9	43.2	570
1954	35.5	55.2	290	1,360	388	536	835	309	43.1	22.0	18.7	12.3	326
1955	16.8	49.5	177	512	1,683	715	1,208	175	97.0	341	64.5	16.2	412

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF NORTH RIVER NEAR TUSCALOOSA, ALA.

		Water year ending September 30							Calendar year	
		Momentary maximum								
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1952	1234	a9,850	Dec. 21, 1951	a10	---	---	---	336	12.59
1953	1274	8,850	Apr. 30, 1953	21	570	1.56	21.14	567	21.01
1954	1334	9,750	Jan. 16, 1954	9.0	326	.891	12.07	314	11.64
1955	1384	11,300	Feb. 7, 1955	12	412	1.13	15.26	---	---

a For period November to September.

MOBILE RIVER BASIN

38. Black Warrior River at Tuscaloosa, Ala.

Location.—Lat. 33°12'50", long. 87°34'25", in SW¼ sec. 15, T. 21 S., R. 10 W., at bridge on U. S. Highway 82, in Tuscaloosa, ¼ mile upstream from Gulf, Mobile & Ohio Railroad bridge and ¾ mile upstream from Tuscaloosa Lock and Dam.

Drainage area.—4,828 square miles.

Gage.—Water-stage recorder. Datum of gage is 83.35 feet above mean sea level, datum of 1929, supplementary adjustment of 1944.

Prior to December 1905, staff gage 1/3 mile downstream and 300 feet downstream from present Gulf, Mobile & Ohio Railroad bridge, at datum 2.5 feet higher than present datum.

Aug. 1, 1928, to Aug. 28, 1939, staff gage just above former Lock 10, ½ mile upstream from present site, at present datum.

Aug. 29, 1939, to Mar. 19, 1951, recording gage ¼ mile downstream from present site and 55 feet downstream from Gulf, Mobile & Ohio Railroad bridge, at present datum.

Subsequent to Apr. 19, 1944, auxiliary water-stage recorder, and Aug. 29, 1939, to Apr. 18, 1944, auxiliary staff gage 500 feet downstream from Tuscaloosa Lock and Dam, at datum 1.08 feet lower.

Average discharge.—35 years (1894-1902, 1928-55), 7,720 cfs.

Extremes.—1889-1905, 1928-55: Maximum discharge, 223,000 cfs Mar. 29, 1951; maximum gage height, 67.7 feet Apr. 18, 1900; minimum daily discharge, 37 cfs Oct. 23, 1953.

Maximum stage known, that of Apr. 18, 1900.

Remarks.—Some regulation at low flow by lock below gage, and occasional regulation by reservoir above Lock 17 (usable capacity, 112,000 acre-feet). Diversion through lock valves included in figures of discharge.

DURATION OF FLOW, 1940-55, BLACK WARRIOR RIVER AT TUSCALOOSA, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	78,000	16.2
2	54,000	11.2
3	43,000	8.91
5	31,000	6.42
7	24,000	4.97
10	18,000	3.73
15	13,000	2.69
20	10,000	2.07
25	7,900	1.64
30	6,200	1.28
35	4,800	.994
40	3,700	.766
50	2,200	.456
60	1,400	.290
70	850	.176
75	660	.137
80	510	.106
85	390	.0808
90	290	.0601
93	230	.0476
95	200	.0414
97	160	.0331
98	130	.0269
99	92	.0191

DURATION OF FLOW, 1929-55, BLACK WARRIOR RIVER AT TUSCALOOSA, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	78,000	16.2
2	54,000	11.2
3	43,000	8.91
5	32,000	6.63
7	25,000	5.18
10	19,000	3.94
15	13,000	2.69
20	10,000	2.07
25	7,900	1.64
30	6,200	1.28
35	4,900	1.01
40	3,900	.808
50	2,400	.497
60	1,500	.311
70	950	.197
75	760	.157
80	600	.124
85	460	.0953
90	340	.0704
93	280	.0580
95	230	.0476
97	190	.0394
98	160	.0331
99	110	.0228

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF BLACK WARRIOR RIVER AT TUSCALOOSA, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1895	a261	a255	a1,960	25,464	7,603	39,977	6,895	5,511	2,133	3,581	1,098	883	a8,031
1896	233	488	2,021	5,981	19,161	12,996	6,072	7,420	2,910	1,232	478	201	4,880
1897	157	307	955	3,493	8,409	52,883	9,657	3,600	715	1,809	701	295	6,949
1898	93	115	5,549	16,577	3,902	3,626	15,620	1,766	303	549	1,783	252	4,182
1899	880	1,626	3,763	18,118	30,923	35,308	11,901	2,092	448	1,111	963	200	8,823
1900	130	721	8,880	9,857	18,356	27,105	48,426	3,702	32,614	10,952	1,674	1,580	13,549
1901	3,382	3,701	5,119	22,938	15,094	11,947	17,370	4,355	3,217	1,210	7,117	2,626	8,132
1902	1,536	712	13,293	12,712	21,987	36,776	18,707	2,349	648	311	477	1,444	9,184
1903	3,393	3,136	8,353	---	---	---	---	---	---	---	---	---	---
1928	---	---	---	---	---	---	---	---	---	---	2,490	3,780	---
1929	1,480	2,120	1,520	12,000	13,800	49,600	9,490	23,700	2,540	1,290	694	2,170	10,100
1930	2,250	39,700	12,400	9,840	9,040	17,600	5,690	12,500	2,360	722	1,290	1,680	9,560
1931	596	8,510	6,140	8,430	5,960	6,890	10,000	2,000	471	601	982	276	4,220
1932	233	398	14,200	21,700	32,700	6,340	9,720	5,020	2,360	8,540	3,650	2,380	8,870
1933	17,300	9,260	35,800	11,400	18,700	12,900	12,400	4,340	1,020	1,500	1,170	1,190	10,600
1934	578	748	2,171	8,635	4,465	19,880	4,861	1,804	4,133	3,619	3,144	811	4,593
1935	12,660	2,876	4,860	9,668	9,361	27,620	15,470	9,357	3,339	771	817	288	8,026

1936	376	1,817	3,095	25,130	27,440	9,414	17,180	1,876	477	2,493	2,238	786	7,614
1937	505	470	2,894	38,460	13,560	10,210	7,895	16,910	1,246	1,105	1,346	3,331	8,171
1938	4,029	1,215	2,694	8,376	5,255	19,740	32,010	3,570	2,176	4,635	4,401	519	7,385
1939	191	1,309	1,233	9,361	31,590	19,700	10,950	4,671	11,530	2,813	7,039	2,583	8,412
1940	650	755	1,202	6,852	25,460	15,910	12,670	3,050	3,071	22,680	1,175	521	7,776
1941	435	1,104	5,083	7,343	6,097	10,680	5,517	1,010	346	2,554	8,603	661	4,128
1942	925	1,233	7,985	5,017	13,980	16,300	3,653	1,402	3,228	1,060	3,561	1,240	4,921
1943	545	898	16,570	6,820	9,927	24,690	12,150	1,916	784	1,042	872	757	6,416
1944	176	382	858	3,280	19,870	29,650	21,040	5,915	1,733	557	1,942	1,162	7,157
1945	435	460	2,483	10,960	26,150	19,570	10,280	7,609	1,079	890	815	353	6,639
1946	829	1,713	8,187	33,950	39,330	16,440	4,933	7,953	3,599	5,281	2,782	5,131	10,690
1947	1,356	12,810	8,774	38,090	7,793	19,850	14,620	4,988	3,597	854	785	282	9,515
1948	303	1,820	5,004	5,827	36,040	19,540	15,850	1,554	892	938	1,156	406	7,317
1949	356	21,740	18,490	39,310	29,130	17,590	10,760	8,877	5,024	3,790	1,210	2,511	13,140
1950	1,470	2,181	4,856	23,010	18,730	27,220	5,455	5,015	2,900	4,620	2,763	5,795	8,636
1951	961	1,361	4,022	10,250	21,720	33,240	21,860	2,420	1,006	2,018	597	1,091	8,292
1952	566	3,370	25,360	12,900	10,630	16,710	4,586	1,459	1,189	288	1,852	527	6,643
1953	785	562	4,226	20,300	23,600	11,980	7,521	13,590	967	1,748	361	192	7,071
1954	189	234	4,421	22,700	5,591	8,343	7,157	3,117	1,254	418	388	139	4,512
1955	206	562	3,183	8,761	23,710	12,910	14,330	3,309	1,858	3,846	1,173	387	6,063

a Not previously published; computed on basis of gage-height record and rating table.

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF BLACK WARRIOR RIVER AT TUSCALOOSA, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1895	107	---	------	205	a8,031	a1.66	a22.58	7.991	22.64
1896	107	---	------	120	4,880	1.01	13.75	4,822	13.44
1897	107	---	------	102	6,949	1.44	19.54	7,277	20.58
1898	107	---	------	90	4,182	.866	11.77	4,221	11.88
1899	107	---	------	110	8,823	1.83	24.82	9,233	25.65
1900	107	215,000	Apr. 18, 1900	92	13,550	2.81	38.10	13,872	38.67
1901	75,107	---	------	340	8,132	1.68	22.89	8,454	23.69
1902	83	---	------	280	9,184	1.90	25.80	9,191	25.62
1928	662	---	------	--	----	---	----	----	----
1929	682	132,000	Mar. 15, 1929	183	10,000	2.09	28.29	14,150	39.76
1930	697	166,000	Nov. 15, 1929	159	9,560	1.98	26.89	6,326	17.80
1931	712	55,500	Nov. 17, 1930	175	4,220	.874	11.86	4,210	11.83
1932	727	78,000	Feb. 17, 1932	94	8,870	1.84	25.00	12,870	36.28
1933	742	127,000	Oct. 17, 1932	390	10,600	2.20	29.71	5,590	15.71
1934	757	99,700	Mar. 4, 1934	303	4,593	.951	12.91	6,022	16.92
1935	782	106,000	Mar. 7, 1935	134	8,026	1.66	22.56	6,746	18.97
1936	802	148,000	Feb. 4, 5, 1936	100	7,614	1.58	21.47	7,498	21.14
1937	822	107,000	Jan. 3, 1937	248	8,171	1.69	22.97	8,515	23.93
1938	852	144,000	Apr. 8, 1938	83	7,385	1.53	20.75	6,943	19.51

1939	872	121,000	Mar. 1, 1939	151	8,412	1.74	23.65	8,403	23.63
1940	1002	112,000	Feb. 6, 1940	141	7,776	1.61	21.94	8,115	22.89
1941	1002	55,900	Mar. 7, 1941	92	4,128	.855	11.59	4,426	12.43
1942	1002	87,800	Feb. 18, 1942	191	4,921	1.02	13.83	5,590	15.72
1943	1002	117,000	Dec. 29, 1942	174	6,416	1.33	18.05	5,008	14.08
1944	1002	150,000	Mar. 29, 1944	57	7,157	1.48	20.16	7,323	20.63
1945	1032	93,500	Feb. 14, 1945	104	6,639	1.38	18.66	7,259	20.41
1946	1052	169,000	Feb. 10, 1946	157	10,690	2.21	30.05	11,690	32.88
1947	1082	146,000	Jan. 20, 1947	104	8,515	1.97	26.76	8,203	23.07
1948	1112	121,000	Feb. 14, 1948	77	7,317	1.52	20.63	10,100	28.46
1949	1142	177,000	Jan. 5, 1949	175	13,140	2.72	36.94	10,470	29.43
1950	1172	152,000	Mar. 14, 1950	321	8,636	1.79	24.27	8,454	23.76
1951	1204	223,000	Mar. 29, 1951	67	8,292	1.72	23.31	10,240	28.78
1952	1234	120,000	Dec. 21, 1951	40	6,643	1.38	18.72	4,641	13.08
1953	1274	97,700	Jan. 9, 1953	46	7,071	1.46	19.88	7,010	19.71
1954	1334	127,000	Jan. 16, 1954	37	4,512	.935	12.68	4,810	13.52
1955	1384	113,000	Feb. 7, 1955	93	6,063	1.26	17.04	——	——

a Not previously published.

MOBILE RIVER BASIN

39. Fivemile Creek near Greensboro, Ala.

Location.—Lat. 32°50', long. 87°36', in N½ sec. 5, T. 21 N, R. 5 E., at bridge on State Highway 69, 8½ miles north of Greensboro, and 12 miles upstream from mouth.

Drainage area.—72.2 square miles.

Gage.—Water-stage recorder. Altitude of gage is 160 feet (by barometer).

Extremes.—1954-55: Maximum discharge, 1,470 cfs Apr. 14, 1955 (gage height, 7.90 feet); minimum, 0.1 cfs Sept. 16, 1954.

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF FIVEMILE CREEK NEAR GREENSBORO, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1954	—	—	—	—	—	—	—	—	—	5.25	3.37	1.98	—
1955	3.72	7.10	38.7	80.5	169	85.2	327	42.9	16.5	39.0	10.7	3.22	67.5

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF FIVEMILE CREEK NEAR GREENSBORO, ALA.

	Water year ending September 30							Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1955	1384	1,470	Apr. 14, 1955	1.4	67.5	0.935	12.71	—	—

MOBILE RIVER BASIN

40. Black Warrior River near Eutaw, Ala.

Location.—Lat. 32°49'05", long. 87°49'00", in SE¼ sec. 6, T. 21 N., R. 3 E., at bridge on State Highway 14, 1¼ miles downstream from Big Creek, and 4 miles southeast of Eutaw.

Drainage area.—5,797 square miles.

Gage.—Water-stage recorder. Datum of gage is 53.11 feet above mean sea level, adjustment of 1912. Prior to Jan. 10, 1955, auxiliary staff gages read twice daily at Lock 7, 3 miles downstream from base gage. Subsequent to Jan. 11, 1955, auxiliary staff gage read once daily at Lock 8, 12 miles upstream from base gage.

Average discharge.—23 years (1932-55), 8,858 cfs.

Extremes.—1932-55: Maximum discharge, 183,000 cfs Apr. 1, 1951; maximum gage height, 59.1 feet, Apr. 1, 1951; minimum discharge, 177 cfs Oct. 9, 1935 (gage height, 18.44 feet); minimum daily, 203 cfs Oct. 9, 1935.

Remarks.—Occasional regulation by reservoir at Lock 17 (usable capacity, 112,000 acre-feet).

Cooperation.—Base data collected by Corps of Engineers.

DURATION OF FLOW, 1940-55, BLACK WARRIOR RIVER NEAR EUTAW, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	58,000	10.0
2	48,000	8.28
3	42,000	7.25
5	36,000	6.21
7	31,000	5.35
10	25,000	4.31
15	17,000	2.93
20	12,000	2.07
25	9,700	1.67
30	7,800	1.35
35	6,100	1.05
40	4,900	.845
50	3,200	.552
60	2,100	.362
70	1,400	.242
75	1,180	.204
80	960	.166
85	780	.135
90	640	.110
93	560	.0966
95	500	.0863
97	440	.0759
98	400	.0690
99	360	.0621

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF BLACK WARRIOR RIVER NEAR EUTAW, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1932	---	---	---	---	---	---	---	---	2,560	8,910	4,080	3,010	---
1933	18,900	9,300	40,100	22,000	20,800	15,200	14,900	5,360	1,580	2,160	1,410	1,680	12,800
1934	873	1,024	2,738	9,717	4,828	24,930	7,002	2,654	4,974	3,991	3,911	1,184	5,682
1935	13,210	3,818	6,119	11,930	10,860	33,350	19,240	11,670	3,133	1,153	1,182	547	9,706
1936	489	2,039	3,608	28,570	33,990	10,210	23,000	2,960	770	3,082	2,822	1,020	9,275
1937	710	709	3,258	43,850	19,910	13,150	8,288	21,920	1,737	1,327	1,450	4,724	10,070
1938	4,871	2,217	3,347	10,000	6,455	21,330	39,220	4,625	3,098	5,593	4,982	934	8,883
1939	397	1,839	1,814	9,856	30,650	26,050	13,960	5,090	12,890	3,347	8,610	3,304	9,665
1940	1,068	1,038	1,689	7,822	28,790	16,650	16,660	4,460	4,418	25,380	1,803	870	9,152
1941	720	1,583	6,235	8,070	7,740	12,980	6,474	1,711	758	3,072	10,060	1,194	5,055
1942	1,112	1,650	9,350	6,009	14,780	19,460	5,306	2,141	4,414	1,566	3,771	1,609	5,887
1943	746	1,121	9,111	16,460	12,090	27,600	15,020	3,235	1,345	1,727	1,264	1,382	7,586
1944	427	812	1,467	4,502	17,970	26,270	35,150	8,957	2,507	1,021	2,486	1,560	8,528
1945	844	947	2,770	11,760	28,880	22,820	10,950	10,960	2,211	1,739	1,442	710	7,878
1946	1,295	2,213	8,515	34,660	44,610	18,100	7,508	9,537	4,474	6,129	3,573	5,593	12,000
1947	1,882	12,980	8,664	41,020	9,729	22,110	16,680	6,828	5,610	2,069	1,293	796	10,830
1948	764	3,207	6,552	6,397	38,820	23,890	18,910	2,874	1,731	1,684	1,570	684	8,790
1949	531	12,780	30,590	44,370	32,850	16,540	17,630	11,700	6,000	4,886	1,746	3,563	15,180
1950	1,441	3,490	5,728	23,350	21,190	28,580	6,907	6,815	3,623	4,511	2,944	7,878	9,657
1951	1,669	2,047	4,867	10,990	22,870	23,860	37,070	3,986	1,911	2,984	1,230	1,492	9,461
1952	1,063	3,634	24,630	16,240	12,740	19,350	7,585	2,893	1,935	646	2,172	749	7,824
1953	932	723	4,121	21,250	24,560	15,880	7,447	17,200	1,543	2,573	893	432	8,061
1954	345	417	5,251	23,070	7,048	9,865	8,378	4,183	1,590	743	614	323	5,164
1955	480	812	2,527	10,520	22,510	13,830	17,670	3,689	2,562	3,917	1,360	590	6,590

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF BLACK WARRIOR RIVER NEAR EUTAW, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1932	727	—	—	—	—	—	—	—	—
1933	742	85,600	Dec. 17, 1932	633	12,800	2.21	29.95	7,401	17.32
1934	757	68,200	Mar. 7, 1934	486	5,682	.980	13.31	7,246	16.98
1935	782	72,700	Mar. 9, 1935	318	9,706	1.67	22.73	8,267	19.36
1936	802	130,000	Feb. 7, 1936	203	9,275	1.60	21.78	9,155	21.50
1937	822	66,700	Jan. 6, 1937	454	10,070	1.74	23.59	10,560	24.73
1938	852	122,000	Apr. 11, 1938	424	8,883	1.53	20.81	8,341	19.53
1939	872	69,300	Mar. 4, 1939	327	9,665	1.67	22.64	9,646	22.60
1940	892	50,400	July 18, 1940	440	9,152	1.58	21.51	9,552	22.44
1941	922	39,500	Mar. 9, 1941	417	5,055	.872	11.83	5,359	12.55
1942	952	46,000	Feb. 20, 1942	502	5,887	1.02	13.79	5,792	13.57
1943	972	79,800	Jan. 2, 1943	380	7,586	1.31	17.76	6,884	16.11
1944	1002	109,000	Apr. 1, 1944	335	8,528	1.47	20.02	8,684	20.39
1945	1032	54,300	Feb. 15, 1945	330	7,878	1.36	18.47	8,509	19.95
1946	1052	134,000	Feb. 13, 1946	470	12,000	2.07	28.09	12,940	30.30
1947	1082	114,000	Jan. 23, 1947	447	10,830	1.87	25.37	9,756	22.85
1948	1112	102,000	Feb. 16, 1948	431	8,790	1.52	20.62	11,590	27.20
1949	1142	158,000	Jan. 9, 1949	410	15,180	2.62	35.55	12,380	29.00
1950	1172	103,000	Mar. 17, 1950	880	9,657	1.67	22.63	9,485	22.22
1951	1204	183,000	Apr. 1, 1951	290	9,461	1.63	22.15	11,220	26.27
1952	1234	54,600	Dec. 24, 1951	390	7,824	1.35	18.37	5,837	13.71
1953	1274	54,700	Feb. 25, 1953	400	8,061	1.39	18.88	8,082	18.92
1954	1334	55,400	Jan. 20, 1954	254	5,164	.891	12.09	4,976	11.66
1955	1384	51,700	Feb. 9, 1955	437	6,590	1.14	15.42	—	—

MOBILE RIVER BASIN

41. Prairie Creek near Gallion, Ala.

Location.—Lat. 32°32', long. 87°41', in SE¼ sec. 9, T. 18 N., R. 4 E., at bridge on State Highway 69, 4 miles upstream from Little Prairie Creek, and 4 miles northwest of Gallion.

