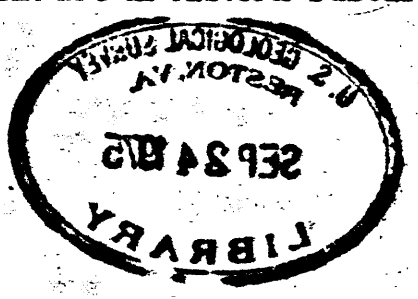
SURFACE-WATER AVAILABILITY, TUSCALOOSA COUNTY, ALABAMA

By Alfred L. Knight and Marvin E. Davis 1919 –

ABSTRACT

The average annual runoff, about 1,270 mgd (million gallons per day), originating in Tuscaloosa County is equivalent to 20 inches or 0.95 mgd per square mile. The Black Warrior and Sipsey Rivers, the largest streams in the county, have average flows of 5,230 mgd and 580 mgd, respectively, where they leave the county, and median annual 7-day low flows in excess of 150 mgd and 35 mgd, respectively. North River, Big Sandy Creek, and Hurricane Creek have average flows in excess of 100 mgd and median annual 7-day low flows in excess of 2 mgd.

Surface water generally contains less than 100 mg/l (milligrams per liter) dissolved solids, less than 10 mg/l chloride, and is soft to moderately hard. Streams having the higher hardness and the higher dissolved-solids content are in eastern Tuscaloosa County.



INTRODUCTION

A statewide study of the geology and availability of water in Alabama is being made by the U. S. Geological Survey in cooperation with the Geological Survey of Alabama. The study is designed to map the surface geology at a scale of 1 inch per mile and to describe and appraise the availability of surface water and ground water of seven areas corresponding generally to major river basins. The work is planned, conducted, and the results are to be published on the basis of county units. The seven areas and the status of the studies are shown on figure 1.

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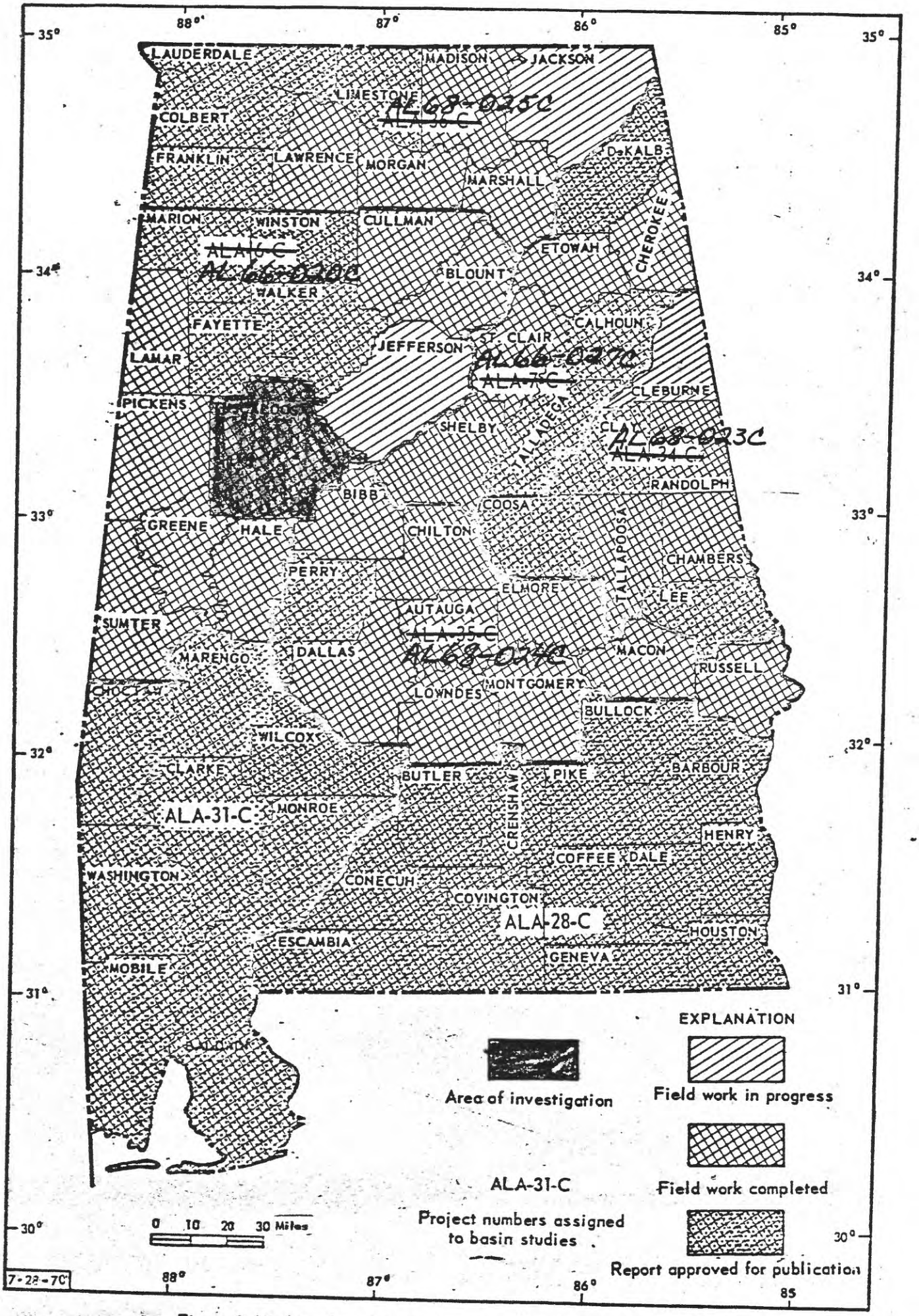

Figure 1.—Status of geologic and water-availability studies in Alabama

Figure 1. --Status of geologic and water-availability studies in Alabama.

This report describes the surface-water availability in Tuscaloosa County, which is in the upper Tombigbee-Black Warrior River basin (AL 66-020C). The purpose of this report is to describe the occurrence, availability, and quality of surface water in the county, and to present the information in such a way that a quick visual appraisal and comparison with other county areas can be made by those interested in the development of water resources. It is a supplement to (1) a ground-water report (Paulson, Miller, and Drennen, 1962), which contains a geologic map and information on the occurrence, availability, and quality of ground water; and (2) a surface-water report (Peirce, 1962), which presents information on the low flow, flow duration, storage requirements, floods, water temperature, and chemical quality of surface water. These three reports can be used to evaluate the general availability of water in Tuscaloosa County.

General information on surface water and water quality is also available in several other reports listed in the selected references section of this report. The author utilizes and summarizes information acquired in earlier studies as well as additional data and information acquired during this study. The report contains analyses of water-resources data that were not presented in previous reports, namely: a map showing average flow and low flow. It also presents in tabular form data obtained since the earlier reports were prepared.

SOURCE AND OCCURRENCE OF WATER

The source of all fresh water in Tuscaloosa County is precipitation which occurs mainly in the form of rain. Annual rainfall averages about 52 inches and is fairly evenly distributed throughout the year. Part of this rainfall runs off directly into streams; part replenishes soil moisture but is returned to the atmosphere by evapotranspiration; and part percolates downward below the soil zone to replenish underground reservoirs. The average annual runoff, about 1,270 mgd (million gallons per day), originating in the county is equivalent to 20 inches or 0.95 mgd per square mile.

The Black Warrior and Sipsey Rivers are the largest streams in the county. The main tributaries of the Black Warrior are North River and Big Yellow, Blue, Davis, Hurricane, Big Sandy, and Grant Creeks. The Sipsey River has no large tributaries in the county.

AVERAGE FLOW

The long-term average flow of a stream, the arithmetic mean of all yearly discharges for a long period of time, is a useful statistic for evaluating the availability of water. Since this statistic should reflect a reasonable balance of wet and dry years, about 20 years of streamflow records are required for adequate definition of average flow. Average flow of streams with short-term records can be computed by correlation with nearby streams where longer streamflow records are available. Average flows greater than 10 mgd for streams in Tuscaloosa County are shown on figure 2.

Figure 2 (caption on next page) belongs near here.

The Sipsey and Black Warrior Rivers have average flows of about 580 mgd and 5,230 mgd respectively where they leave the county. North River, Davis, Hurricane, and Big Sandy Creeks each have average flows that exceed 100 mgd along their lower reaches. Other streams within Tuscaloosa County have average flows less than 70 mgd.