Drainage area.—169 square miles.

Gage.—Water-stage recorder. Auxiliary staff gage read once daily at Lock 5 on Black Warrior River, ¾ mile upstream from Prairie Creek.

Average discharge.—12 years (1940-52), 238 cfs.

Extremes.—1940-52: Maximum discharge, 39,000 cfs Dec. 28, 1942 (gage height in stilling well, 19.3 feet; from outside gage, 20.1 feet); minimum daily since Oct. 1, 1944, a reverse flow of 10 cfs Apr. 2, 1951, caused by backwater from Black Warrior River; minimum prior to Oct. 1, 1944, not determined.

Cooperation.—Base data collected by Corps of Engineers.

DURATION OF FLOW, 1940-55, PRAIRIE CREEK NEAR GALLION, ALA.

Percent of time	Discharge (cfs)	Discharge (cfsm)
1	3,600	21.3
2	2,300	13.6
3	1,750	10.4
5	1,200	7.10
7	860	5.09
10	540	3.20
15	200	1.18
20	130	.769
25	95	.562
30	72	.426
35	55	.325
40	44	.260
50	28	.166
60	17	.101
70	12	.0710
75	9.4	.0556
80	7.5	.0444
85	5.8	.0343
90	4.2	.0249
93	3.1	.0183
95	2.5	.0148
97	1.8	.0107
98	1.4	.00828
99	.6	.00355

MONTHLY AND YEARLY MEAN DISCHARGE, IN CUBIC FEET PER SECOND, OF PRAIRIE CREEK NEAR GALLION, ALA.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1940		---	---	---	822	361	177	228	234	537	40.6	7.4	---
1941	6.0	17.6	213	111	137	456	137	10.5	7.0	12.3	73.5	6.1	99.1
1942	3.5	7.4	235	126	385	1,026	76.0	44.9	40.2	22.5	78.7	26.7	172
1943	8.5	11.0	989	81.5	199	726	267	49.7	29.8	217	13.4	42.1	221
1944	5.0	84.8	112	417	792	1,237	1,146	88.7	18.6	10.1	73.4	15.9	331
1945	8.05	18.3	50.6	183	857	951	676	210	42.5	69.1	12.7	10.2	253
1946	18.8	21.5	274	566	467	412	77.3	310	71.6	160	228	297	241
1947	14.5	195	162	1,610	260	460	689	470	206	121	13.9	8.44	352
1948	8.04	251	381	348	777	1,584	442	39.9	37.1	40.3	12.8	10.1	327
1949	6.65	762	315	602	895	438	270	263	110	53.3	65.1	301	335
1950	16.3	19.3	113	222	318	327	39.2	369	19.8	126	47.2	143	146
1951	14.1	18.6	295	349	536	1,284	272	45.5	24.7	7.23	4.71	9.25	238
1952	4.79	9.85	95.2	219	108	630	205	301	17.2	4.72	8.87	1.72	135

YEARLY DISCHARGE, IN CUBIC FEET PER SECOND, OF PRAIRIE CREEK NEAR GALLION, ALA.

		Water year ending September 30						Calendar year	
		Momentary maximum							
Year	W.S.P.	Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1940	1032	7,500	Feb. 6, 1940	—	--	—	—	—	—
1941	1032	10,500	Mar. 7, 1941	—	99.1	0.586	7.96	100	8.02
1942	1032	a16,300	Mar. 21, 1942	—	172	1.02	13.85	237	19.06
1943	1032	39,000	Dec. 28, 1942	—	221	1.31	17.77	152	12.24
1944	1032	19,500	Mar. 23, 1944	—	331	1.96	26.64	321	25.81
1945	1032	25,100	Mar. 26, 1945	3.9	253	1.50	20.35	273	21.97
1946	1052	5,100	Dec. 25, 1945	4.2	241	1.43	19.39	246	19.73
1947	1082	16,300	Jan. 19, 1947	4.4	352	2.08	28.30	375	30.13
1948	1112	21,100	Mar. 23, 1948	4.9	327	1.93	26.31	363	29.23
1949	1142	9,400	Jan. 5, 1949	4.4	335	1.98	26.93	258	20.71
1950	1172	4,280	May 21, 1950	5.5	146	.864	11.74	161	12.97
1951	1204	32,400	Mar. 29, 1951	b-10	238	1.41	19.08	219	17.59
1952	1234	10,500	Mar. 4, 1952	0.4	135	.799	10.84	—	—

a Maximum observed.
b Upstream flow caused by backwater from Black Warrior River.

Selected Site Records

All continuous records of daily discharge available for streams in west-central Alabama were summarized in the preceding section. The drainage basins of these gaged streams range in size from 22.8 to 8,790 square miles; but only 5 of the 41 basins are smaller than 100 square miles, and the median-sized basin is 316 square miles. Consequently, there remain in the area many small streams whose flow characteristics never have been directly investigated. Because small streams are more numerous than large streams and because they are closer to a greater number of potential users of water, small streams are of considerable importance as possible sources of water supply for small towns and for irrigation. As the use of surface water for these purposes increases, the small stream will play an increasingly important part in the water economy of the area. Thus, a study of the area's surface-water resources should include some investigation of the discharge characteristics of smaller streams.

Such investigations generally are limited by the amount of funds and time available. In most cases both are too short for a small-streams study based entirely on a program of continuous gaging. While it is true that continuous gaging is desirable if the character of a stream is to be completely revealed, much valuable information can often be economically obtained without such long and minute scrutiny. This is particularly true if information is desired only on some single aspect of streamflow as, for example, low flow or flood flow.

Flood flows are studied primarily to arrive at a basis for the design of culverts, bridges, spillways, and other drainage or control structures whose purpose is simply to pass on excess runoff with a minimum of damage to existing facilities. On the other hand, studies of low flow are directly related to the use of the water itself. The low flow of a stream is the critical design quantity for many uses, for when no storage is provided, the supply is limited to the amount that nature provides. Thus, it is important to know the low-flow characteristics of streams that are now or may in the future be developed for use.

This section of the report presents information on the low flows of a selected group of 23 streams in west central Alabama. Most of these would be classified as small streams (only 5 exceed 100 square miles in drainage area). In selecting these streams for study, an effort was made to anticipate the future water-supply needs of municipalities and industry. The stream nearest every town with a population of 500 or more was considered a potential water supply and an effort was made to determine the low-flow regimen.

The discharge of these selected streams was measured during low-flow conditions when streamflow is primarily from ground-water sources. In themselves, these discharge measurements are of no great value, but when correlated with the simultaneous discharge of a continuously gaged stream for which a long-term record is available, they give an accurate picture of the low-flow potential of the stream. As one of the most useful tools for the preliminary studies of low flow is the flow-duration curve, the low-flow portion of the duration curve has been computed for nearly all of the selected streams. Because many of the discharge measurements were made in the fall of 1954, an outstandingly dry year, the low flows measured were extreme, and it was found possible in most cases to extend the estimated duration curves to 99 percent flow duration without extrapolating beyond the range of the measurements. A description of the correlation technique used for estimating the duration curve is contained in other volumes of this series of reports and need not be repeated here.[1]

Data Presented

The locations of the selected sites are identified by reference number on plate 1. The data are presented in alphabetical order by stream name and include the following:

1. The location of the site on the stream referenced to land-line surveys and to physical landmarks.

2. The drainage area in square miles.

3. The name and drainage area of the gaged stream with which the flow of the selected stream was correlated (index station).

4. A tabulation of discharge measurements made at the selected site. When known, the corresponding discharge of the index station is also shown.

5. The estimated discharge for selected percentages of time between 60 and 99 percent for the base period 1940-55. This information is not shown for station 19, for which no satisfactory correlation could be established; nor for station 9 beyond the 95 percent point, because of poor definition of the discharge relation.

[1] For example, see the section of Low Flow, Hydrology and Surface-Water Resources of East-Central Alabama, Geological Survey of Alabama Special Report 22, 1955.

1. BEAR CREEK NEAR GORDO, ALA.

Pickens County

Location—In N½ sec. 5, T. 20 S., R. 13 W., at bridge on U. S. Highway 82, 2 miles northwest of Gordo.

Drainage area.—22.2 square miles.

Index station.—Luxapalila Creek near Fayette, Ala.
Drainage area: 127 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Sept. 14, 1954	0.72	26
Sept. 25, 1955	2.02	40
Jan. 10, 1956	8.26	58
Sept. 19, 1956	.52	27
Oct. 30, 1956	8.47	55

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	(cfsm)
60	14	0.63
70	11	.50
80	8.8	.40
90	5.2	.23
95	3.6	.16
97	2.9	.13
99	1.4	.063

2. BEAVER CREEK NEAR GUIN, ALA.

Marion County

Location.—In SW ¼ sec. 20, T. 12 S., R. 13 W., at bridge on U. S. Highway 78 and 43, 2 miles north of Guin.

Drainage area.—18.2 square miles.

Index station.—Buttahatchee River below Hamilton, Ala. Drainage area: 284 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Sept. 7, 1946	4.04	—
Aug. 18, 1954	2.56	26
Sept. 14, 1954	2.06	20
Oct. 12, 1954	2.79	36
Sept. 25, 1955	2.74	37
Jan. 9, 1956	5.43	71
Sept. 18, 1956	2.70	33
Nov. 18, 1956	6.82	92

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	Discharge (cfsm)
60	8.2	0.45
70	6.5	.36
80	5.2	.29
90	4.1	.23
95	3.4	.19
97	3.0	.16
99	2.5	.14

3. BIG CREEK NEAR WEDGEWORTH, ALA.

Hale County

Location.—In SE¼ sec. 2, T. 21 N., R. 3 E., at bridge on State Highway 60, 1½ miles north of Wedgeworth.

Drainage area.—193 square miles.

Index station.—Mulberry River at Jones, Ala.
Drainage area: 208 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
June 24, 1943	24.1	126
Aug. 24, 1943	5.15	71
Oct. 6, 1944	10.1	84
Oct. 25, 1944	6.94	69
July 12, 1945	25.1	99
Aug. 23, 1945	12.3	69
Sept. 13, 1954	1.38	30
Oct. 12, 1954	1.69	32
Sept. 24, 1955	3.50	57
Jan. 9, 1956	24.6	86
Sept. 17, 1956	2.77	53
Oct. 29, 1956	6.59	92

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	Discharge (cfsm)
60	33	0.17
70	23	.12
80	14	.073
90	9.0	.047
95	6.0	.031
97	4.0	.021
99	2.4	.012

4. BIG SANDY CREEK NEAR DUNCANVILLE, ALA.

Tuscaloosa County

Location.—In NE¼ sec. 14, T. 24 N., R. 6 E., at bridge on U. S. Highway 82, ½ mile east of Duncanville.

Drainage area.—56.0 square miles.

Index station.—Mulberry River at Jones, Ala.
Drainage area: 208 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
June 23, 1943	30.7	114
Aug. 5, 1943	22.4	71
Oct. 10, 1943	31.5	69
June 24, 1944	34.7	95
Oct. 6, 1944	30.5	84
July 13, 1945	31.2	99
Sept. 13, 1954	20.6	30
Oct. 11, 1954	21.6	33
Sept. 24, 1955	20.0	57
Aug. 22, 1956	26.1	63
Sept. 19, 1956	24.2	57
Oct. 26, 1956	31.6	97
Dec. 5, 1956	31.9	84
Jan. 8, 1957	62.4	223
Feb. 16, 1957	69.5	170

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	Discharge (cfsm)
60	43	0.77
70	38	.68
80	34	.61
90	30	.54
95	27	.48
97	25	.45
99	22	.39

5. BOGUE CREEK NEAR SULLIGENT, ALA.

Lamar County

Location.—In NE¼ sec. 31, T. 13 S., R. 15 W., at bridge on U. S. Highway 278, 1 mile west of Sulligent.

Drainage area.—13.3 square miles.

Index station.—Buttahatchee River near Sulligent, Ala.
Drainage area: 472 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Sept. 15, 1954	4.39	32
Oct. 13, 1954	6.45	63
Sept. 24, 1955	6.71	59
Jan. 10, 1956	8.62	135
Sept. 18, 1956	6.00	58
Nov. 27, 1956	9.67	176

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	(cfsm)
60	10.5	0.79
70	9.3	.70
80	8.4	.63
90	7.5	.56
95	6.9	.52
97	6.6	.50
99	5.9	.44

6. BRINDLE CREEK NEAR HANCEVILLE, ALA.

Cullman County

Location.—In NW¼ sec. 15, T. 11 S., R. 2 W., at bridge on county road, 2 miles northeast of Hanceville.

Drainage area.—106 square miles.

Index station.—Mulberry Fork near Garden City, Ala.
Drainage area: 368 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Oct. 23, 1941	2.00	11
Aug. 25, 1943	.97	6
Oct. 13, 1948	.22	4.9
Dec. 14, 1948	116	500
Sept. 14, 1954	1.07	7.2
Oct. 12, 1954	.16	9.6
Sept. 26, 1955	3.78	20.7
Jan. 9, 1956	6.32	45.6
Sept. 18, 1956	1.90	10.2
Nov. 27, 1956	2.02	13.6

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	Discharge (cfsm)
60	23	0.22
70	12	.11
80	5.0	.047
90	2.2	.021
95	1.4	.013
97	1.1	.010
99	.6	.0057

7. CALVERT PRONG NEAR ONEONTA, ALA.

Blount County

Location.—In SW¼ sec. 14, T. 12 S., R. 1 E., at bridge on U. S. Highway 231, 4 miles northwest of Oneonta.

Drainage area.—34.8 square miles.

Index station.—Locust Fork near Cleveland, Ala.
Drainage area: 309 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Oct. 9, 1948	8.90	11
Sept. 13, 1954	6.58	2.5
Oct. 11, 1954	6.16	4.3
Sept. 26, 1955	7.12	5.4
Jan. 10, 1956	12.8	49
Sept. 18, 1956	8.98	6.3
Nov. 27, 1956	8.51	7.9

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	Discharge (cfsm)
60	14	0.40
70	12	.34
80	11	.32
90	9.5	.27
95	8.5	.24
97	8.0	.23
99	7.5	.22

8. CLEAR CREEK NEAR DOUBLE SPRINGS, ALA.

Winston County

Location.—In NE¼ sec. 1, T. 11 S., R. 9 W., at bridge on county road, 3 miles southwest of Double Springs.

Drainage area.—88.5 square miles.

Index station.—Clear Creek at Falls City, Ala.
Drainage area: 147 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Sept. 15, 1954	5.23	7.8
Oct. 13, 1954	9.42	15
Sept. 24, 1955	9.61	16.3
Sept. 17, 1956	10.3	16.7
Jan. 8, 1956	17.9	33.0
Nov. 26, 1956	38.0	53.4

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	Discharge (cfsm)
60	42	0.47
70	30	.34
80	23	.26
90	16	.18
95	13	.15
97	12	.14
99	7.8	.088

9. COPELAND CREEK AT BLOUNTSVILLE, ALA.

Blount County

Location.—In SE¼ sec. 12, T. 11 S., R. 1 W., at bridge on county road, ½ mile north of Blountsville, Ala.

Drainage area.—12.4 square miles.

Index station.—Mulberry Fork near Garden City, Ala. Drainage area: 368 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Sept. 14, 1954	No flow	7.2
Oct. 12, 1954	0.13	9.6
Sept. 26, 1955	.70	20.7
Jan. 10, 1956	1.29	41.6
Sept. 18, 1956	.27	10.2
Nov. 27, 1956	.46	13.6

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	(cfsm)
60	3.5	0.28
70	1.9	.15
80	.90	.073
90	.37	.030
95	.05	.004

10. COPELAND CREEK NEAR HANCEVILLE, ALA.

Blount County

Location.—In S½ sec. 19, T. 11 S., R. 1 W., at mouth, 5 miles east of Hanceville.

Drainage area.—27.0 square miles.

Index station.—Mulberry Fork near Garden City, Ala.
Drainage area: 368 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Sept. 14, 1954	5.54	7.2
Oct. 12, 1954	5.49	9.6
Sept. 26, 1955	6.12	20.7
Jan. 9, 1956	8.00	45.6
Sept. 18, 1956	7.58	10.2
Nov. 27, 1956	5.19	13.6

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	(cfsm)
60	11	0.41
70	8.7	.32
80	7.0	.26
90	5.7	.21
95	5.2	.19
97	5.0	.18
99	4.6	.17

11. ELLIOTS CREEK NEAR MOUNDVILLE, ALA.

Hale County

Location.—In W½ sec. 6, T. 23 N., R. 5 E., at bridge on State Highway 69 at Moundville.

Drainage area.—31.2 square miles.

Index station.—Mulberry River at Jones, Ala.
Drainage area: 208 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Nov. 3, 1948	20.5	128
Sept. 13, 1954	6.91	30
Oct. 12, 1954	9.11	32
Sept. 24, 1955	7.20	57
Jan. 9, 1956	14.9	86
Sept. 17, 1956	7.10	53
Oct. 29, 1956	15.1	92

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	(cfsm)
60	22	0.71
70	19	.61
80	16	.51
90	13	.42
95	11	.35
97	9.4	.30
99	7.3	.23

12. FIVEMILE CREEK NEAR AKRON, ALA.

Hale County

Location.—In SE¼ sec. 18, T. 22 N., R. 4 E., at bridge on State Highway 60, 1 mile east of Akron.

Drainage area.—104 square miles.

Index station.—Mulberry River at Jones, Ala.
Drainage area: 208 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
June 24, 1943	10.9	126
Oct. 5, 1943	13.7	86
June 9, 1944	39.1	132
Sept. 13, 1954	.53	30
Oct. 12, 1954	3.44	32
Sept. 24, 1955	3.38	57
Jan. 9, 1956	23.6	86
Sept. 17, 1956	3.45	53
Nov. 29, 1956	16.0	84

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	(cfsm)
60	40	0.38
70	27	.26
80	17	.16
90	10	.096
95	6.8	.065
97	4.8	.046
99	2.3	.022

13. LITTLE NEW RIVER NEAR WINFIELD, ALA.

Marion County

Location.—In SW½ sec. 8, T. 13 S., R. 11 W., at bridge on U. S. Highway 78, 5 miles east of Winfield.

Drainage area.—45.1 square miles.

Index station.—Sipsey River at Fayette, Ala.
Drainage area: 276 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Oct. 16, 1941	1.71	30
Sept. 7, 1946	2.41	46
Oct. 17, 1946	7.97	82
Sept. 14, 1954	No flow	7.6
Oct. 12, 1954	.50	13
Sept. 25, 1955	.30	13
Jan. 8, 1956	5.56	39
Sept. 19, 1956	.13	12
Nov. 28, 1956	9.02	61

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	Discharge (cfsm)
60	14	0.31
70	9.5	.21
80	5.6	.12
90	2.8	.062
95	1.5	.033
97	1.1	.024
99	.4	.0089

14. LUBBUB CREEK NEAR ALICEVILLE, ALA.

Pickens County

Location.—In SE¼ sec. 9, T. 22 S., R. 15 W., at bridge on county road, 3 miles northeast of Aliceville.

Drainage area.—300 square miles.