Figure 2.--Surface-water availability, Tuscaloosa County, Alabama.

7-DAY Q_2

A streamflow parameter that provides useful information in appraising the low flow of Alabama streams is the median value of the annual 7-day minimum flows--hereafter referred to as the 7-day Q_2. This parameter can be satisfactorily evaluated from a relatively small amount of streamflow data. As a median value, it is a fairly stable parameter, being the average of position in an array of items and hence unaffected by extreme values. Also, as a median, it is a good measure of normal conditions. The recurrence interval for a median value in a series of annual events is always equal to 2 years in any form of frequency distribution. The 7-day period of low flow is short enough to represent flow that is available for the most part without storage, yet is long enough to suppress the effects of abnormally low transient flows of little hydrologic significance that might result from occasional regulations or from infrequent natural events.

The approximate range of the 7-day Q_2 for streams in Tuscaloosa County is shown by color pattern on figure 2.

The 7-day Q_2 for the Black Warrior River (adjusted to the base period 1939-62) is 142 mgd at Tuscaloosa (station 02465000). Between 1915 and October 1960, low flows of the Black Warrior River were affected by occasional regulation of Bankhead Lake and by regulation at locks and dams along the river. Between October 1960 and January 1962, Lewis Smith Reservoir in Walker County was being filled. Since the drainage area above Lewis Smith Reservoir is 944 sq mi or about 20 percent of the drainage area of the Black Warrior River at Tuscaloosa, filling the reservoir had a great effect on the 7-day Q_2. After January 1962, the 7-day Q_2 for the Black Warrior River has been affected by streamflow regulation at Lewis Smith Reservoir in addition to regulation at Bankhead Lake and at locks and dams along the river.

The 7-day Q_2 for Sipsey River ranges from less than 30 mgd in northern Tuscaloosa County to greater than 35 mgd in the southwestern part of the county.

North River, prior to the completion of Lake Tuscaloosa in 1969, had a 7-day Q_2 (adjusted to the base period 1939-62) in excess of 10 mgd in its lower reaches. Big Sandy Creek has a 7-day Q_2 in excess of 10 mgd and Hurricane, Cypress, Yellow, and Binion Creeks have 7-day Q_2's in excess of 2 mgd. High values of 7-day Q_2 for Big Sandy Creek are attributed to springflow in the upper reaches of the stream.

STORAGE REQUIREMENTS

Surface-water storage is required if the demand for water exceeds streamflow during periods of low flow. The storage required to provide draft rates ranging from 25 to 50 percent of the average flow of a stream in Tuscaloosa County can be estimated from average flow and 7-day Q_2 by referring to figures 3 and 4. Storage values estimated from figure 3

Figures 3 and 4 (captions on next page) belong near here.

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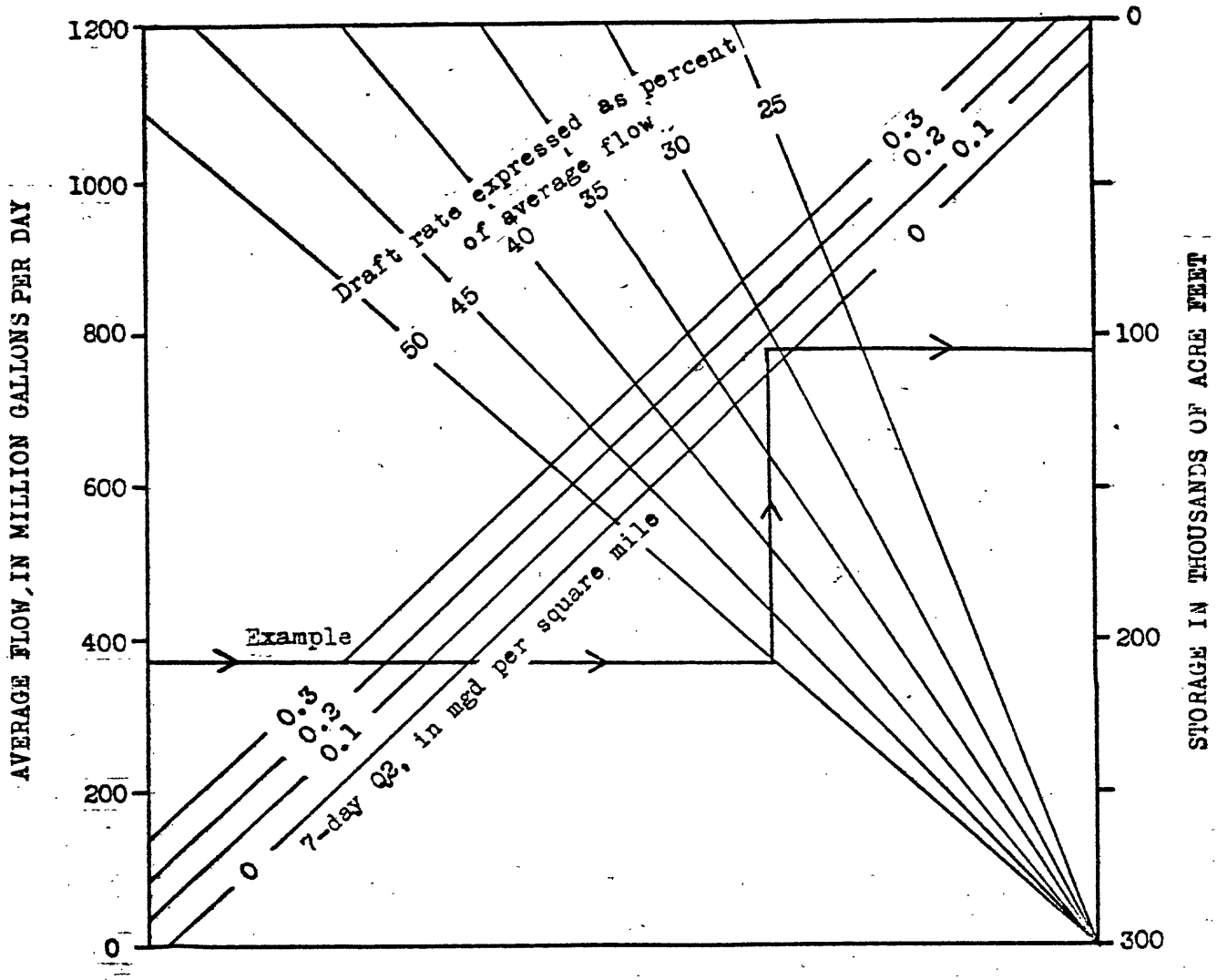
should be adequate to provide the selected draft rate on the average 80 percent of the time.

Figure 3.--Storage required for sustained draft rates.

Figure 4.--Areal variation in 7-day Q_2 for streams in Tuscaloosa County.



Example shown (North River near Tuscaloosa)

Average flow = 362mgd

Draft rate = 50 percent average flow

7-dayQ2 = 0.05 mgd per square mile

Storage required = 105,000 acre feet

Figure 3.— Storage required for sustained draft rates from streams in Tuscaloosa County.