Index station.—Sipsey River near Elrod, Ala.
Drainage area: 518 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Nov. 16, 1941	49.2	112
Aug. 26, 1943	16.3	40
Aug. 26, 1945	38.8	84
Sept. 14, 1954	1.43	17
Sept. 24, 1955	6.44	26
Jan. 9, 1956	68.1	100
Sept. 18, 1956	6.39	25
Oct. 30, 1956	61.6	100

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	Discharge (cfsm)
60	115	0.38
70	80	.27
80	50	.17
90	33	.11
95	23	.077
97	16	.053
99	7	.023

15. LUBBUB CREEK NEAR REFORM, ALA.

Pickens County

Location.—In N½ sec. 28, T. 19 S., R. 14 W., at bridge on U. S. Highway 82, 1 mile east of Reform.

Drainage area.—63.8 square miles.

Index station.—Sipsey River at Fayette, Ala.
Drainage area: 276 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
July 7, 1949	13.4	107
Sept. 3, 1954	No flow	9.8
Sept. 14, 1954	No flow	7.6
Sept. 25, 1955	.48	13
Jan. 10, 1956	16.9	38
Sept. 18, 1956	.56	14
Oct. 30, 1956	16.2	39

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	Discharge (cfsm)
60	21	0.33
70	14	.22
80	9.7	.15
90	5.3	.083
95	2.9	.045
97	2.0	.031
99	.6	.0094

16. LUXAPALILA CREEK NEAR WINFIELD, ALA.

Marion County

Location.—In NE¼ sec. 12, T. 13 S., R. 13 W., at bridge on U. S. Highway 78 and 43, 2 miles northwest of Winfield.

Drainage area.—21.7 square miles.

Index station.—Luxapalila Creek near Fayette, Ala.
Drainage area: 127 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Oct. 16, 1941	4.08	—
Aug. 25, 1943	1.14	—
Oct. 7, 1943	2.63	—
June 22, 1944	4.66	—
Oct. 3, 1944	8.13	—
July 9, 1945	4.76	50
Sept. 7, 1946	4.80	46
Oct. 18, 1946	6.27	65
July 8, 1949	8.97	78
Sept. 5, 1952	4.26	42
Nov. 13, 1952	5.55	61
Dec. 18, 1952	8.82	78
Aug. 18, 1954	2.52	31
Sept. 14, 1954	2.33	26
Oct. 12, 1954	3.76	37
Sept. 24, 1955	3.93	41
Jan. 8, 1956	5.60	58
Sept. 19, 1956	3.03	27
Nov. 28, 1956	7.74	63

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	(cfsm)
60	8.8	0.41
70	7.2	.33
80	6.2	.29
90	5.2	.24
95	4.5	.21
97	4.2	.19
99	3.2	.15

17. MILL CREEK NEAR CARBON HILL, ALA.

Walker County

Location.—In SW¼ sec. 17, T. 13 S., R. 9 W., at bridge on county road to Nauvoo, 2 miles northeast of Carbon Hill.

Drainage area.—28.5 square miles.

Index station.—Sipsey River at Fayette, Ala.
Drainage area: 276 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Sept. 14, 1954	0.05	7.6
Oct. 12, 1954	.24	13
Sept. 25, 1955	.21	13
Jan. 8, 1956	2.61	39
Sept. 19, 1956	.06	12
Nov. 28, 1956	6.34	61

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	(cfsm)
60	9.2	0.32
70	6.2	.22
80	3.8	.13
90	1.9	.067
95	1.0	.035
97	.75	.026
99	.28	.0098

18. NEW RIVER NEAR WINFIELD, ALA.

Marion County

Location.—In SW¼ sec. 10, T. 13 S., R. 11 W., at bridge on U. S. Highway 78, 7 miles east of Winfield.

Drainage area.—55.6 square miles.

Index station.—Luxapalila Creek near Fayette, Ala.
Drainage area: 127 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Oct. 16, 1941	2.78	—
Sept. 7, 1946	3.14	46
Oct. 17, 1946	9.28	66
Sept. 14, 1954	.58	26
Oct. 12, 1954	1.56	37
Sept. 25, 1955	1.22	40
Jan. 8, 1956	3.38	58
Sept. 19, 1956	1.16	27
Nov. 28, 1956	11.8	63

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	(cfsm)
60	18	0.32
70	11	.20
80	7.0	.13
90	4.0	.072
95	2.8	.050
97	2.2	.040
99	1.1	.020

19. PUMPHOUSE CREEK AT HALEYVILLE, ALA.

Winston County

Location.—In NE¼ sec. 32, T. 9 S., R. 10 W., at dam for city water supply, ½ mile east of Haleyville.

Drainage area.—1.24 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Discharge (cfsm)
Sept. 15, 1954	0.18	0.15
Oct. 13, 1954	.26	.21
Sept. 24, 1955	.22	.18
Jan. 9, 1956	.33	.27

20. PURGATORY CREEK AT GUIN, ALA.

Marion County

Location.—In NW¼ sec. 4, T. 13 S., R. 13 W., at culvert on State Highway 107, ½ mile south of Guin.

Drainage area.—6.97 square miles.

Index station.—Buttahatchee River below Hamilton, Ala. Drainage area: 284 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Aug. 19, 1954	5.04	28
Sept. 14, 1954	4.97	20
Oct. 12, 1954	5.68	36
Sept. 24, 1955	6.25	35
Jan. 8, 1955	6.72	71
Sept. 19, 1956	5.55	30
Nov. 28, 1956	6.80	92

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	(cfsm)
60	7.4	1.06
70	6.9	.99
80	6.5	.93
90	6.1	.88
95	5.8	.83
97	5.6	.80
99	5.4	.77

21. WEST FORK SIPSEY FORK NEAR DOUBLE SPRINGS, ALA.

Winston County

Location.—In SW¼ sec. 30, T. 10 S., R. 7 W., at bridge on U. S. Highway 278, 5 miles east of Double Springs.

Drainage area.—176 square miles.

Index station.—Sipsey Fork near Falls City, Ala.
Drainage area: 365 square miles.

Discharge measurements.—

Date	Discharge (cfs)	discharge Index station (cfs)
Sept. 15, 1954	3.06	3.5
Oct. 13, 1954	7.82	9.5
Sept. 24, 1955	5.26	8.05
Jan. 8, 1956	21.7	37.3
Sept. 17, 1956	6.79	11.5
Nov. 26, 1956	33.2	60.5

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	(cfsm)
60	42	0.24
70	32	.18
80	22	.12
90	15	.085
95	11	.062
97	10	.057
99	6.6	.038

22. WILLIAMS CREEK NEAR HAMILTON, ALA.

Marion County

Location.—In NE¼ sec. 35, T. 10 S., R. 14 W., at bridge on U. S. Highway 43, 1 mile northeast of Hamilton.

Drainage area.—27.6 square miles.

Index station.—Buttahatchee River below Hamilton, Ala. Drainage area: 284 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Sept. 15, 1954	3.12	19
Oct. 12, 1954	5.42	36
Sept. 25, 1955	5.52	37
Jan. 9, 1956	10.4	71
Sept. 18, 1956	4.48	33
Nov. 29, 1956	11.0	90

Estimated duration of flow, 1940-55.—

Percent of time	Discharge (cfs)	Discharge (cfsm)
60	15	0.54
70	12	.43
80	9.2	.33
90	7.3	.26
95	6.0	.22
97	5.3	.19
99	4.4	.16

23. YELLOW CREEK NEAR VERNON, ALA.

Lamar County

Location.—In NE¼ sec. 21, T. 15 S., R. 15 W., at bridge on State Highway 17, 1 mile south of Vernon.

Drainage area.—158 square miles.

Index station.—Buttahatchee River near Sulligent, Ala.
Drainage area: 472 square miles.

Discharge measurements.—

Date	Discharge (cfs)	Index station discharge (cfs)
Oct. 19, 1941	4.49	105
Aug. 26, 1943	4.13	46
June 22, 1944	11.3	108
Sept. 15, 1954	2.64	32
Sept. 24, 1955	8.52	59
Jan. 10, 1956	46.2	135
Sept. 18, 1956	7.73	58
Nov. 27, 1956	46.0	176

Estimated duration of flow, 1940-55.—

	Discharge	
Percent of time	(cfs)	(cfsm)
60	73	0.46
70	49	.31
80	32	.20
90	18	.11
95	12	.076
97	10	.063
99	6.6	.042

STREAMFLOW CHARACTERISTICS

Flood Flow

The magnitude and frequency of flood flows are important items in the design of dams, bridges, highway embankments, and similar structures bordering stream channels or encroaching on flood plains. Where the failure of such structures would not endanger human life, economy is generally achieved by designing them for no greater flood than that likely to occur during their useful life. If the structure—a highway bridge, for example—is to serve for many years, the cost of a modest structure plus the repair costs of occasional flood damage may be less than the initial cost of a structure large enough to insure against flood damage at any time. Some basis for appraising the frequency with which a structure is likely to be damaged or destroyed by flood is, therefore, essential for sound economic design.

A long-term record of flood events at the site of each proposed structure would provide a sound basis for design. This situation seldom exists because it is impracticable to maintain stream-gaging stations at all points where flood data might be desired. Even when the importance of the proposed structure would warrant the installation of a special gaging station at the site, it is rarely possible to anticipate the need far enough in advance to obtain records of sufficient length. This difficulty has been partly overcome by the development of methods for extending flood-frequency relations determined at gaging stations to ungaged streams. A statewide analysis of flood frequencies applying these methods to Alabama streams is available in USGS Circular 342 (Peirce, 1954) and is the source of the charts and tables presented later in this section.

Factors Influencing Flood Flow

Floods are influenced by two kinds of factors—climatic and physiographic. The principal climatic factors in west-central Alabama are the amount of rain and its distribution with respect to time and place. Physiographic factors include the slope, composition, and culture of the land surface and the drainage pattern or general arrangement of stream channels. Although there is considerable interrelation between the two kinds of factors, in general it can be said that the climatic factors are variables exercising their greatest influence on the volume of flood runoff, while the physiographic factors are essentially constants influencing mainly the concentration or time distribution of that runoff. Both the climatic and the land factors have been discussed at some length in preceding sections of this report.

Thus, while the primary cause of floods in west-central Alabama is excessive rainfall, the peak rate of runoff from a given basin is governed not only by the intensity and duration of the rain itself, but also by the size of the basin, its shape and alinement with respect to the direction of storm travel, land and stream slopes, floodwater storage in channels and flood plains, basin geology, type of vegetal cover, and land use. Some of these factors have greater influence on minor floods than on major floods, while the effects of others may vary with the season or with antecedent conditions. One factor often condtions another so that few factors have independently recognizable effects. The flood flow of a stream at any time shows only the integrated effect of all such factors. At the present time there is no better way of evaluating the design flood than through a study of past flood experience based on streamflow records that have been collected continuously and systematically over a long period of years.

Available Flood Records

Flood-frequency analyses are commonly based on a study of annual floods, an "annual flood" being defined as the greatest momentary peak discharge during a water year. Annual floods at 40 gaging stations are tabulated in the section "Records of Streamflow." These flood records range in length from 1 to 28 years (average length, 11 years) and include records of basins ranging in size from 22.8 to 8,970 square miles.

Plotting an Annual Flood Series

The process of relating the magnitude and the frequency of floods at a gaging station is most easily carried out by graphical methods. In the method currently used by the U. S. Geological Survey, the annual floods are arrayed and numbered in descending order of discharge, that is, beginning with the greatest flood as number 1. The recurrence interval for each flood is then computed as (N+1)/M, where N in the number of annual floods in the array and M is the order number. The "recurrence interval" is the average length of time in which a particular discharge will be equaled or exceeded as an annual maximum. For example, a flood having a recurrence interval of 25 years, or the "25-year flood," is the flood that can be expected to be equaled or exceeded 4 times in 100 years. No regularity of occurrence is implied; a 25-year flood could occur in two consecutive years, but there is only 1 chance in 25 that it will occur in any particular year.

The annual floods are then plotted, with discharges as ordinates and recurrence intervals as abscissae, on a special coordinate paper designed to make the plotted points approach a straight line, and a curve is fitted by eye. Flood-frequency curves are illustrated by figures 11a and 11b for the Black Warrior and the Tombigbee Rivers.

Mean Annual Flood

For appraising the relative flood potentials of different streams, it is convenient to select for comparison an index flood of some particular frequency based on a common period of record for all streams being studied. A commonly used index flood is the average of the annual floods for each stream. This flood is referred to as the "mean annual flood"; according to statistical theory, when determined from a great number of annual floods, it has a recurrence interval of 2.33 years. When determined from relatively few annual floods (e.g., a typical streamflow record), the mean annual flood is subject to the inherent errors of small samples, but it can be estimated within certain statistical limits if determined graphically from the flood-frequency curve as the discharge having a recurrence interval of 2.33 years.

Mean annual floods determined by this method for 20 gaging stations in west-central Alabama are listed in table 11. They are based on a 23-year record (1929-51) and, according to sampling theory, there is only 1 chance in 20 that errors due to sampling exceed 15 percent.

Regional Flood Frequency

Flood-frequency curves for different streams can be directly compared if the discharge values are expressed in dimensionless terms as ratios to the mean annual flood. When this is done for

Table 11.—Mean annual floods at gaging stations on tributary streams in west-central Alabama, period 1929-51.

Index No.	Stream and location	Drainage area (sq. mi.)	Mean annual flood (cfs)
2	Buttahatchee River near Hamilton	316	13,200
3	Buttahatchee River near Sulligent	472	13,500
4	Luxapalila Creek near Fayette	127	7,200
9	Sipsey River at Fayette	276	10,200
10	Sipsey River at Moores Bridge	403	11,500
11	Sipsey River near Elrod	518	11,000
12	Sipsey River near Pleasant Ridge	753	10,000
13	Noxubee River near Geiger	1,140	13,200
16	Mulberry Fork near Garden City	368	27,000
17	Sipsey Fork near Falls City	365	21,000
18	Clear Creek at Falls City	147	6,600
19	Sipsey Fork near Arley	529	26,000
21	Sipsey Fork near Sipsey	994	39,000
22	Blackwater Creek near Manchester	188	4,100
26	Locust Fork near Cleveland	309	18,300
27	Locust Fork at Trafford	625	31,600
28	Turkey Creek at Morris	81.5	6,600
29	Locust Fork at Sayre	887	29,800
36	North River near Samantha	219	8,700
41	Prairie Creek near Gallion	169	19,000

a number of gaged streams in a given locale, and for the same period, it is commonly found that a similarity in shape and slope of the curves exists over broad geographic regions. Experience has shown that by combining the closely related curves, it is practicable to develop an average or composite frequency curve that is generally applicable to all streams in each homogeneous region. The composite curve shows the ratio to the mean annual flood (2.33-year flood) for floods of other recurrence intervals. Thus, if the mean annual flood for an ungaged stream can be determined, the composite frequency curve provides a ready tool for determining the magnitude of floods of other recurrence intervals.

Experience has shown further that the area of a watershed is a dominant physiographic factor influencing the magnitude of the mean annual flood. When the mean annual floods for gaged streams in the same climatic region are plotted against the corresponding drainage areas on logarithmic paper, a definite relationship is apparent for those streams draining basins of similar physiographic character. Groups of streams displaying a common relationship can be used to define the hydrologic areas within which the mean annual flood for an ungaged basin of known area can be estimated from the relationships established.

Thus for ungaged watersheds a method is provided for estimating the probable magnitude of a flood of any recurrence interval not in excess of the general period of record at gaged sites. The procedure is: (1) read the mean annual flood corresponding to the known drainage area from the relationship curve; (2) multiply this value by the ratio to mean annual flood for the desired recurrence interval taken from the composite frequency curve for the region.

In USGS Circular 342, geographic divisions for which composite frequency curves were developed are referred to as "flood regions," while those in which the mean annual flood was related to drainage area are called "hydrologic areas." Such a distinction is necessary because in Alabama the boundaries of the two classes do not always coincide.

Regional flood frequency in west-central Alabama.—Hydrologic areas and flood regions of west-central Alabama, based on the period 1929-51, are shown in figure 9. The hydrologic areas are numbered 2, 3, 5, 7, and the flood regions are designated by letter-prefix A or B to correspond with the notation used in Circular 342. The variation of mean annual flood with drainage area in the four hydrologic areas is shown by the curves of figure 10 within the ranges defined by the base data. The composite frequency curves for the two flood regions are expressed in tabular form in table 12. The use of curves and table is illustrated by the following problem:

Find the 25-year flood on Lost Creek (Walker County) at a site where the drainage area is 150 square miles. As shown in figure 9, this site is in the area designated as A-3 (flood region A, hydrologic area 3). From figure 10 the mean annual flood from a drainage area of 150 square miles is read from the curve for Area 3 as 11,000 cfs. From table 12 the 25-year flood ratio in Region A is found to be 2.25. Therefore, 11,000 cfs multiplied by 2.25, or 24,750 cfs is the estimated 25-year flood. For practical purposes, this could be rounded to 25,000 cfs.