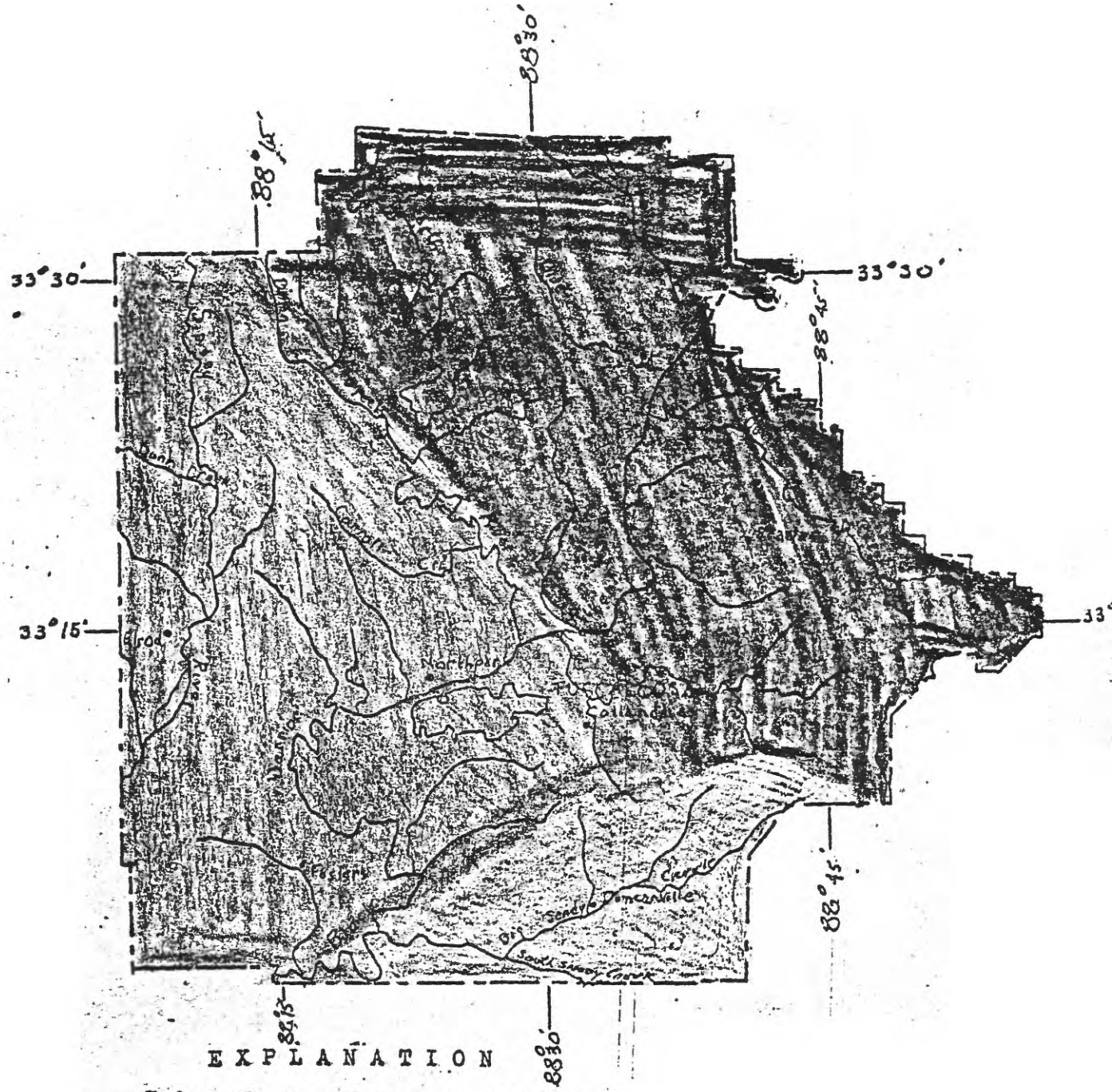


Figure 4— Areal variation in 7-day Q2 for streams in Tuscaloosa County

The example on figure 3 illustrates how to estimate storage requirements. The average flow at station 02465000 (North River near Tuscaloosa) was taken from figure 2, the 7-day Q_2 was taken from figure 4, and a draft rate was assumed.

In 1969 an impounding reservoir, Lake Tuscaloosa, was completed on North River and will be used by the city of Tuscaloosa as a source of water supply. The reservoir has a useable storage capacity of 123,000 acre-feet (40 billion gallons) and is intended to provide a continuous draft of 200 mgd. The average flow of North River at Lake Tuscaloosa dam is about 400 mgd (fig. 2). Using a 7-day Q_2 of 0.05 mgd per square mile (fig. 4) and assuming a draft rate of 200 mgd or 50 percent of the average flow, a storage requirement of about 120,000 acre-feet is estimated from figure 3. Although this estimate compares very closely with the actual capacity of Lake Tuscaloosa, estimates taken from figure 3 should be used only for the selection of possible sites at which a desired draft rate could be obtained and not for final design purposes. Final design of impoundments must include adjustments for the effects of evaporation, seepage, and sedimentation.

The storage capacity of two other impounding reservoirs in Tuscaloosa County, Harris Lake and Nicol Lake on Yellow Creek, provides a dependable supply of about 22 mgd. Harris Lake has a useable storage capacity of 815 million gallons and Nicol Lake has a useable storage capacity of 2,300 million gallons.

CHEMICAL QUALITY OF WATER

The chemical quality of water may limit the water's usefulness for particular purposes. Domestic water users are usually concerned with hardness and the iron, chloride, and dissolved-solids content of the water. Most supplies are selected to insure good quality or are treated to reduce or remove objectionable minerals and properties. Quality requirements for industrial water depends on the type of use made of the water. Some industries have quality requirements far more exacting than requirements for municipal supplies; other industries that use water only for cooling can use highly mineralized water.

Iron in excess of 0.3 mg/l (milligram per liter) may cause staining of porcelain or enamel fixtures, clothing, or other fabrics. Hard water is objectionable for some uses and soft water, under certain conditions, may induce corrosion. General terms used in this report to describe hardness of water are as follows: soft, 0-60 mg/l; moderately hard, 61-120 mg/l; hard, 121-180 mg/l; and very hard, 181 mg/l or more. Chloride content also affects the suitability of water for many uses. If chloride is present in sufficient concentration, the water has an objectionable taste.

The chemical quality of water from streams in Tuscaloosa County, with the exception of Black Warrior River and Hurricane Creek, is relatively uniform and the water should be suitable for most uses. The dissolved-solids content (estimated from specific conductance values) of surface water in the county generally is less than 100 mg/l, the chloride content is less than 10 mg/l, and the water is soft to moderately hard. Streams having the higher hardness and the higher dissolved-solids content are in eastern Tuscaloosa County where they drain outcrops of limestone and dolomite. The chemical quality of water from the Black Warrior River is erratic because of municipal and industrial waste being added to the river upstream from Tuscaloosa. Water from Hurricane Creek generally has a sulfate content greater than water from other streams in the county (Avrett, 1966), except Black Warrior River, and generally has a pH less than 6.5. Drainage and seepage from open-pit coal mines are probably the causes of the relatively high sulfate and low pH values.

Streamflow and chemical quality data collection sites are shown on figure 2 and the results of chemical analyses collected since October 1965 are tabulated in table 1. Chemical-quality records at these sites and other sites in the county prior to November 1965 have been published in reports listed in selected references.

SELECTED REFERENCES

Avrett, J. R., 1966, A compilation of surface water quality data in Alabama: Alabama Geol. Survey Circ. 36, 574 p.

Hains, C. F., 1968, Flow characteristics of Alabama streams: Alabama Geol. Survey Circ. 32, 382 p.

Jefferson, P. O., 1968, Regional draft-storage relations in west-central Alabama: U.S. Geol. Survey Prof. Paper 600-C, p. C182-C184.

Paulson, Q. F., Miller, J. D., and Drennen, C. W., 1962, Ground-water resources and geology of Tuscaloosa County, Alabama: Alabama Geol. Survey County Rept. 6, 97 p.

Peirce, L. B., 1959, Surface-water resources and hydrology of west-central Alabama: Alabama Geol. Survey Spec. Rept. 24, 236 p.

_____1962, Surface water in Tuscaloosa County, Alabama: Alabama Geol. Survey County Rept. 9, 89 p.

_____1967, 7-day low flows and flow duration of Alabama streams: Alabama Geol. Survey Bull. 87, pt. A, 114 p.

U.S. Geological Survey, 1960, Compilation of records of surface waters of the United States through September 1950, Part 2-B, South Atlantic slope and eastern Gulf of Mexico basins, Ogeechee River to Pearl River: U.S. Geol. Survey Water-Supply Paper 1304, 399 p.

_____1963, Compilation of records of surface waters of the United States, October 1950 to September 1960, Part 2-B, South Atlantic slope and eastern Gulf of Mexico basins, Ogeechee River to Pearl River: U.S. Geol. Survey Water-Supply Paper 1724, 458 p.

U.S. Geological Survey, 1961-64, Surface water records of Alabama: U.S. Geol. Survey, Water Resources Division, Tuscaloosa, Al. (issued annually).

_____1965-70, Water resources data for Alabama, Part 1, Surface water records: U.S. Geol. Survey, Water Resources Division, Tuscaloosa, Al. (published annually).

_____1965-70, Water resources data for Alabama, Part 2, Water quality records: U.S. Geol. Survey, Water Resources Division, Tuscaloosa, Al. (issued annually).

_____1964, Water quality records in Alabama, Louisiana, and Mississippi: U.S. Geol. Survey, Water Resources Division, 85 p.