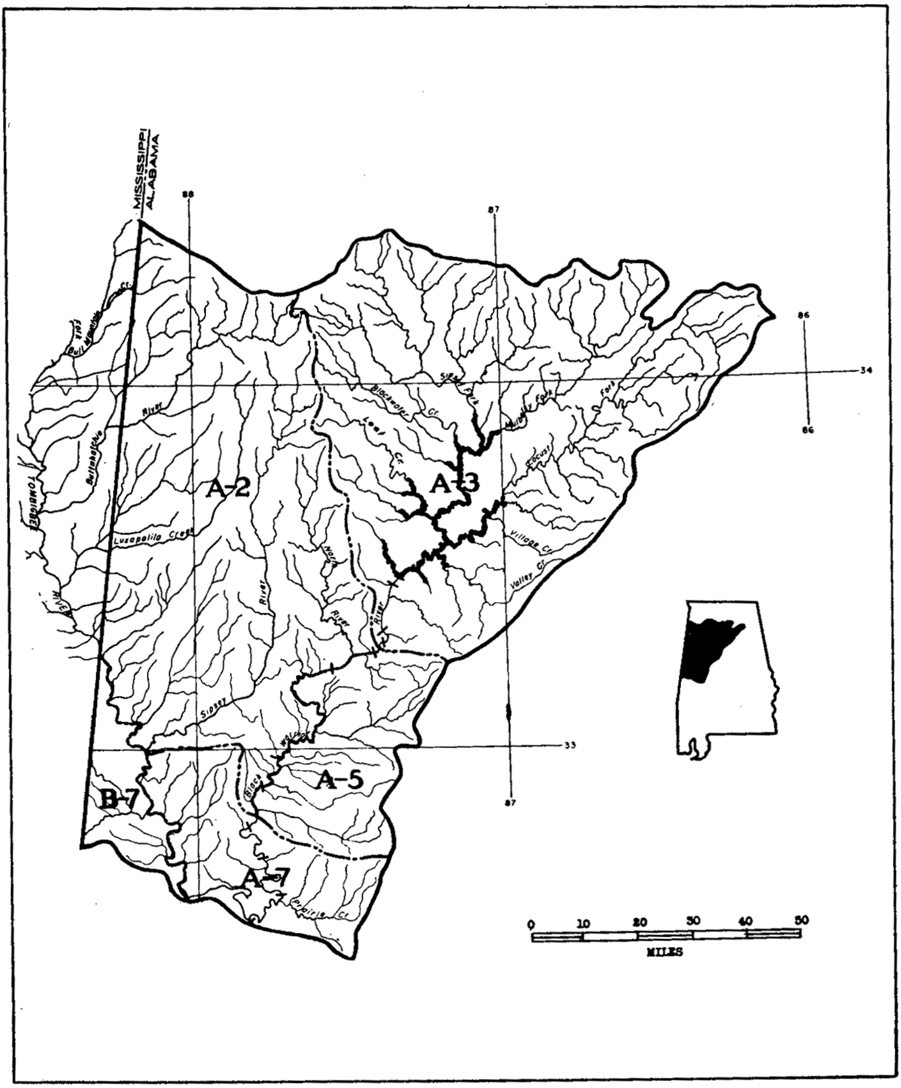


Figure 9.—Flood regions of west-central Alabama

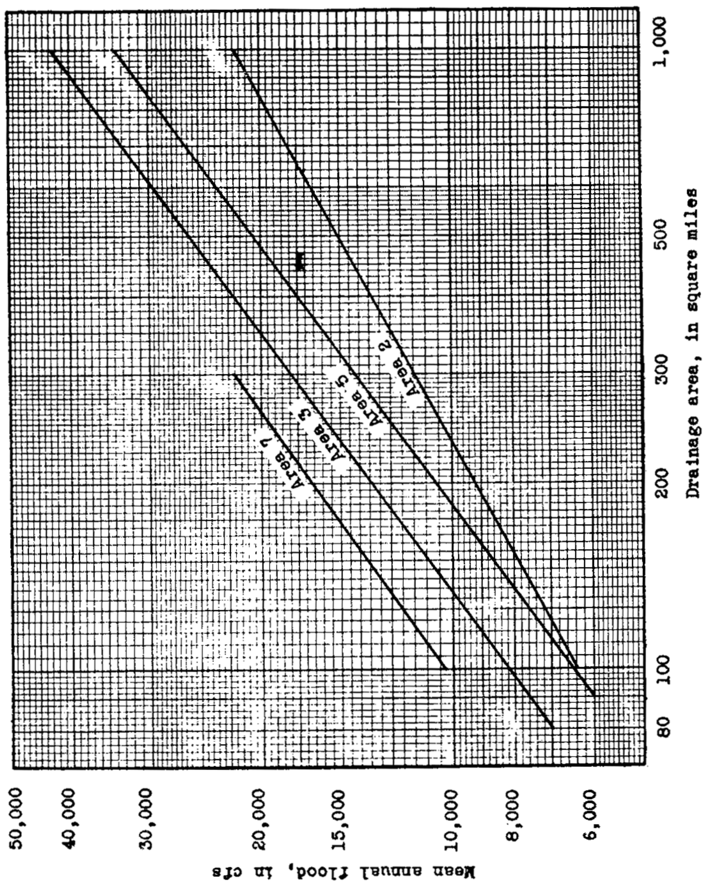
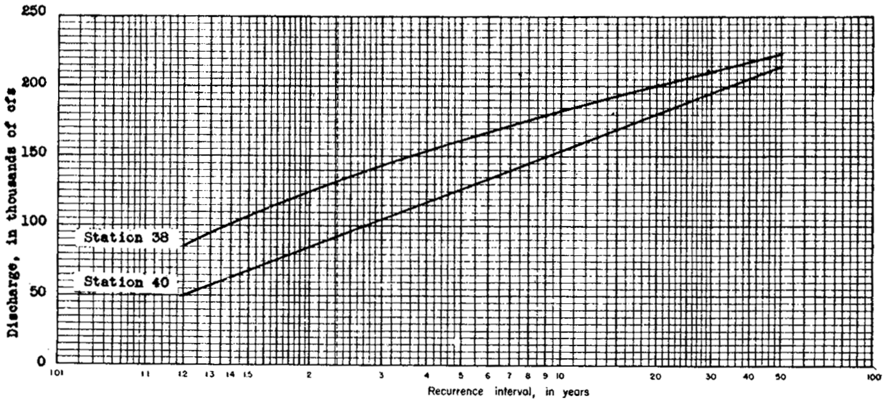


Figure 10.—Relation of mean annual flood to drainage area in west-central Alabama

Table 12.—Flood ratios in west-central Alabama

Recurrence interval (years)	Ratio to mean annual flood	
	Region A	Region B
1.5	0.70	0.62
2	.90	.87
3	1.16	1.23
4	1.32	1.45
5	1.45	1.62
10	1.80	2.13
15	1.99	2.40
20	2.14	2.61
25	2.25	2.77
30	2.33	2.89
40	2.47	3.09
50	2.58	3.25



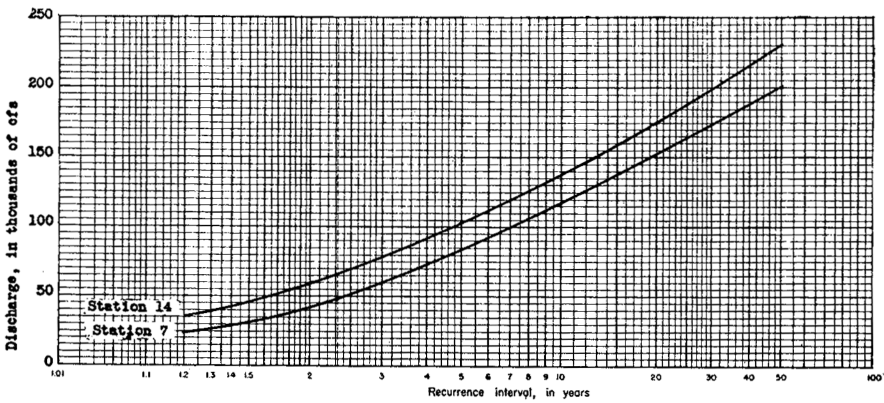


Figure 11a (top).—Frequency of annual floods, Black Warrior River at Tuscaloosa (Sta. 38) and near Eutaw (Sta. 40), period 1929-51.

Figure 11b (bottom).—Frequency of annual floods, Tombigbee River near Cochrane (Sta. 7) and at Gainesville (Sta. 14), period 1893-1951.

Flood Frequency on Major Rivers

The main stems of the major Alabama rivers for drainage areas greater than approximately 3,000 square miles have been found to display flood-frequency characteristics unlike those of their tributaries and in general unlike those of each other. This dissimilarity is to be expected partly because of the disparity in the duration and the areal extent of rainstorms capable of producing floods on large and small basins and partly because the major rivers reflect the combined effects of many diverse physical features which in smaller basins may have marked localized effects on flood characteristics.

Flood-frequency curves for gaging stations on the Black Warrior River and the Tombigbee River in west-central Alabama are shown by figures 11a and 11b. Floods at ungaged sites on these streams for recurrence intervals commonly used for design purposes can be read from the diagrams of figures 12 and 13.

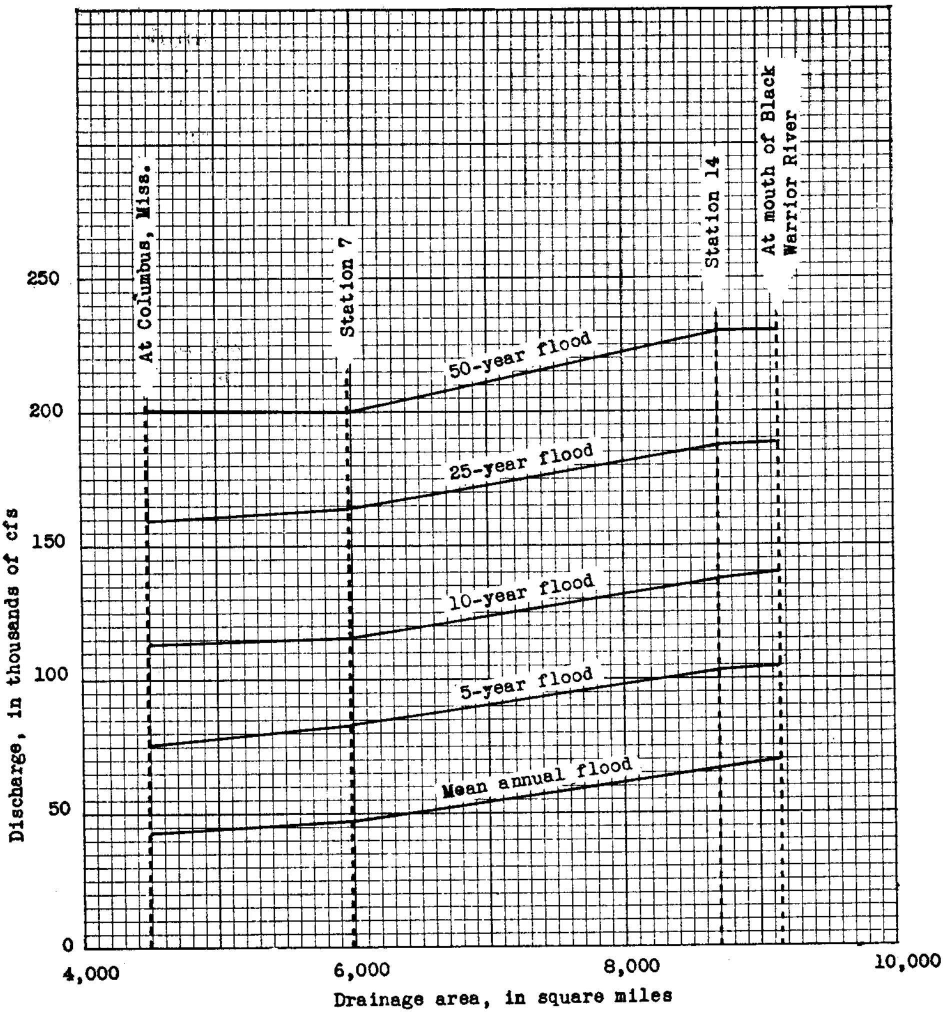


Figure 12.—Variation of discharge with drainage area for selected flood frequencies on Tombigbee River

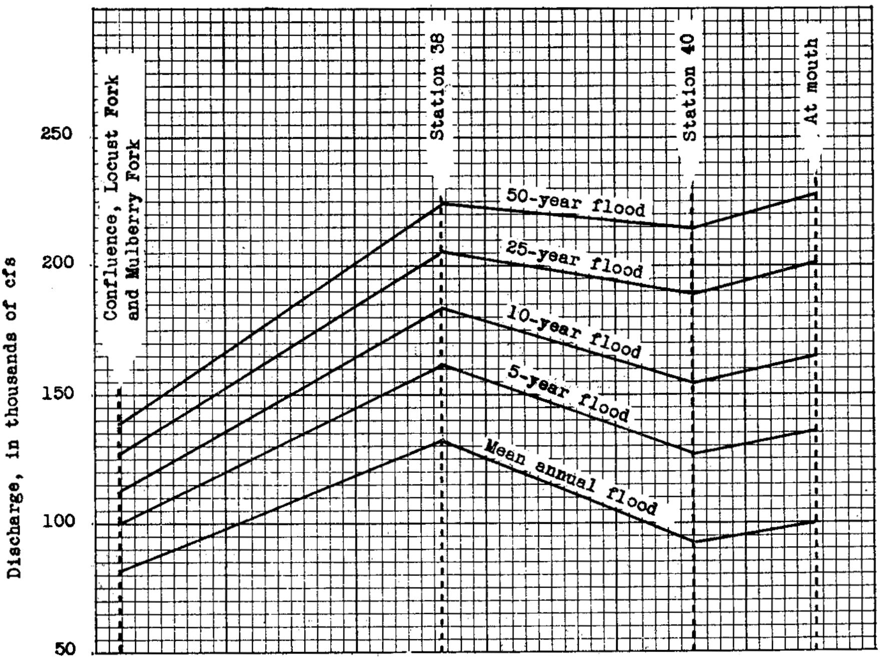


Figure 13.—Variation of discharge with drainage area for selected flood frequencies on Black Warrior River.

Low Flow

Because water, like other commodities, increases in value as it becomes less plentiful, the ability of an area to sustain streamflow during rainless periods is an asset of considerable value. Low flow is the critical design quantity for many uses, for when no storage is provided the supply is limited to the amount that nature will provide.

The low flow of streams in west-central Alabama is derived almost entirely from ground-water sources. Except in the major rivers, direct runoff ceases within a few days after the end of rainfall. After direct runoff has passed, streamflow is governed by the amount of water stored in the ground and the rate at which it finds its way to the stream channel. Where streams are deeply entrenched in permeable formations there may be sufficient ground-water storage to maintain flow for several months even without additional rain. On the other hand, streams that are lightly entrenched, or that lie in regions of shallow soil cover over impermeable rock, recede rapidly during rainless periods and frequently have little or no flow within 3 or 4 weeks after heavy rainfall.

The flow draining from ground-water sources is called base flow. Thus, as soon as direct runoff ceases, a stream is said to be under base-flow conditions. Figure 14 compares the base-flow recession curves for two streams in the report area that have drainage basins of comparable size and no significant climatic differences. It shows that if both streams are assumed to have an initial discharge of 100 cfs at the beginning of an extended dry period, the discharge of Clear Creek after 20 rainless days is nearly 20 times that of Lost Creek. Such contrasts in low-flow behavior, striking as they are, are not uncommon in west-central Alabama where basin geology may differ markedly, even for neighboring streams. The effects of basin geology on low flow are discussed at more length in the following section.

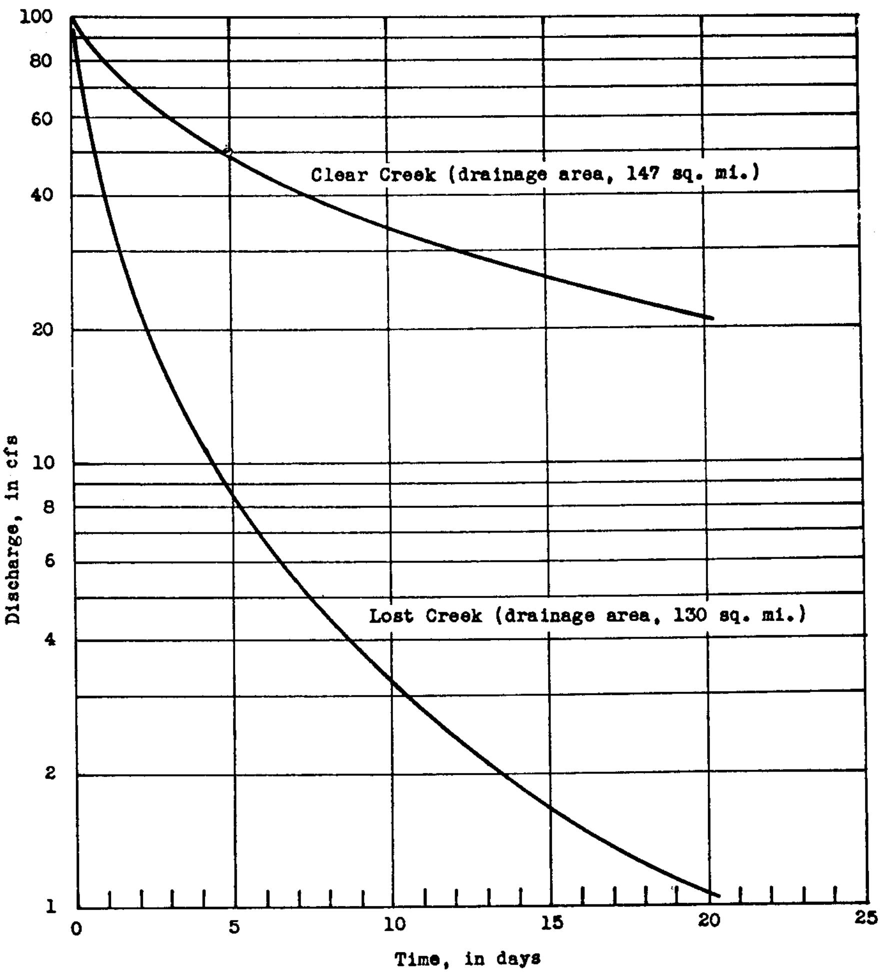


Figure 14.—Base-flow recession curves for two streams in west-central Alabama.

Areal Aspects of Low Flow

Because of the fundamental differences in the causative factors of high flow and low flow, an areal analysis of the latter is the more difficult. Floods are dynamic phenomena—the result, in most cases, of intense rainstorms so concentrated with respect to time and areal extent as to dominate briefly the runoff picture. Geologic factors, which largely determine the dry-weather characteristics of streamflow, are reduced in effectiveness during floods to subordinate roles, and play smaller and smaller parts as the magnitude of the flood increases. Furthermore, flood-producing storms, unlike physiographic and geologic details, are not restricted in occurrence to any particular locality; in the same general region, meteorological conditions that produce floods in one locality can be expected eventually to recur in another. Thus, in flood flow we are dealing with volumes and rates of runoff that are more directly related to the three dimensions of rainfall (depth, area, duration) than to the physiographic and geologic character of the land on which it falls. Under such circumstances, it is not surprising to find that certain areal aspects of flood flow are readily definable over broad climatic regions.

On the other hand, low flow is controlled almost completely by geologic factors, which flood flow tends to conceal. As streamflow declines, individual basin differences emerge, becoming more and more pronounced as streamflow approaches minimum discharge. This is especially true of the smaller basins in which the effect of some singular hydrologic feature is more likely to predominate. Large basins reflect the combined and overlapping influences of many diverse hydrologic features and thus tend to have similar yields per square mile of area drained. Their constituent sub-basins, however, may differ widely in unit yield. One stream may rise in a perennial spring with consistent year-round flow, while another stream entrenched in impermeable formations may flow only for a few days following rainfall.

Thus, in contrast to flood flow, which is associated with a conspicuous meteorologic factor capable of transposition over wide areas, low flow is regulated by a complex of geologic factors, diverse in action, fixed in location, and diffuse in effect. As a consequence, low flows are less suited to extrapolation on an areal basis without some streamflow data at each site.

The dominant factors governing low flow are geologic and topographic. The geology governs the permeability and capacity of ground-water aquifers (water-bearing beds or strata), and the topography governs the location and depth of incision of the stream channel with respect to these aquifers. The relation of a stream channel to geologic formations can be determined in more or less detail from geologic and topographic maps. Hence, if the low-water flow of one stream is known, useful inferences as to the low-water behavior of another stream can often be made on the basis of a correspondence in geology as indicated by a geologic map. Such inferences are not infallible and should be regarded only as an indication of a likely stream to investigate and not as the investigation itself. Inferences regarding the areal low-flow characteristics of west-central Alabama are presented in this section of the report.

Low Flow Regions of West Central Alabama

The discharge characteristics for many streams of the area, both at gaging stations and at selected sites, are presented in the form of flow-duration tables in the section on Streamflow Records. The discharge equaled or exceeded 95 percent of the time expressed in cfsm (cubic feet per second per square mile) is indicated on plate 1 by figures in parentheses near each site for which a flow-duration curve is available. Flow of 95-percent duration was selected for this purpose because in west-central Alabama this flow corresponds approximately to the median annual 7-day minimum[1], a useful index of low flow.

A study of the data plotted on plate 1 indicates that west-central Alabama can be divided into 6 sub-areas in which significant differences in the low-water yield of the smaller streams are fairly well defined. These six sub-areas or "low-flow regions" are outlined on plate 1 as areas A, B, ... F, and the approximate range of flow having a duration of 95 percent is indicated for each. The same regions are also outlined in figure 15 on a smaller scale to facilitate a comparison with the physiographic divisions of west-central Alabama shown in figure 6.

[1] The annual 7-day minimum flow is the average discharge for the lowest consecutive 7 days during each climatic year (April 1 to March 31). The "median" annual 7-day minimum flow is the 7-day minimum that occurs, on the average, every 2 years; that is, it has an equal chance of occurring or not occurring in any particular year.