Table 1.--Chemical analyses of water from streams in Tuscaloosa County

35-458

Number	Stream name ~~or well owner~~	Date of collection	~~Water-bearing unit~~	Stream discharge (mgd) ~~or well depth (feet)~~	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Temperature: °C	Temperature: °F
2-4465.00	Sipsey River near Elrod.	11-30-65		81.4	--	--	--	--	--	--	12	0	--	6.0	--	--	--	28	18	49	7.1	8	47
		1- 6-66		449	--	--	--	--	--	--	8	0	--	6.8	--	--	--	22	15	40	7.2	12	53
		3- 8-66		801	--	--	--	--	--	--	16	0	--	2.2	--	--	--	21	8	54	7.6	8	46
		5- 9-66		776	--	--	--	--	--	--	10	0	--	2.2	--	--	--	18	10	39	7.3	19	67
		7- 7-66		58.8	--	--	--	--	--	--	16	0	--	3.0	--	--	--	22	9	53	7.1	26	79
		8- 9-66		76.9	--	--	--	--	--	--	10	0	--	2.2	--	--	--	18	10	42	6.4	--	--
		9-20-66		158	--	--	--	--	--	--	8	0	--	2.2	--	--	--	15	8	33	7.3	21	70
		11- 9-66		86.6	--	--	--	--	--	--	12	0	--	2.6	--	--	--	20	10	48	6.5	12	54
		12-14-66		575	--	--	--	--	--	--	6	0	--	3.2	--	--	--	12	7	43	6.2	7	45
		1-26-67		218	--	--	--	--	--	--	10	0	--	3.6	--	--	--	15	7	50	7.2	9	49
		3-30-67		311	--	--	--	--	--	--	12	0	--	3.0	--	--	--	15	5	46	7.0	17	63
		4-18-67		119	--	--	--	--	--	--	15	0	--	2.2	--	--	--	22	10	60	6.7	20	68
		6-22-67		41.1	--	--	--	--	--	--	12	0	--	4.6	--	--	--	22	13	72	7.1	27	81
		8- 4-67		201	--	--	--	--	--	--	12	0	--	1.2	--	--	--	18	8	56	6.6	24	75
		8-29-67		438	--	--	--	--	--	--	14	0	--	4.4	--	--	--	22	11	49	7.0	22	72
		10- 7-67		60.1	--	--	--	--	--	--	14	0	--	2.6	--	--	--	30	19	77	7.0	18	64
		10-26-67		92.4	--	--	--	--	--	--	33	0	--	2.8	--	--	--	34	7	67	7.0	14	58

Table 1.--Chemical analyses of water from streams in Tuscaloosa County--Continued

75-458

Number	Stream name	Date of collection	Water bearing unit	Stream discharge (mgd)	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Temperature °C	Temperature °F
2-4465.00 Continued	Sipsey River near Elrod.	11- 9-67		164	--	--	--	--	--	--	12	0	--	2.4	--	--	--	24	14	70	6.7	14	58
		12-12-67		2,540	--	--	--	--	--	--	4	0	--	.4	--	--	--	10	7	31	6.1	12	53
		1-23-68		776	--	--	--	--	--	--	7	0	--	1.4	--	--	--	15	9	42	6.9	8	47
		2-27-68		231	--	--	--	--	--	--	12	0	--	2.0	--	--	--	19	9	51	6.6	6	42
2-4624.80	Big Yellow Creek near Whitson.	3-30-67		4.8	--	--	--	--	--	--	16	0	--	1.8	--	--	--	12	0	43	7.1	19	66
		10-26-67		.3	--	--	--	--	--	--	33	0	--	2.2	--	--	--	25	0	77	6.9	12	53
2-4625.00	Black Warrior River at Bankhead Lock and Dam.	3-30-67		--	--	--	--	--	--	--	24	0	--	5.8	--	--	--	40	20	126	7.1	17	63
		10-25-67		1,290	--	--	--	--	--	--	24	0	--	4.2	--	--	--	46	26	147	7.5	19	66
2-4626.00	Blue Creek near Oakman.	11-15-65		0.1	--	--	--	--	--	--	50	0	--	5.4	--	--	--	35	0	100	7.5	14	57
		12-21-65		.2	--	--	--	--	--	--	24	0	--	5.4	--	--	--	20	0	60	7.7	7	44
		2-17-66		21.7	--	--	--	--	--	--	6	0	--	2.2	--	--	--	8	3	21	7.5	10	50
		4- 7-66		6.3	--	--	--	--	--	--	8	0	--	1.8	--	--	--	10	3	22	7.6	16	60
		5-23-66		.8	--	--	--	--	--	--	14	0	--	1.8	--	--	--	15	4	34	7.5	20	68
		7-12-66		.01	--	--	--	--	--	--	28	0	--	1.6	--	--	--	32	9	67	7.4	26	79
		8- 8-66		.1	--	--	--	--	--	--	18	0	--	2.6	--	--	--	20	5	55	7.0	26	78
		12-12-66		130	--	--	--	--	--	--	16	0	--	2.8	--	--	--	15	2	42	6.9	6	42
		4-17-67		.3	--	--	--	--	--	--	22	0	--	.8	--	--	--	14	0	43	7.2	22	71