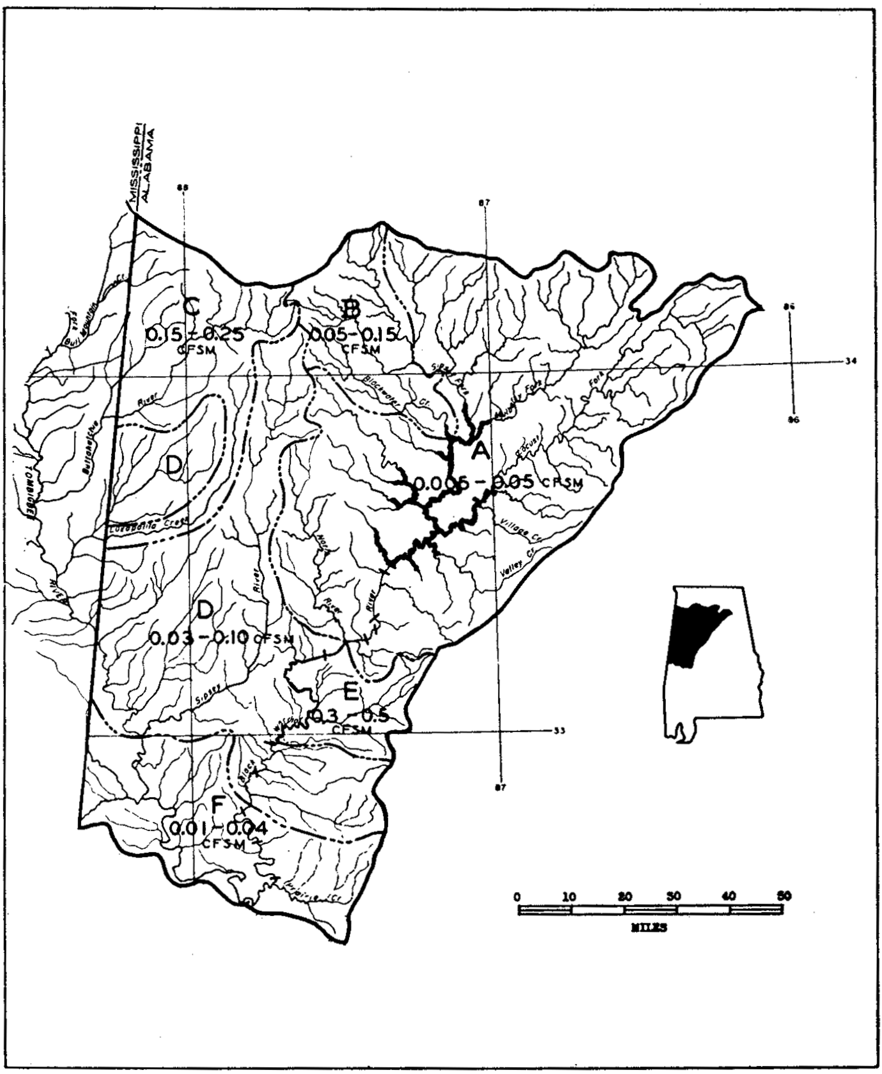


Figure 15.—Low-flow regions of west-central Alabama showing approximate range in flow (cfsm) of 95 percent duration for each region.

Most of the streamflow data used in this study were collected for the purpose of investigating specific streams and not for the purpose of delineating low-flow regions. As a result, the boundaries of the regions are to a large extent based on geologic considerations. The purpose of these generalizations regarding low flow in west-central Alabama is to make possible a quick and reasonable appraisal of the probable low-flow characteristics of moderate-sized ungaged streams in the area. Such generalizations are unreliable when applied to drainage areas considerably smaller than those at which discharge measurements have been made. If actual development of the stream is contemplated, appraisals based on these generalizations should be verified by discharge measurements made at appropriate times and correlated with gaging station records. It has been said[1] that "one well-planned discharge measurement usually tells more about the low flow of a stream than weeks of exploration and analysis of topographic and geologic factors."

Description of Low-flow Regions

Regions A and B comprise the Black Warrior River basin upstream from Tuscaloosa. These two regions together are coextensive with the outcrop area of the Carboniferous (Pottsville) shales and sandstones of the Cumberland Plateau section. It will be noted from plate 1 that the western boundary of these regions, which follows the drainage divide of the Tombigbee and Black Warrior Rivers (Byler Ridge), corresponds closely to the Fall Line of figure 6 where the rocks of the Pottsville disappear beneath the Cretaceous sediments of the Coastal Plain.

The low index flow of Region A (0.005-0.05 cfsm at the 95 percent duration point) reflects the shallowness of the soil mantle and the relatively poor water-bearing properties of the underlying rocks. The upper limit of index flow is 10 times the lower, representing the greatest variability in index flow of any of the six low-flow regions. Springs and open wells, in common use throughout the region for domestic supply, are prone to diminish or fail during dry seasons. Spring water escapes usually just above a bed of shale or a coal seam. Coal seams are especially effective in hindering the downward percolation of water, and, in early days of coal prospecting in the region, wet

[1] C. H. Hardison, U. S. Geological Survey, personal communication, 1956.

fern-covered benches along hillsides and in the heads of ravines were considered good guides for locating coal (Smith, 1907, p. 88).

Index flows of three streams in Region A do not agree with others in the region (see plate 1). These streams are Turkey Creek (gaging station 28), Calvert Prong (selected site 7), and Copeland Creek (selected site 10). Their index flows range from 0.15 to 0.24 cfsm, which is significantly above the general range for the region. The geologic map[1] discloses that these three streams have a common geologic characteristic; that is, their headwater streams rise in anticlinal limestone valleys. Turkey Creek heads in Birmingham Valley, Calvert Prong in Murphree Valley, and Copeland Creek in the southern terminus of Sequatchie (Browns) Valley. Although Copeland Creek is spring-fed, this apparent difference is merely local evidence of the greater productivity of the limestone aquifers from which all three streams apparently benefit. Some of the unmeasured streams in the region may be similarly affected and thus have an index flow higher than that shown by figure 6.

Region B is in the Carboniferous area and thus from a geologist's viewpoint, should perhaps be regarded as a sub-division of Region A rather than as a separate and distinct region. From a hydrologist's viewpoint, however, Region B, as compared with Region A, shows both an increase in index flow and a decrease in it's variability. The increase in the upper limit of index flow is due largely to the contribution of a single stream, Clear Creek (selected site 8, gaging station 18), although the index flow of West Fork of Sipsey Fork (selected site 21) is also above the upper limit of index flow assigned to Region A. The headwater streams of Clear Creek rise near the northern boundary of the Coastal Plain, and have cut through the sands and gravels of it's basal formation (Tuscaloosa). Thus, while the channels of these streams are now incised in the underlying Pottsville, there remain widespread deposits of highly permeable Cretaceous sediments in the interstream areas, and apparently it is these deposits that give Clear Creek its well-sustained low flow. These conditions also apply, but in much less degree, to the headwater streams of Blackwater Creek and to the westward-reaching tributaries of the West Fork of Sipsey Fork.

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[1] Geologic Map of Alabama, prepared by Alabama Geological Survey in cooperation with the U. S. Geological Survey, 1926.

Region C, whose index flow (0.15-0.25 cfsm) is the second highest in the report area, includes the upper basin of Buttahatchee River and other tributaries of the Tombigbee River. Extending from the southern boundary of the region as an appendage is the basin of Luxapalila Creek, whose excellent low-water yield warrants the inclusion of this stream in the region. The typical geology of much of the region is that of the Fall Line Hills in which the streams have cut their channels completely through the unconsolidated sediments of the Coastal Plain to the underlying rocks of the Coal Measures. As noted in Region B, this particular geologic combination appears to be especially favorable for sustained flow, acting much as a layer of sponge over an impervious pavement. It perhaps reaches its peak expression in Purgatory Creek at Guin (selected site 20) whose phenomenal index flow of 0.83 cfsm is the most outstanding encountered in the report area. This stream and nearby Bogue Creek (selected site 5), another stream of outstandingly high index flow, are fed by numerous springs, some of which have been developed for municipal use.[1]

Region D, separated into two parts by the basin of Luxapalila Creek,[2] includes drainage into both the Tombigbee and Black Warrior Rivers. Sipsey River and Lubbub, Coal Fire, and Yellow Creeks drain to the Tombigbee River; Fivemile and Big Creeks and other minor tributaries drain to the Black Warrior River. Geologic exposure in this region is varied. Large areas of the upper Pottsville formation are exposed in the headwaters of Sipsey River although elsewhere in the northern part of the region the streams are bedded in the formations of the Tuscaloosa group. In the southern part of Pickens County, the Tuscaloosa group is covered by the more recent Eutaw formation, which extends east of the Black Warrior River into the part of Region

[1] It should be noted here that the unit flows (cfsm) of streams fed by large springs, or by localized spring fields, have very little meaning except at the points where they were determined. They cannot be applied to the drainage area at other points, even on the same stream, for the purpose of estimating discharge.

[2] During the early 1940's, Luxapalila Creek was canalized in Alabama from the State line to Winfield—a distance of about 50 miles. Before this improvement, the stream was much like its neighbors, i.e., tortuous, sluggish, and snag-filled, with numerous sloughs and cut-offs and wide swampy overflow areas. It is possible that the contrast in index flow between Luxapalila Creek and adjoining streams is due in part to this extended deepening of the channel and the reduction in evapo-transpiration opportunity effected through canalization, clearing, and drainage of bordering swamps. Unfortunately, no records of streamflow before canalization are available to verify this supposition.

D drained by Fivemile and Big Creeks. In general, the index flows of streams in this region are lower and less consistent with geologic aspects than those of streams fed by the same coastal plain sediments in other parts of the State. To a large extent this is probably an effect of the extensive alluvial deposits in the stream valleys. Most of the stream valleys are broad and flat and are floored by sand, silt, and clay considered to be Recent alluvium. The water-bearing properties of this alluvium vary widely and influence the low-water behavior of the streams. In addition, greater than average evapotranspiration loss may in part account for the low index flows, as most of these streams meander sluggishly through thickly wooded bogs and swamps where the opportunity for such loss is greater than in other areas.

Region E is outlined to include little more than two small streams whose unusually high index flows sharply distinguish them from other streams nearby. One of these streams, Big Sandy Creek (selected site 4), rises in the southern terminus of Birmingham Valley where major faulting of the underlying Paleozoic rocks and sinkhole development in limestone have produced much irregularity in geologic structure. About 4½ miles south of Coaling, a large spring rises directly into the channel of Big Sandy Creek, and it is from this spring that the stream derives most of its low-water flow. Elliots Creek (selected site 11), the other principal stream of the region, drains formations of the Tuscaloosa group known to be excellent aquifers, but it compares so favorably in index flow with Big Sandy Creek that it appears likely that this stream, too, is fed by large springs. Thus, the index flow shown for this area is probably not applicable to all small streams in the region.

Region F has been outlined by following drainage divides that correspond as closely as possible to the boundaries of the Prairie Belt section of figure 6. The underlying chalks and marls of the Selma group are low in permeability. They are too impure to be dissolved by percolating waters so that the sinks, caves, and solution channels characteristic of most limestone regions are missing. Streams of the region are flashy—reacting quickly to heavy rainfall with high rates of runoff for short periods, but having little ability to sustain flow during rainless periods.

Frequency of Low Flows

Low flows, like flood flows, are susceptible of frequency analysis—and by much the same methods. The difference in duration of high flows and low flows, however, necessitates a somewhat different treatment of their respective analyses. In the foregoing section on flood frequency, floods were identified by a single parameter—their peak discharge; other important parameters such as volume and time-distribution of flood runoff were disregarded. This concept of a flood as a momentary peak rate of flow that need last no longer than the time required to perceive it is, in some ways, both realistic and useful. In nature, peak flows are usually short-lived; moreover, the dynamic forces associated with them may create havoc in a matter of seconds. The main point of interest in developing a method of analysis is that if a flood is defined as a momentary event, floods of all magnitudes at any particular site can be related to frequency by means of a single flood-frequency curve.

This simple approach is unrealistic when applied to low-flow frequency. Momentary minimum rates of flow are often of little practical significance. Sharp momentary decreases in the low flow of streams that occur as the result of some accidental regulation have little hydrologic significance. Furthermore, only under unusual circumstances would such brief events be injurious to property or to riparian life. The economic and ecological effects of low flow are related not only to the low rates of flow but to the length of time those rates persist. Thus, in low-flow frequency, the continuity of flow is an element that must be considered.

Studies of low-flow frequency are based on the lowest average flow for a specified number of consecutive days during each climatic year. In low flow analysis, the 12-months period starting April 1 is used as a climatic year so that the droughts during the summer and fall of a single year will be treated as a single occurrence. This climatic year is designated by calendar year in which it begins. In the following examples, the 7-day minimum flows have been used to demonstrate the method. The same method could be followed for any other number of consecutive days such as the 30-day minimum flow, but a separate frequency curve would be required for each period selected.

Low-flow frequency at a gaging station.—Minimum 7-day flows observed during the climatic years 1939-54 are listed in table 13 for 5 gaging stations in the Tombigbee River basin. The data for any of these stations can be arranged as a frequency curve. Choosing one for which the data are complete—for example, Station 9—the procedure is as follows:

Array and number the 7-day minima in ascending order of magnitude—that is, beginning with the lowest (8.5 cfs) as order number 1. Compute the recurrence interval for each as (N + 1)/M, where N is the number of items in the array (16, in this case), and M is the order number.[1] Plot the data using discharges as ordinates and recurrence intervals as abscissae and fit a smooth curve by eye, as in figure 16. The plotting paper used here is similar to that used for plotting the flood-frequency curves of figure 11 except that the discharge scale is logarithmic.

[1] It should be noted that the formula (N + 1)/M always yields a recurrence interval of two years for the median or central item in the array.

Table 13.—7-day minimum discharges in cfs at selected gaging stations in Tombigbee River basin, period 1939-54

	7-day minima, cfs				
Year Starting April 1	Buttahatchee R. at Sulligent Station 3	Luxapalila Cr. near Fayette Station 4	Sipsey R. at Fayette Station 9	Sipsey R. near Elrod Station 11	Noxubee R. near Geiger Station 13
1939	116	a	42.4	a	73.6
1940	95.0	a	30.0	53.6	a
1941	104	a	26.1	53.4	a
1942	61.7	a	20.6	56.0	a
1943	47.1	a	13.9	37.7	a
1944	59.7	a	21.3	50.7	43.1
1945	77.7	42.4	38.4	68.1	51.0
1946	103	46.6	47.7	105	69.4
1947	91.9	48.0	34.6	65.7	49.6
1948	72.7	48.9	29.0	54.3	65.7
1949	156	65.1	58.7	123	109
1950	156	63.1	51.9	116	117
1951	77.6	48.9	19.0	54.3	68.1
1952	79.7	42.6	16.3	34.6	35.9
1953	64.3	39.0	19.1	33.4	44.3
1954	33.9	26.4	8.5	15.1	23.4

a No record.

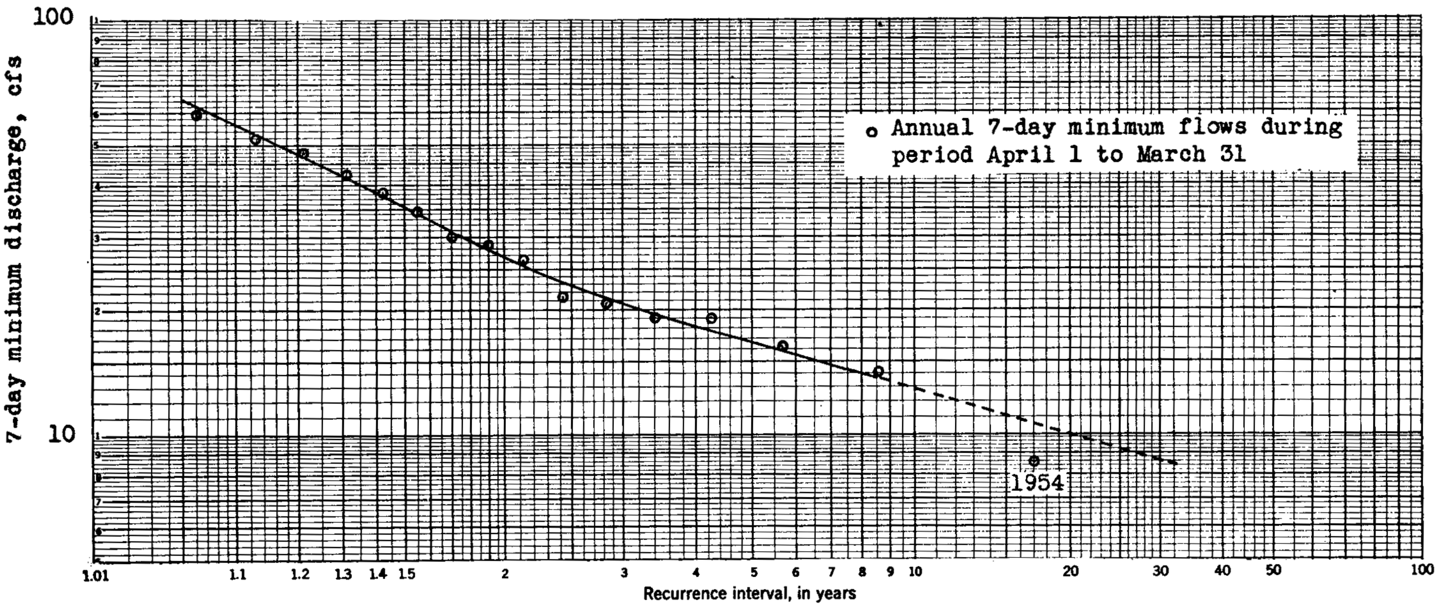

Figure 16.—Frequency of annual 7-day minimum flows, Sipsey River at Fayette, Ala. (Station 9), 1939-54.

Two points of interest in connection with the frequency curve of figure 16 may be mentioned. The first one is rather minor and relates to the determination of the median 7-day minimum flow, which previously has been referred to as a useful index for comparing the low-flow characteristics of different streams. The median value computed directly from the array of data as the average of the two central items (8th and 9th) is (26.1 + 29.0)/2 or 27.6 cfs. From the frequency curve, the median is read as the discharge having a recurrence interval of 2 years, or 26.5 cfs. Although in this example the two values are not greatly different, the latter is the more dependable because it takes into account the deviation of the two central items in the array from the regression indicated by the other items.

The second feature of interest is more important. The frequency curve as drawn gives reduced weight to the plotted point representing the driest year (1954), although obviously it could have been curved smoothly to pass through this point. Should it have been so drawn? Experience and statistical theory both indicate that it should not. The climatic year 1954 was outstandingly dry, and the true recurrence interval for the 7-day minimum of that year is probably considerably greater than the 17 years indicated by the length of record. As drawn, the frequency curve must be extended to a recurrence interval of 32 years before the 1954 discharge of 8.5 cfs is reached. Although this is only an estimate, there is no statistical reason why a 32-year event could not have occurred during this 16-year period. On the other hand, statistical answers, however logical, are not necessarily correct. Much remains to be learned about the frequency relations of extremely low flows. During periods of extreme deficiency, as in 1954, conditions may be so altered that the more normal relations do not apply, in which case some break or discontinuity of the frequency curve could be expected.

On the basis of data for Station 9 alone, what, then, can be said regarding the frequency of the 1954 7-day minimum? Only that the discharge is lower than would be expected at average intervals of 15 years. Longer records at other gaging stations outside the report area indicate that a discharge of 8.5 cfs at Station 9 can be expected at average intervals of 30 to 40 years.

Regional low-flow frequency.—Frequently, the lowest flows of record are chosen as a design basis for water supply. If a supply from Sipsey River near Station 9 were contemplated, the designer might well inquire how the lowest flows observed there in 1954 compared with the flows of other streams in the area during the same dry period from the standpoint of relative severity. Perhaps a local shower at a critical time sustained the flow at Station 9 so that the flow observed at that station was not truly representative of drought conditions prevailing generally in the area. Questions of this kind are best answered by means of a regional analysis of low flows using all applicable streamflow records in the general vicinity, the theory being that the combined experience at a number of stations yields a more dependable answer than any single station alone.

Data from table 13 can again be used to illustrate the method.

When comparing different streams, a common period of record should be used—not merely periods of the same length, but the same identical years; otherwise, climatic differences during the different periods may enter to confound the results. Preferably, the records should be complete at all stations for the base period selected, but this is not always essential. For example, although the data at Stations 4, 11, and 13 (table 13) are incomplete for part of the period, the period 1939-54 can and should be used in order to take advantage of the full-length records at Station 3 and 9.

The first step is to estimate the missing 7-day minimum discharges. To avoid any misunderstanding on this point, it should be explained that these estimates are not made with the intent of converting an incomplete record into a complete one; instead they are to be used only to determine the probable order numbers of the observed discharges when they are later arrayed in ascending order of magnitude.

These estimates can be read directly from a curve relating discharge at the incomplete-record station with that at a complete-record station. A discharge-relation curve for this purpose is conveniently obtained by plotting corresponding discharges at the two stations for equal percentage durations of flow. As an example, the discharge relation so derived for Stations 4 and 9 is shown in figure 17. The plotted circles represent discharges of equal percent duration at the two stations during the water years 1940-55, which data were obtained from the flow-duration tables presented in a preceding section of this report. Approximately the same relation curve can be obtained by arraying in order of magnitude the 7-day minima at the two stations for the concurrent period of record, 1945-54, and plotting the discharges of equal order number (solid circles in figure 17). The first method is very convenient if flow-duration data are available, but in most cases the use of both methods is preferable.

The estimated 7-day minima at Station 4 for the climatic years 1939-44 are now read from the curve of figure 17 as the ordinates corresponding to the observed discharges at Station 9. In a similar manner, the missing data are estimated for Stations 11 and 13, using appropriate discharge-relation curves.

There is now available for each of the 5 stations a tabulation of 16 annual 7-day minimum discharges, some of which have been estimated at Stations 5, 11, and 13. The 16 discharge figures for each station are then arrayed and numbered in order of ascending magnitude. The estimated figures have now served their purpose and are not used hereafter in this report.

The next step is to reduce the data at all stations to a directly comparable basis so that they can be averaged to yield a composite frequency curve applicable to the general area. It is clear that the array of low-flow discharges for each station represents the interaction of two factors: (1) the geolgic and topographic character of the basin, and (2) a procession, so to speak, of meteorological events. The first is a relatively permanent feature of the basin which, for any given set of meteorological conditions, can be depended upon to produce the same effect year after year. Once its effects have been determined over a broad enough range of meteorological conditions, the geologic and topographic factor can be temporarily eliminated. Then, after the influence of the meteorologic factor on frequency has been ascertained, the effect of the geologic and topographic factor can be restored.

One method of eliminating the geologic and topographic effect is to select one of the stations as an index or "pivot" station and to transpose the discharges observed at the other stations to the pivot station by means of the discharge-relation curves already prepared. In effect, this makes all basins identical in geology and topography with that of the pivot station.

In the present example, Station 9—more or less centrally located in the area—has been selected as the pivot station. The discharges observed at Station 9 and the transposed discharges

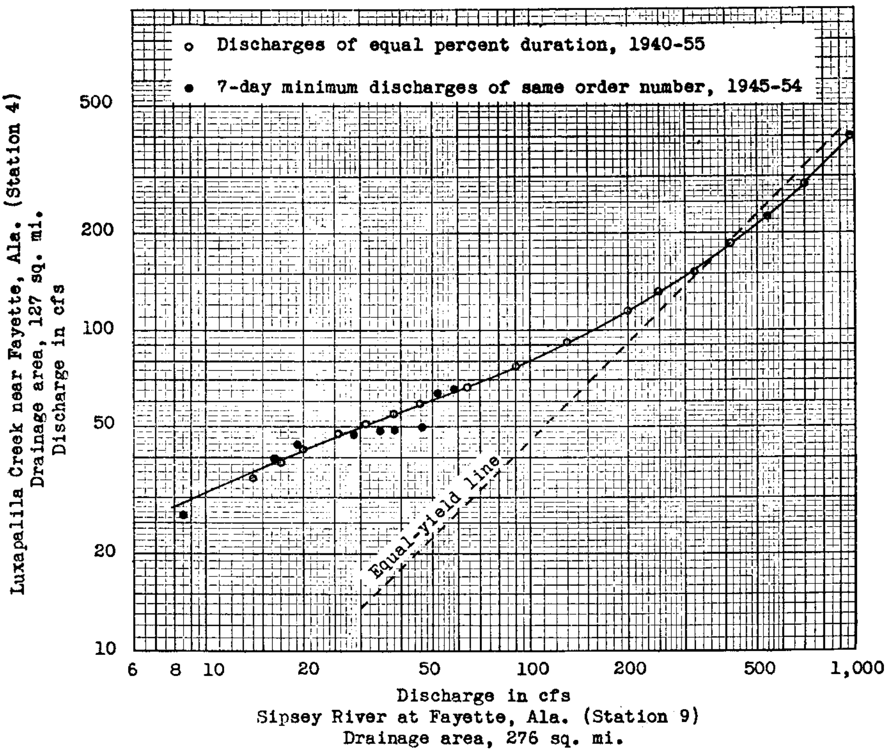

Figure 17.—Discharge correlation based on daily flows of equal percent duration.

from the four other stations are arrayed in order of magnitude in table 14. Blanks in the data indicate where the estimated discharges would have fallen had they been used.

The data are now combined or lumped by computing the median discharge for each order number (each horizontal row of figures). The medians and their recurrence intervals are listed in the last two columns of table 14; when plotted, the data of these two columns yield the frequency curve of figure 18.

Although figure 18 is a composite frequency curve representing the combined experience at 5 representative gaging stations in the upper Tombigbee River basin, it still expresses the results in terms of discharge at the pivot station. In order to apply the composite curve to one of the other stations, the geologic and topographic factor previously eliminated must be re-

Table 14.—7-day minimum discharges, in cfs, period 1939-54, at selected gaging stations in Tombigbee River basin, transposed to Station 9 (pivot station) and arrayed in order of magnitude

Order No.	Station 3	Station 4	Station 9 (pivot station)	Station 11	Station 13	Median	Recurrence interval, years (N + 1)/M
1	7.9	6.6	8.5	7.7	10.3	8.0	17.00
2	12.4	—	13.9	16.5	—	14.3	8.50
3	17.0	17.5	16.3	17.0	17.3	17.1	5.67
4	17.8	—	19.0	18.5	—	18.4	4.25
5	18.9	21.5	19.1	24.5	—	20.3	3.40
6	22.3	—	20.6	25.8	21.6	22.0	2.83
7	24.1	21.6	21.3	25.9	22.4	22.7	2.43
8	24.2	26.0	26.1	26.2	25.5	25.9	2.12
9	25.0	—	29.0	26.2	26.5	26.4	1.89
10	30.5	28.5	30.0	27.0	—	29.2	1.70
11	32.0	29.6	34.6	31.2	35.7	32.6	1.55
12	35.8	29.6	38.4	32.5	37.8	35.4	1.42
13	36.0	—	42.4	—	38.2	38.9	1.31
14	41.6	—	47.7	49.0	41.0	44.6	1.21
15	62.0	56.5	51.9	53.5	61.8	57.3	1.13
16	62.0	60.0	58.7	57.0	65.5	60.2	1.06

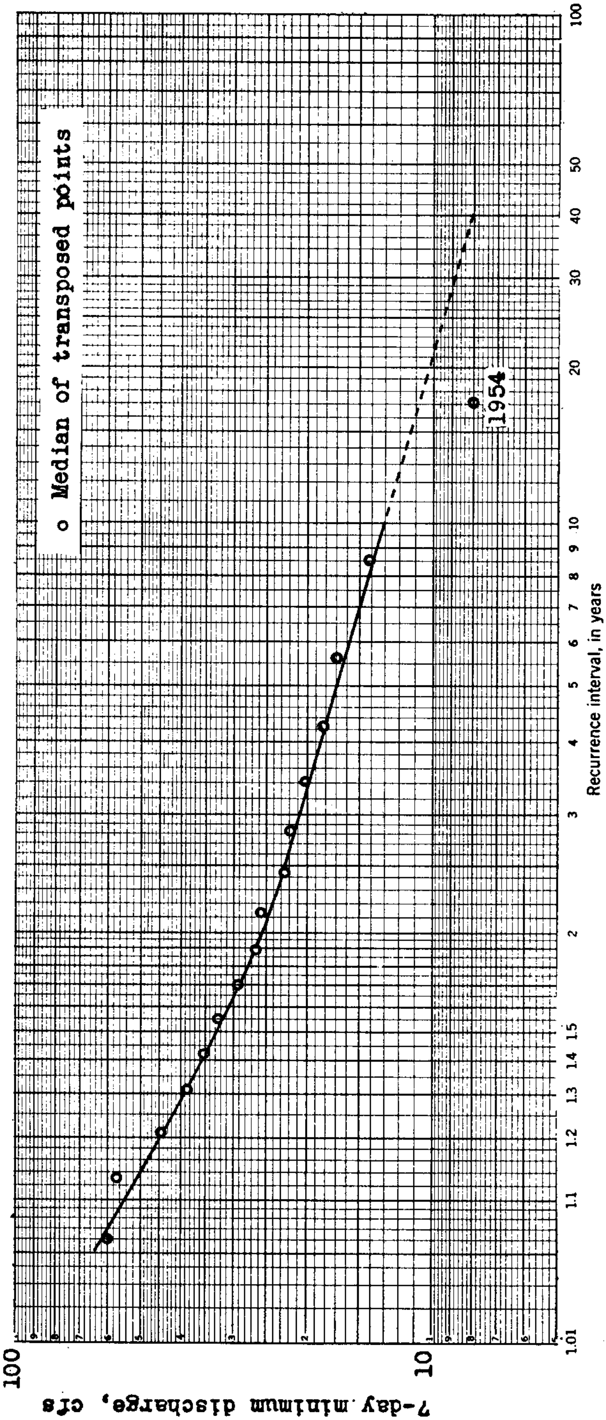

Figure 18.—Frequency of annual 7-day minimum flows, Sipsey River at Fayette, Ala. (Station 9), based on regional analysis of five gaging-station records, 1939-54.

stored. This, of course, is easily accomplished by reversing the process by which it was removed. For example, the 7-day minimum discharge having a recurrence interval of 2 years is read from the composite frequency curve as 25.5 cfs at Station 9, the pivot station; and from the discharge relation of figure 17 this is found to correspond to a discharge of 46.0 cfs at Station 4.

The composite low-flow frequency curve has great versatility. It is not restricted in application to those gaged streams from which it was derived. Because of its regional significance, it can be applied to any stream in the general area whose discharge can be correlated with that of the pivot station or any of the other gaging stations used in developing the composite curve. Thus, the frequency relations of figure 18 can be extended to many of the selected sites in the Tombigbee River basin for which skeleton flow-duration tables are presented in this report.

It must be noted, however, that the regional low-flow frequency curve, in contrast to the regional flood-frequency curve, cannot be applied to a totally ungaged basin. The effect of geology and topography on low flow in the ungaged basin must first be defined, which is simply another way of saying that a discharge correlation with a gaged stream must be established. At the present stage of hydrologic art, there is no known way to accomplish this except by actual measurements of discharge.

The composite low-flow frequency curve presented in figure 18 offers several advantages over a low-flow frequency curve based on the data observed at a single station. First, a comparison of the discharge at the lowest plotted point indicates that the 7-day minimum flow of 8.5 cfs experienced at Station 9 is in line with the severity of drought experienced at the other stations, which give a composite 7-day minimum flow of 8.0 cfs for Station 9. From this it can be concluded that the low flow observed at Station 9 in 1954 closely represents the drought conditions that prevailed generally in the report area in 1954. Therefore, if these drought conditions are suitable as a basis for design the records for Station 9 can be used without adjustment. Similar comparisons of the observed and regionalized discharge for the four stations used in the regional analysis are included in the following table:

Station No.	Station Name	1954 Low Flow From Regional Analysis (cfs)	Observed (cfs)	Difference in percent
3	Buttahatchee River	34.1	33.9	— 0.6
4	Luxapalila Creek	28.5	26.4	— 7.6
9	Sipsey River at Fayette	8.0	8.5	+ 6.3
11	Sipsey River at Elrod	15.6	15.1	— 2.6
13	Noxubee River near Geiger	19	23.4	+23.1

The 1954 low flow observed at station 13 appears to be considerably higher than would be expected under the drought conditions prevailing generally throughout the area. If this can be attributed to an unusual meteorological occurrence during the drought, then the next time an areal drought of the same frequency as that of 1954 occurs the discharge at Station 13 may be considerably lower than experienced in 1954. Observed discharge at the other four stations is not significantly different from that shown by the regional analysis.

Secondly, the composite low-flow frequency curve is a more reliable estimate of long-term conditions than is a curve drawn on the basis of a single record, especially when the curve is transposed to those stations where only 10 or 12 years of record are available. A regional analysis based on longer term records outside the report area might add to the reliability of the curve presented in figure 18, but such an analysis is outside the scope of this report in that the main object here is to compare the relative severity of the 1954 drought at stations in the report area.

Correlation of Annual Rainfall and Runoff

The annual runoff from a drainage basin forms a convenient unit for many hydrologic studies, particularly those relating to storage impoundments. When expressed as its equivalent depth in inches over the entire basin, annual runoff may be compared directly with annual rainfall, which is also measured in inches. The average annual runoff represents the upper limit of the water potentially available for development.

The ideal basis for project design is a long-term record of streamflow at the site of the project, but rarely is such record

Table 15.—Annual rainfall (P), runoff (R), and water loss (P-R), in inches, for selected drainage basins in west-central Alabama.

Water Year	Station 3 Buttahatchee River near Sulligent, Ala.			Station 11 Sipsey River near Elrod, Ala.			Station 16 Mulberry Fork near Garden City, Ala.		
	P	R	P-R	P	R	P-R	P	R	P-R
1944	49.18	20.88	28.30	52.03	18.05	33.98	51.71	23.59	28.12
1945	56.76	18.71	38.05	51.86	19.17	32.69	46.84	20.00	26.84
1946	63.43	25.49	37.94	66.45	29.60	36.85	70.13	31.52	38.61
1947	55.77	26.16	29.61	55.62	25.85	29.77	51.08	27.83	23.25
1948	54.36	23.43	30.93	54.89	20.70	34.19	53.29	21.66	31.63
1949	72.42	39.07	33.35	73.97	33.71	40.26	68.99	37.66	31.33
1950	66.61	31.80	34.81	65.57	28.08	37.49	62.92	29.62	33.30
1951	52.95	28.15	24.80	54.58	24.82	29.76	54.04	24.36	29.68
1952	49.40	21.32	28.08	48.27	16.25	32.02	55.86	26.95	28.91
1953	49.77	20.21	29.56	51.76	19.15	32.61	52.80	24.36	28.44
1954	37.99	14.01	23.98	37.12	10.80	26.32	44.56	14.88	29.68
Station mean	**55.33**	**24.48**	**30.85**	**55.65**	**22.38**	**33.27**	**55.66**	**25.68**	**29.98**

Water Year	Station 17 Sipsey Fork near Falls City, Ala.			Station 18 Clear Creek at Falls City, Ala.			Station 22 Blackwater Creek near Manchester, Ala.		
	P	R	P-R	P	R	P-R	P	R	P-R
1944	53.58	22.55	31.03	58.24	24.49	33.75	57.68	19.91	37.77
1945	47.23	17.82	29.41	56.12	22.24	33.88	56.11	19.76	36.35
1946	68.51	31.39	37.12	71.83	33.26	38.57	71.07	30.87	40.20
1947	49.25	25.56	23.69	54.23	27.82	26.41	55.35	28.12	27.23
1948	55.60	20.30	35.30	54.45	22.22	32.23	55.76	19.42	36.34
1949	71.47	38.08	33.39	75.85	39.84	36.01	81.53	36.15	45.38
1950	65.42	29.34	36.08	68.46	32.22	36.24	74.07	30.77	43.30
1951	51.27	24.57	26.70	54.97	25.52	29.45	61.54	23.30	38.24
1952	51.11	21.40	29.71	53.30	22.02	31.28	55.27	19.63	35.64
1953	48.06	19.22	28.84	49.02	22.18	26.84	54.93	20.12	34.81
1954	38.46	11.79	26.67	44.66	13.85	30.81	48.74	12.11	36.63
Station mean	**54.54**	**23.82**	**30.72**	**58.28**	**25.97**	**32.31**	**61.10**	**23.65**	**37.45**

Table 15.—Annual rainfall (P), runoff (R), and water loss (P-R), in inches, for selected drainage basins in west-central Alabama

(Continued)

Water Year	Station 26 Locust Fork near Cleveland, Ala.			Station 28 Turkey Creek at Morris, Ala.			Station 36 North River near Samantha, Ala.		
	P	R	P-R	P	R	P-R	P	R	P-R
1944	50.72	21.96	28.76	50.77	18.10	32.67	52.76	18.86	33.90
1945	46.08	18.58	27.50	51.16	16.65	34.51	56.03	20.14	35.89
1946	70.99	32.96	38.03	69.32	30.68	38.64	68.64	30.97	37.67
1947	53.56	29.12	24.44	58.25	28.56	29.69	55.00	25.82	29.18
1948	52.61	20.31	32.30	52.57	22.43	30.14	52.18	19.67	32.51
1949	67.57	38.33	29.24	76.76	38.60	38.16	74.97	33.16	41.81
1950	59.09	28.39	30.70	52.59	15.50	37.09	67.46	25.89	41.57
1951	53.78	24.74	29.04	51.87	22.42	29.45	56.30	26.07	30.23
1952	49.21	24.75	24.46	43.86	19.09	24.77	48.84	18.15	30.69
1953	51.87	22.86	29.01	49.78	19.49	30.29	50.98	23.26	27.72
954	40.19	13.96	26.23	44.51	11.91	32.60	37.16	13.99	23.17
Station mean	**54.15**	**25.09**	**29.06**	**54.68**	**22.13**	**32.55**	**56.39**	**23.27**	**33.12**

Water Year	Yearly means		
	P	R	P-R
1944	52.96	20.93	32.03
1945	52.02	19.23	32.79
1946	68.93	30.75	38.18
1947	54.23	27.20	27.03
1948	53.97	21.13	32.34
1949	73.73	37.18	36.55
1950	64.69	27.96	36.73
1951	54.59	24.88	29.71
1952	50.57	21.06	29.51
1953	51.00	21.21	29.79
1954	41.49	13.03	28.46

available. More frequently, it is necessary to synthesize streamflow records for the site from records of nearby streams that are more or less representative of the one proposed for development. Occasionally, however, even records of this kind may be unavailable or of inadequate length. In such cases, valuable inferences as to the amount of and variation in annual runoff can sometimes be based on rainfall records. In many areas, records of rainfall antedate records of streamflow from 30 to 50 years. Thus, if satisfactory correlations can be established between annual rainfall and runoff during the stream-gaging period, annual runoff may be estimated for the entire period of rainfall record.

In any locality, variations in annual runoff are caused chiefly by variations in amount and distribution of rainfall, as modified by temperature and wind and by numerous drainage basin characteristics such as area, geology and soils, topography, vegetation, and land use. The time-distribution of rainfall is a highly influential factor in determining runoff. During one year a large part of the rain may fall in the winter months when temperatures are low and the soil is saturated, whereas during another year the same total rainfall may be largely composed of light rains in the spring and summer when the soil is dry and temperature and wind are most favorable for evapo-transpiration. In most sections of the United States, little runoff would occur if the annual rainfall were evenly distributed throughout each day of the year.

Annual rainfall-runoff data for 9 drainage basins in west-central Alabama are shown in table 15 for the water years 1944-54. The rainfall on each basin was computed from rainfall records of the U. S. Weather Bureau by the Thiessen method, which assumes that the rainfall at any point in the basin is measured by the rainfall station nearest that point. Areal variation in annual rainfall is not great in west-central Alabama, and sufficient rainfall stations are available to determine the annual rainfall for any sizeable basin. However, there is a wide range in annual rainfall from year to year—in the tabulated data, for example, from 41.5 inches in 1954 to 73.7 inches in 1949.

Point Rainfall-runoff Relation

As an example of a simple rainfall-runoff correlation for a single basin, the data of table 15 for Station 26 are shown plotted (open circles) in figure 19. As the data are all for the same basin, variation due to the physiographic factors is not a factor. In spite of this, the plotted data scatter widely and it is evident that the correlation is not of much practical use. Thus, there must be other factors involved. The tabulated figures of rainfall and runoff for Station 26 show that prior as well as current rainfall influences the runoff for some years. For example, although rainfall for 1947 is about the same as for 1951, runoff for 1947 is considerably greater as a result of carryover from the preceding abnormally wet year.

A worthwhile improvement in the relationship of figure 19 can be made by assigning some weight to prior rainfall. This is indicated by plotting the solid circles, whose abscissae were

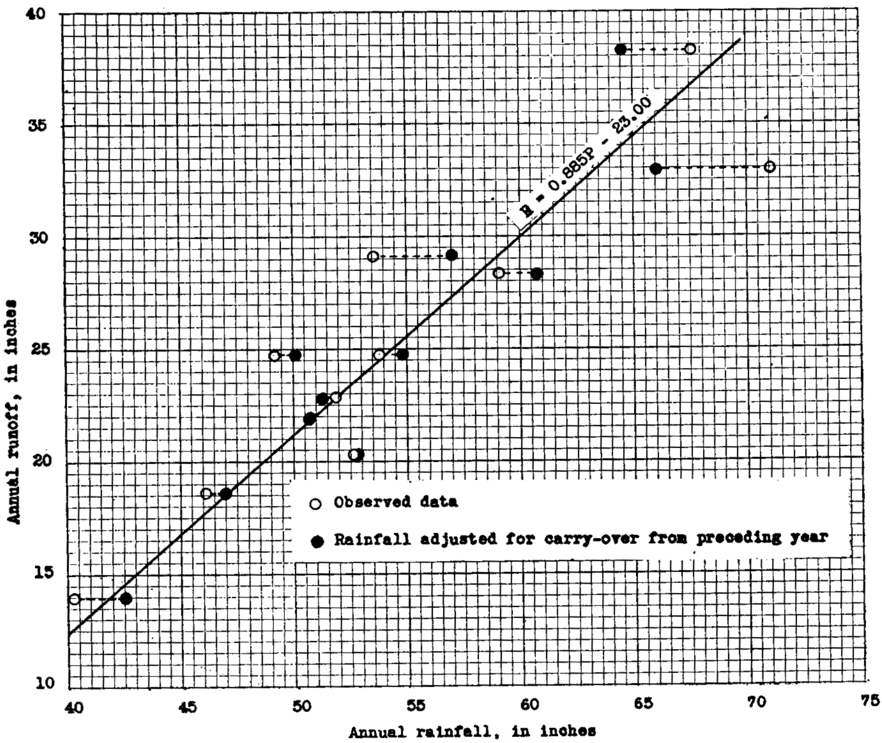

Figure 19.—Annual rainfall-runoff relation, Locust Fork near Cleveland, Ala. (Station 26)

computed by adding 80 percent of the current year's rainfall to 20 percent of that for the preceding year. The regression line shown in the figure was fitted to these points. The standard error of estimate is 2.5 inches or 10.0 percent of the mean annual runoff, and the coefficient of correlation is 0.938.

It is well to point out, however, that the percentages used in weighting the rainfall in this example probably would not apply to some other basin. Various schemes have been suggested to adjust for the effects of carryover, but they must all be chosen to fit the particular case. Quite often no improvement in correlation can be made by adjustments of this kind, the effects of carryover being concealed by more influential factors.

Regional Rainfall-runoff Relations

The scatter of the points in the foregoing example must be due largely to the time distribution of precipitation in the various years, but, because of the many variables involved, no simple index of the rainfall distribution factor is available. The best index of the distribution factor is provided by the measurement of rainfall and runoff for one or more basins in an area. If such information is available for one basin, it may be used as an index over the whole region, because the rainfall-temperature pattern for any year is much the same over a broad area.

Data from table 15 for all stations are plotted in figure 20 for 5 selected years. (For clarity, data for other years are not plotted.) Although the points scatter widely, they plot as a group for any one year. The indicated slope of the line averaging the points for each year is not appreciably different for the yearly groups and averages about 0.8, but the position of the line varies from year to year. Further, if lines of 0.8 slope are drawn through the average point for each yearly group, then the points for the individual basins plot in a fairly definite pattern about those lines. The grouping of the points by years reflects the common distribution of rainfall and temperature during the year, while the pattern about the line reflects the runoff characteristics of the individual basins. The variation in climatic effect has been eliminated by adjusting the position of the regression line, and the deviations from that line represent physiographic and geologic differences among the various basins.

The equations of lines having a slope of 0.8 drawn through the mean rainfall-runoff point for each year are given in table 16 for the water years 1944-54. The yearly deviations of the points for each basin from the average line of regression are listed in table 17. As an example, these computations for Station 26 are shown in table 18. The annual rainfall, P, and observed annual runoff, Ro, are listed in columns 2 and 3 of the table. The runoff, Rx, indicated by the average rainfall-runoff equation for each water year is listed in column 4. The differences between these figures and the observed runoff are listed in column 5 as R - Rx. These differences are all positive and average 2.67 inches, indicating that losses from this basin are smaller than the average for the region. With this pattern of runoff established, annual runoff for Station 26 can be computed for years prior to the establishment of the gaging station when other streamflow rec-

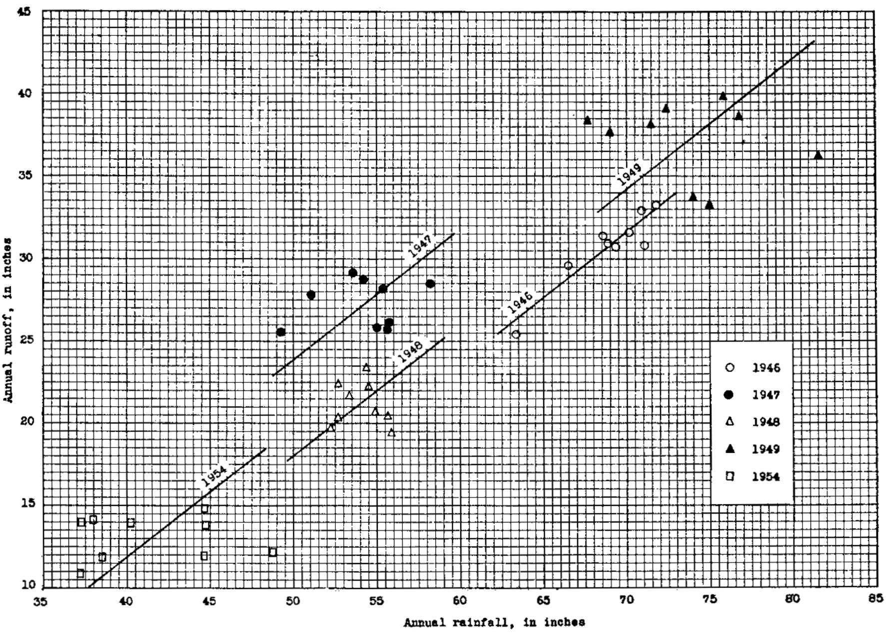

Figure 20.—Annual rainfall-runoff relations in west-central Alabama for selected water years.

ords are available to fix the position of the average rainfall-runoff regression for each year. The runoff figures of column 4 adjusted for the average basin departure (Rx + 2.67) are listed in column 6. Column 7 shows the departure of these adjusted figures from the observed runoff. The standard error of estimate for the computed figures of runoff is 2.15 inches (8.6 percent of the mean), which is somewhat better than that obtained by the simpler treatment of the first example. It is to be noted, however, that runoff could be estimated much farther back by the first method in which rainfall is the only index used.

Correlation of annual runoff with basin characteristics.—If the pattern of points about the average rainfall-runoff regression line reflects the physiographic characteristics of the individual basins, it should be possible to correlate the average deviations listed in table 17 with some physical property of the drainage basin known to influence runoff. In preceding reports of this series it was, in fact, found possible to correlate the deviations

Table 16.—Equations expressing the average rainfall-runoff relation for west-central Alabama by water years, 1944-54.

Water Year	Rainfall-runoff relation
1944	R = 0.8P — 21.4
1945	R = 0.8P — 22.4
1946	R = 0.8P — 24.39
1947	R = 0.8P — 16.18
1948	R = 0.8P — 22.05
1949	R = 0.8P — 21.80
1950	R = 0.8P — 23.79
1951	R = 0.8P — 18.79
1952	R = 0.8P — 19.40
1953	R = 0.8P — 19.59
1954	R = 0.8P — 20.16

P = Annual rainfall, in inches
R = Annual runoff, in inches

with basin geology, using flow per square mile at the 90 percent duration point as an index of the effect of geology on infiltration and ground-water storage. However, using the rainfall-runoff data here presented for west-central Alabama, no satisfactory correlation of this type could be found. Various properties of the flow-duration curve were used as indices of basin geology, but in all attempts the correlations obtained were no better than might reasonably have been expected from chance alone. Evidently the interaction of basin properties in the nine basins used is too great to allow any factor to be singled out. Although this is not the answer expected, it is not without value, as negative results are often instructive.

Table 17.—Deviation, in inches, of individual points from average rainfall-runoff relation.

Sta. No.	Stream and location	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	Mean
3	Buttahatchee R. nr. Sulligent	+2.98	—4.31	—0.86	—2.28	+1.99	+2.93	+2.30	+4.58	+1.20	—0.02	+3.78	+1.12
11	Sipsey R. near Elrod	—2.13	+ .07	+ .83	—2.47	—1.16	—3.67	— .59	— .05	—2.97	—2.67	+1.26	—1.23
16	Mulberry Fk. nr. Garden City	+3.66	+4.92	— .19	+3.15	+1.08	+4.27	+3.07	— .08	+1.66	+1.71	— .61	+2.06
17	Sipsey Fk. near Falls City	+1.13	+2.43	+ .97	+2.34	—2.13	+2.70	+ .79	+2.34	— .09	+ .36	+1.18	+1.09
18	Clear Cr. at Falls City	— .66	— .27	+ .19	+ .62	+ .71	+ .96	+1.24	+ .33	—1.22	+2.55	—1.72	+ .25
22	Blackwater Cr. nr. Manchester	—4.79	—2.74	—1.60	+ .02	—3.14	—7.27	—4.70	—7.14	—5.19	—4.23	—6.72	—4.32
26	Locust Fk. near Cleveland	+2.82	+4.11	+ .56	+2.45	+ .27	+6.07	+4.91	+ .51	+4.78	+ .95	+1.97	+2.67
28	Turkey Cr. at Morris	—1.08	—1.89	— .39	—1.86	+2.42	—1.01	—2.78	— .29	+3.40	— .74	—3.54	— .71
36	North R. near Samantha	—1.91	—2.29	+ .45	—2.00	— .02	—5.02	—4.29	— .18	—1.52	+2.07	+4.42	— .94

Table 18.—Rainfall-runoff relations for Locust Fork near Cleveland, Ala. (Station 26)

	2	3	4	5	6	7
Water Year	P	Ro	Rx	Ro-Rx	Rx + 2.67	(Rx + 2.67) -Ro
	Observed annual rainfall (inches)	Observed annual runoff (inches)	Runoff indicated by yearly regression (inches)	Deviation from yearly regression (inches)	Computed annual runoff (inches)	Departure from observed runoff (inches)
1944	50.72	21.96	19.14	+2.82	21.81	—0.15
1945	46.08	18.58	14.47	+4.11	17.14	—1.44
1946	70.99	32.96	32.40	+ .56	35.07	+2.11
1947	53.56	29.12	26.67	+2.45	29.34	+ .22
1948	52.61	20.31	20.04	+ .27	22.71	+2.40
1949	67.57	38.33	32.26	+6.07	34.93	—3.40
1950	59.09	28.39	23.48	+4.91	26.15	—2.24
1951	53.78	24.74	24.23	+ .51	26.90	+2.16
1952	49.21	24.75	19.97	+4.78	22.64	—2.11
1953	51.87	22.86	21.91	+ .95	24.58	+1.72
1954	40.19	13.96	11.99	+1.97	14.66	+ .70
Mean	**54.15**	**25.09**	—	**+2.67**	**25.09**	***2.15**

*Standard error of estimate.

CHEMICAL QUALITY OF SURFACE WATER OF WEST-CENTRAL ALABAMA

By James W. Geurin

The environment generally affects the quality of water. Ground water is usually of more uniform chemical composition than surface water, principally because of its relatively slow movement compared to that of surface water. Whereas the composition is more uniform, ground water usually contains in solution more mineral matter than surface water. Ground water influences the quality of surface water, especially during those periods when the base flows of the streams are maintained by inflow of ground water.

Surface water, moving rapidly from one environment to another, may undergo changes in composition. Generally speaking, surface water tends to carry increasing loads of dissolved material, even though the concentration of mineral matter may be reduced by increased runoff or inflow of less mineralized waters. In addition to the dissolved substances which occur in natural surface flow—that is, due to the solvent action of water on soils and rocks—cultural factors also tend to add mineral matter to the stream system.

The natural processes that influence quality of surface waters usually operate in such a manner that ranges in mineral content would recur similar to recurring stages of runoff, and the chemical characteristics of the water could be determined easily by sampling during specific periods. Changing of the stream regimen, use of water and its subsequent return to the stream, and the addition of materials by man, introduce an entirely different set of conditions which in many cases cause erratic changes in composition or mineral content of the water. The definition of the quality of water must now take into account the added influences and, because of the erratic nature of these influences, almost constant surveillance is required to insure that the definition is adequate and correct.

Unfortunately, records are not available either in frequency or in duration to define adequately the quality of the waters of streams in west-central Alabama. An indication of the quality is given by the available records collected during 1952 and 1956.

The quantity of materials dissolved or suspended in waters may limit the usefulness of waters for particular purposes. Domestic users are usually concerned with the hardness, iron, manganese, fluoride, nitrate, and sulfate content of the water. If no other water is available, domestic users will tolerate considerable quantities of dissolved matter in the water or may reduce the concentration of objectionable constituents by the use of some type of home treatment. Most municipal supplies are selected to insure a good quality or are treated to reduce or remove objectionable characteristics. Many municipal supplies conform to chemical standards established by the U. S. Public Health Service for potable water to be used on interstate carriers. The maximum allowable concentration of some constituents as established by the Public Health Service are as follows:

Constituents	Maximum Concentration (ppm)
Iron and manganese together	0.3
Magnesium	125
Sulfate	250
Chloride	250
Fluoride	1.5
Dissolved solids	500 (1,000 permitted)

The quality of water needed for industry is often as important as the quantity. The water uses by industry are so varied and the quality requirements so diverse that it is not possible to set up a single set of water quality tolerances that will fit all industries. Most industries have specific water quality requirements, some of which are far more exacting in certain aspects than the requirements for potable supplies. These requirements may be met by selection of a satisfactory natural water supply source, or by chemical treatment of an unsuitable supply. Limits of tolerance for chemical quality of water for some industries are shown in table 19.

The limits given serve only to indicate certain characteristics of water that are significant in the evaluation of the suitability of water for some industrial processes. The values given in the table are only suggested guides in evaluating the suitability of water supplies and, in general, are those beyond which corrective treatment of the supply begins to be necessary.

Table 19.—Water-quality tolerances for industrial applications[1]

(Range of recommended threshold or limiting values in parts per million)

Industry	Turbidity (as SiO_2)	Color (units)	Taste	Odor	Oxygen consumed	Dissolved oxygen	Total solids	Hardness (as $CaCO_3$)	Alkalinity (as $CaCO_3$)	Iron (Fe)	Manganese (Mn)	Fe + Mn	Aluminum (as Al_2O_3)	Silica (SiO_2)	Calcium (Ca)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Hydroxide (OH)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	pH	Other
Baking	10	10	None	Low	—	—	—	(2)	—	0.2	0.2	0.2	—	—	—	—	—	—	—	—	—	—	H_2S, 0.2
Boiler feed water:																							
Pressure = 0-150 psi	20	80	—	—	15	1.4	3,000-500	80	—	—	—	—	5	40	—	50	200	50	—	—	—	>8.0	H_2S, 5
Pressure = 150-250 psi	10	40	—	—	10	.14	2,500-500	40	—	—	—	—	.5	20	—	30	100	40	—	—	—	>8.4	H_2S, 3
Pressure = 250-400 psi	5	5	—	—	4	.00	1,500-100	10	—	—	—	—	.05	5	—	5	40	30	—	—	—	>9.0	H_2S, 0
Pressure = over 400 psi	1	2	—	—	3	.00	50	2	—	—	—	—	.01	1	—	0	20	15	—	—	—	>9.6	H_2S, 0
Brewing:																							
Light beer	0-10	0-10	None	Low	—	—	500	—	75-80	.1	.1	.1	—	50	100-200	—	50-68	—	(3)	—	1	6.5-7.0	NO_3, 30; H_2S, 0.2
Dark beer	0-10	0-10	None	Low	—	—	1,000	—	80-150	.1	.1	.1	—	50	200-500	—	50-68	—	(3)	—	1	—	NO_3, 30; H_2S, 0.2
Carbonated beverages	1-2	5-10	None	Low	1.5	—	850-855	200-250	50-128	.1- .2	.2	.1-1.5	—	—	—	—	—	—	250	250	.2-1.0	—	H_2S, 0-0.2
Confectionary	—	—	Low	Low	—	—	50-100	—	—	.2	.2	.2	—	—	—	—	—	—	—	—	—	>7.0	H_2S, 0.2
Cooling water	50	—	—	—	—	—	—	50	—	.5	.5	.5	—	—	—	—	—	—	—	—	—	—	
Food canning & freezing	1-10	—	None	Low	—	—	—	50-85	—	.2	.2	.2	—	—	—	—	—	—	—	(4)	1	>7.5	H_2S, 1
Food equipment washing	1	5-20	None	None	—	—	850	10	—	—	—	.2	—	—	—	—	—	—	—	250	1	—	
Food processing—general	1-10	5-10	Low	Low	—	—	850	10-250	30-250	.2	.2	.2- .3	—	—	—	—	—	—	—	—	1	—	
Ice manufacturing	1-5	5	None	Low	3	—	170-1,300	70-72	30-50	.03- .2	.2	.2	—	10	—	—	—	—	—	—	1	—	
Laundering	—	—	—	—	—	—	—	0-50	60	.2-1.0	.2	.2	—	—	—	—	—	—	—	—	—	6.0-6.8	
Plastics	2	2	—	—	—	—	200	—	—	.02	.02	.02	—	—	—	—	—	—	—	—	—	—	
Pulp & paper:																							
Ground wood pulp	50	30	—	—	—	—	500	200	150	.3	.1	—	—	50	—	—	—	—	—	75	—	—	CO_2, 10
Soda & sulfate pulps	25	5	—	—	—	—	250	100	75	.1	.05	—	—	20	—	—	—	—	—	75	—	—	CO_2, 10
Kraft paper (bleached)	40	25	—	—	—	—	300	100	75	.2	.1	—	—	50	—	—	—	—	—	200	—	—	CO_2, 10
Kraft paper (unbleached)	100	100	—	—	—	—	500	200	150	1.0	.5	—	—	100	—	—	—	—	—	200	—	—	CO_2, 10
Fine paper	10	5	—	—	—	—	200	100	75	.1	.05	—	—	20	—	—	—	—	—	—	—	—	CO_2, 10
Rayon (viscose):																							
Pulp	5	5	—	—	—	—	100	8	50	.05	.03	.05	<8	<25	—	—	—	—	—	—	—	—	Cu <5
Manufacture	0.3	—	—	—	—	—	—	55	—	.0	.0	.0	—	—	—	—	—	—	—	—	—	7.8-8.3	
Steel manufacture	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	175	—	6.8-7.0	
Sugar manufacture	—	—	—	—	—	—	—	—	—	.1	—	—	—	—	20	100	—	—	20	20	—	—	Mg, 10
Tanning operations	20	10-100	—	—	—	—	—	50-513	128-135	.1-2.0	.1- .2	.2	—	—	—	—	—	—	—	—	—	6.0-8.0	
Textile manufacture	3-25	5-70	—	—	—	—	—	0-50	—	.1-1.0	.05-1.0	.2-1.0	—	—	10	200	—	—	100	100	—	—	Mg, 5

1 State of California Water Pollution Board, 1952.
2 Some hardness desirable.
3 Presence of $CaSO_4$ advantageous.
4 Sodium chloride, NaCl, 1,000-1,500.

The quality requirements for water use in agriculture are almost as diverse as those for industrial water, owing to the many uses of water in an agricultural economy. In addition to the need for a safe and adequate supply of drinking water for the farmer and his family, water may be required for sanitary purposes, cleansing of dairy and other equipment, irrigation, and the watering of stock and wildlife.

Although the quality requirements for irrigation are in general less exacting than those for domestic use, no single standard has been devised that will apply to all areas of the country. The classification of irrigational waters as to good or bad must take into account numerous factors, among which are: agricultural practices, climate, nature of the soil and crop tolerances. Good soil drainage may be a more important factor than water quality, for even good waters on poorly drained land may not produce good crops. On the other hand, relatively high mineralized waters may often be used successfully on open textured, well drained soils. However, since a good soil may be removed from production by irrigation with water of poor quality, a knowledge of the chemical quality of potential irrigation supplies is desirable for sound planning. Classification of a water for irrigation usage requires knowledge of the concentration of dissolved solids, the relative proportion of sodium to other cations, the concentration of boron or other elements that may be toxic, and in some cases the bicarbonate concentration.

The quality of the surface waters of west-central Alabama is indicated by analyses of samples collected at 10 locations during June, August, and September 1952, and at 15 locations during February, May, and September 1956. The results of these analyses are shown in table 20.

As indicated by analyses of samples collected during 1952 and 1956, the surface waters in west-central Alabama are of good quality, having concentrations of dissolved solids ranging from 21 to 465 ppm, usually being less than 150 ppm. Most of the waters are very soft.

The upper Black Warrior River and its tributaries flow through the outcrop of the Pottsville, Copper Ridge, and Ketona dolomite formations. The lower Black Warrier River and tributaries to the Tombigbee River in west-central Alabama flow through the outcrop of the Tuscaloosa, Eutaw, and Selma chalk formations.

Table 20. Chemical Analyses of Surface Waters in West-Central Alabama

Analyses by U. S. Geological Survey, in parts per million

Date of Collection	Mean Daily Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids Residue on evaporation at 180° C.	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25° C.)	pH	Color
Buttahatchee River near Hamilton (Station 2)																		
Feb. 7, 1956	1,270	5.6	0.02	0.8	0.9	1.2	0.6	6	1.0	2.2	0.1	0.9	21	6	1	21.4	6.0	15
May 17	180	7.2	.00	1.2	2.1	1.3	.6	9	.8	1.5	.0	.4	24	12	4	28.8	6.0	10
Sept. 11	41	6.5	.55	3.0	1.0	1.4	1.1	18	2.0	2.0	.4	.9	30	12	0	33.7	7.2	50
Luxapalila Creek near Fayette (Station 4)																		
Feb. 7, 1956	386	8.0	.07	2.0	.6	1.9	.6	6	4.2	3.0	.2	1.7	30	7	2	31.2	5.9	20
May 17	79	8.9	.00	1.4	.7	1.8	.8	8	.8	2.0	.0	.8	31	6	0	27.0	6.1	5
Sept. 11	30	9.0	.14	.8	.6	1.6	.7	16	2.0	2.0	.1	.9	[1]26	4	0	20.7	6.7	25
Coalfire Creek near Pickensville (Station 6)																		
Feb. 8, 1956	634	8.5	.10	2.0	.7	1.9	1.2	8	.0	2.5	.1	.0	33	8	1	31.8	5.8	55
May 15	42	12	.33	2.2	1.3	2.0	.9	13	.8	2.0	.0	.4	35	11	0	33.7	6.3	45
Sept. 11	9.4	8.7	.11	1.6	.9	1.3	.9	11	.5	2.5	.0	.2	[1]22	8	0	28.5	6.6	15
Lubbub Creek near Carrolton (Station 8)																		
Feb. 8, 1956	610	7.7	.01	2.0	.4	1.9	1.0	6	.2	2.8	.3	.1	35	7	2	28.3	5.7	45
May 15	31	10		2.6	1.2	2.1	.9	14	1.0	2.2	--	.0	45	12	0	37.3	6.1	100
Sept. 11	5.4	9.5	1.0	2.0	1.2	1.9	1.3	18	3.5	2.8	.6	.5	39	10	0	33.1	6.8	55

Table 20. Chemical Analyses of Surface Waters in West-Central Alabama—(continued)

Analyses by U. S. Geological Survey, in parts per million

Date of Collection	Mean Daily Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids Residue on evaporation at 180° C.	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25° C.)	pH	Color
Sipsey River near Fayette (Station 9)																		
Feb. 7, 1956	3,010	6.8	.04	2.8	1.3	1.9	1.0	6	9.8	3.0	.1	.1	36	12	7	41.8	5.9	25
May 17	202	8.9	.06	3.8	1.9	2.0	.8	12	9.5	1.8	.0	.4	38	18	8	53.6	6.5	10
Sept. 11	17	6.1	.18	3.6	2.2	1.9	1.0	18	11	2.0	.3	.3	36	18	3	50.2	7.1	25
Sipsey River near Elrod (Station 11)																		
Feb. 8, 1956	2,570	7.7	.04	2.6	.6	1.6	1.2	6	4.5	2.8	.1	.0	37	9	4	35.0	5.6	40
May 17	790	4.6	.27	3.2	1.2	1.4	.7	15	6.8	3.0	.6	.3	29	13	0	42.4	6.3	5
Sept. 11	33	6.8	.27	3.6	1.9	2.2	1.3	18	12	2.5	.3	.3	41	17	2	55.2	7.1	35
Noxubee River near Geiger (Station 13)																		
Feb. 8, 1956		6.2	.12	14	1.0	2.1	2.0	44	6.0	2.0	.2	.3	86	39	3	91.9	6.7	90
May 14		8.8	.00	19	1.8	4.8	1.2	64	11	4.8	.6	.8	87	55	2	133	7.0	5
Sept. 10		6.3	.00	30	1.6	5.0	1.2	100	4.5	6.0	.0	.1	101	82	0	181	7.5	15
Tombigbee River near Gainesville (Station 14)																		
Feb. 8, 1956		5.2	.14	12	1.0	1.8	1.6	38	.8	2.0	.1	.1	78	34	3	80.5	6.7	90
May 14		8.6	.02	14	.9	2.0	.9	47	6.2	3.0	.6	.5	63	38	0	91.6	7.0	5
Sept. 10		4.3	.00	14	1.2	5.7	1.5	51	5.8	6.8	.1	.4	72	39	0	113	7.0	10

Table 20. Chemical Analyses of Surface Waters in West-Central Alabama—(continued)

Analyses by U. S. Geological Survey, in parts per million

Date of Collection	Mean Daily Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids Residue on evaporation at 180° C.	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25° C.)	pH	Color
Mulberry Fork near Garden City (Station 16)																		
June 24, 1952	56.0	5.0	.05	9.0	1.2	2.7	.6	33	1.6	3.8	.1	1.4	43	27	0	68.9	7.2	4
Aug. 25	26.5	5.1	.04	11	1.5	3.0	1.9	40	4.7	3.2	.1	1.2	52	34	1	81.1	7.3	5
Sept. 19	470	4.2	.33	3.8	1.5	3.6	2.9	17	4.9	3.8	.2	1.0	50	16	2	39.7	6.3	22
Sipsey Fork near Falls City (Station 18)																		
June 23, 1952	109	4.2	.14	5.2	1.3	1.6	1.2	21	2.2	2.0	.1	.8	35	18	1	45.3	6.9	18
Aug. 26	24.4	4.4	.73	4.1	1.8	1.7	1.4	18	2.3	2.2	.1	.9	40	18	3	39.7	7.0	60
Sept. 18	29.0	5.6	.12	3.5	1.2	2.0	1.6	18	3.2	2.0	.1	.0	32	14	0	38.7	6.9	17
Sipsey Fork near Sipsey (Station 21)																		
June 23, 1952	300	6.2	.26	4.1	1.4	1.7	1.6	17	1.6	2.2	.3	1.0	38	16	2	40.3	6.7	37
Aug. 26	69.0	6.0	1.1	3.3	1.8	1.5	1.6	14	4.1	2.5	.1	1.1	42	16	4	36.4	6.7	60
Sept. 18	75.5	5.4	.31	2.7	1.4	2.1	1.6	17	2.0	2.2	.1	.0	29	12	0	36.4	6.8	21
Blackwater Creek near Manchester (Station 22)																		
Sept. 18, 1952	24.0	8.0	.67	2.9	2.6	2.2	2.1	9	14	2.2	.1	.5	45	18	11	57.3	6.7	38
Feb. 7, 1956	2,190	5.1	.05	2.4	1.8	1.0	1.0	4	14	2.5	.2	.8	39	13	10	45.6	5.5	15
May 17	145	6.8	.01	2.8	3.6	2.1	.9	6	20	1.2	.0	.1	51	22	17	65.0	6.6	10
Sept. 12	12	6.4	.00	12	8.8	2.6	1.6	16	64	1.5	.1	.6	107	66	53	162	6.0	10

Table 20. Chemical Analyses of Surface Waters in West-Central Alabama—(continued)

Analyses by U. S. Geological Survey, in parts per million

Date of Collection	Mean Daily Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids Residue on evaporation at 180° C.	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25° C.)	pH	Color
Lost Creek near Oakman (Station 24)																		
Feb. 7, 1956	558	7.5	.02	4.6	3.6	6.5	1.0	12	32	3.0	.2	1.0	60	26	16	95.8	6.3	15
May 17	66	6.3	.02	6.2	7.9	9.4	1.2	26	35	2.0	.0	.0	85	48	26	129	7.2	5
Sept. 12	1.8	4.3	.00	13	11	31	2.2	80	79	4.0	.1	.2	186	78	12	298	7.4	12
Locust Fork near Trafford (Station 27)																		
June 24, 1952	125	5.0	.05	9.6	3.1	2.7	1.3	34	10	3.2	.1	1.3	57	37	9	92.2	7.1	5
Aug. 25	84.1	4.8	1.2	9.8	3.1	2.4	2.3	38	8.8	2.5	.1	1.6	73	37	6	88.4	7.2	70
Sept. 19	240	4.1	.06	12	4.8	3.0	2.7	44	14	3.0	.1	.4	69	50	14	112	7.1	25
Turkey Creek at Morris (Station 28)																		
June 24, 1952	24.5	7.0	.11	23	9.1	2.0	2.0	108	5.1	3.2	.1	1.6	113	95	6	187	7.4	18
Aug. 25	18.5	7.2	.04	29	13	2.6	1.0	142	7.0	2.8	.1	1.1	134	126	9	230	7.8	7
Sept. 19	18.0	7.4	.08	23	14	2.5	1.6	138	5.4	2.5	.0	.3	127	115	2	223	7.6	6
Feb. 7, 1956	340	7.9	.06	12	5.1	3.2	.9	48	18	3.0	.2	1.4	81	51	12	118	7.0	10
May 15	38	5.1	.00	24	11	3.5	.9	121	7.2	2.0	.0	.5	110	105	6	206	7.5	15
Sept. 12	11	7.5	.00	29	12	2.2	.8	151	4.8	2.5	.2	.9	129	122	0	233	7.9	15

Table 20. Chemical Analyses of Surface Waters in West-Central Alabama—(continued)

Analyses by U. S. Geological Survey, in parts per million

Date of Collection	Mean Daily Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids Residue on evaporation at 180° C.	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25° C.)	pH	Color
Five Mile Creek near Ketona (Station 30)																		
June 24, 1952	16.8	8.8	.07	31	14	1.8	1.2	154	3.6	3.0	.1	2.7	144	135	8	247	7.7	6
Aug. 25	9.79	7.0	.20	33	15	1.8	.8	163	6.3	2.8	.1	2.1	150	144	10	256	8.0	15
Sept. 19	8.35	7.6	.05	32	17	1.5	1.1	169	2.9	3.0	.1	1.6	150	150	11	259	7.9	6
Village Creek at Ensley																		
Aug. 26, 1952	53.1	11	.12	46	14	42	17	128	138	20	1.6	8.1	376	172	68	596	7.0	17
Locust Fork at Port Birmingham																		
June 24, 1952	----	5.0	.02	11	3.8	8.5	2.1	39	23	3.8	.2	2.2	82	43	11	133	7.1	4
Valley Creek near Oak Grove (Station 32)																		
Aug. 26, 1952	121	10	.24	56	12	33	15	62	192	20	1.4	2.0	379	189	138	622	6.5	20
Oct. 1	114	14	.17	62	13	57	18	154	178	34	2.8	.3	465	208	82	758	6.9	30
North River near Tuscaloosa (Station 37)																		
Feb. 7, 1956	2,060	8.4	.06	1.6	1.0	2.1	.6	7	.0	2.8	.1	.0	33	8	2	29.1	6.2	40
May 18	159	8.9	.05	1.8	1.2	2.2	.8	13	.8	2.0	.0	.4	32	10	0	34.4	6.5	15
Sept. 11	26	8.2	.34	1.6	1.0	1.5	1.2	16	2.0	2.2	.1	.4	33	8	0	27.0	6.8	55

Table 20. Chemical Analyses of Surface Waters in West-Central Alabama—(continued)

Analyses by U. S. Geological Survey, in parts per million

Date of Collection	Mean Daily Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids Residue on evaporation at 180° C.	Hardness as $CaCO_3$ Calcium, Magnesium	Hardness as $CaCO_3$ Non-carbonate	Specific conductance (micromhos at 25° C.)	pH	Color
Hurricane Creek near Holt (Station 35)																		
Feb. 8, 1956	367	7.3	.03	2.2	1.6	1.8	.4	4	12	2.2	.1	.3	38	12	9	40.8	5.6	10
May 18	36	9.2	.00	4.6	4.0	1.8	.8	7	27	1.8	.0	.3	67	28	22	78.6	6.1	5
Sept. 11	6.7	6.8	.00	8.0	7.1	1.9	1.3	10	49	2.2	.1	.3	89	49	41	126	6.0	9
Five Mile Creek near Greensboro (Station 39)																		
Feb. 8, 1956	236	8.9	.10	1.8	.5	1.6	.6	5	.2	3.0	.1	.2	28	7	2	31.6	5.7	40
May 14	18	9.2	.65	2.4	.7	1.6	.6	12	.5	2.8	.6	1.1	36	9	0	35.6	6.0	0
Sept. 10	3.6	11	.76	1.8	.6	1.2	.9	10	2.5	3.2	.0	.2	41	7	0	28.4	6.2	50
Black Warrior River near Eutaw (Station 40)																		
Feb. 9, 1956	---	6.0	.08	7.6	2.6	5.8	1.6	14	27	4.0	.1	.4	69	30	18	101	6.3	35
May 14	---	.0	.00	9.6	2.4	9.0	.9	26	24	7.0	.6	.2	73	34	12	118	7.9	5
Sept. 10	---	6.0	.00	14	4.9	27	2.1	61	46	16	.2	.3	147	55	5	251	6.9	5

[1] Sum of determined constituents.

Records collected in 1952 and 1956 indicate that the waters of Black Warrior River and its tributaries, with the exception of Five Mile Creek, Village Creek, Lost Creek, and Valley Creek, carry concentrations of dissolved solids less than 150 ppm. As would be expected, concentrations were slightly higher during periods of low flow.

Figure 21 shows the chemical composition of waters at selected stream locations in west-central Alabama.

The quality of stream waters is usually poorest during periods of low flow, although exceptions can occur on the initial rise after heavy rains, on the lower reaches of longer streams, and on those streams where the cultural factors influence quality more than the natural factors. For the streams in west-central Alabama, in general, the waters contain slightly greater concentrations of mineral matter during periods of low flow.

Modal flows were calculated for the 1956 water year for several streams in west-central Alabama. Samples collected during September 1956 were obtained when the flows in the streams were at or near the modal flow, that is, the most frequently occuring flow. The quality of the water that occurred during the modal flow, as indicated by these analyses, is that which the user would expect to find most frequently. As, in general, the highest concentrations of dissolved solids occurred during the periods of modal flow and these periods are coincident with the periods of lowest runoff during the year, it is reasonable to assume that users of surface waters in west-central Alabama could expect quality as good or better than that indicated by the analyses of low flow shown in table 20.

Examination of data collected in 1952 and 1956 in west-central Alabama indicates that, with the exception of some streams flowing into Locust Fork and Black Warrior River from the east, the quality of waters of the streams is affected more by geologic and climatic conditions than by cultural conditions. Generally, the waters are of good quality, are low in dissolved solids, and are soft, although some contained objectionable quantities of iron and fluoride, and were high in color.

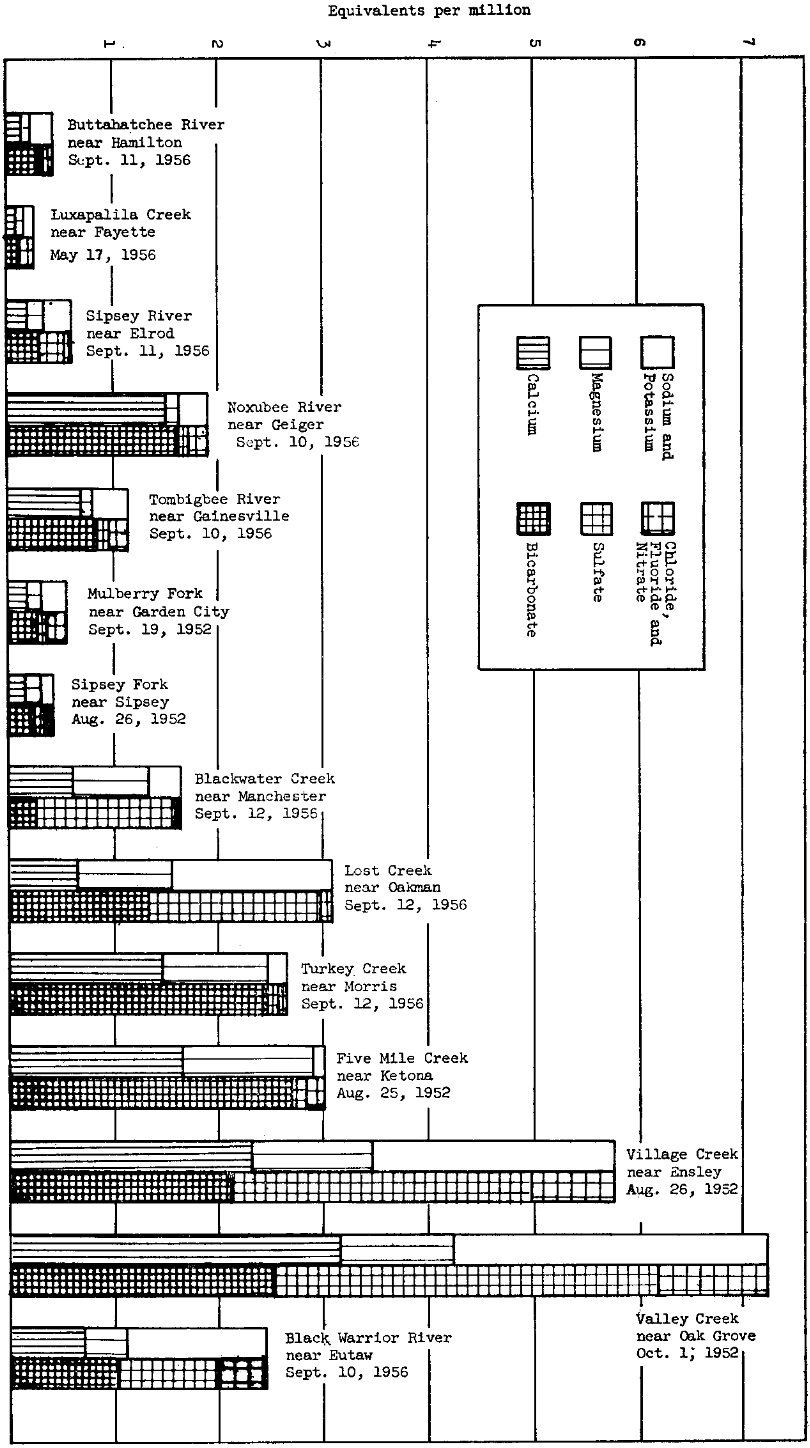

Figure 21.—Chemical composition of waters from selected stream locations in west-central Alabama.

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