75-458

Table 1.--Chemical analyses of water from streams in Tuscaloosa County--Continued

Number	Stream name	Date of collection	Water-bearing unit	Stream discharge (mgd)	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Temperature °C	Temperature °F
2-4626.00 Continued	Blue Creek near Oakman.	8- 1-67		0.6	--	--	--	--	--	--	24	0	--	0.6	--	--	--	18	0	54	7.1	23	73
		10- 4-67		.2	--	--	--	--	--	--	20	0	--	1.6	--	--	--	16	0	50	7.2	14	58
		11-11-67		.3	--	--	--	--	--	--	16	0	--	2.0	--	--	--	19	6	44	7.2	11	51
2-4628.00	Davis Creek below Abernant.	11- 9-65		1.6	--	--	--	--	--	--	106	0	--	4.6	--	--	--	102	15	200	7.6	16	61
		12-14-65		5.6	--	--	--	--	--	--	82	0	--	4.8	--	--	--	75	8	160	7.7	8	47
		2-16-66		1,300	--	--	--	--	--	--	8	0	--	1.0	--	--	--	12	5	29	7.6	12	54
		4-20-66		17.1	--	--	--	--	--	--	26	0	--	2.2	--	--	--	28	7	68	7.6	18	64
		6- 9-66		4.8	--	--	--	--	--	--	42	0	--	2.2	--	--	--	38	4	96	7.3	22	71
		8-10-66		2.3	--	--	--	--	--	--	62	0	--	1.2	--	--	--	62	11	140	7.3	23	74
		9-21-66		1.8	--	--	--	--	--	--	72	0	--	2.2	--	--	--	60	1	136	7.5	19	66
		11-10-66		6.5	--	--	--	--	--	--	68	0	--	1.6	--	--	--	62	6	151	7.3	13	56
		12-15-66		18.0	--	--	--	--	--	--	32	0	--	2.4	--	--	--	32	6	77	7.2	7	44
		3- 9-67		25.7	--	--	--	--	--	--	26	0	--	3.0	--	--	--	22	1	63	7.3	11	51
		3-29-67		9.1	--	--	--	--	--	--	30	0	--	2.2	--	--	--	30	5	83	7.4	17	63
		4-17-67		3.2	--	--	--	--	--	--	41	0	--	4.2	--	--	--	40	6	106	6.9	21	69
		6-27-67		7.5	--	--	--	--	--	--	39	0	--	1.2	--	--	--	34	2	88	7.7	25	77
		8- 3-67		4.7	--	--	--	--	--	--	49	0	--	1.4	--	--	--	46	6	118	7.3	25	77

Table 1.--Chemical analyses of water from streams in Tuscaloosa County--Continued

Number	Stream name	Date of collection	Water-bearing unit	Stream discharge (mgd)	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25° C)	pH	Temperature: °C	Temperature: °F
2-4628.00 Continued	Davis Creek below Abernant.	9- 1-67		5.2	--	--	--	--	--	--	42	0	--	2.2	--	--	--	39	5	101	7.1	19	66
		10- 9-67		1.3	--	--	--	--	--	--	64	0	--	2.2	--	--	--	54	2	134	7.3	17	62
		10-24-67		1.1	--	--	--	--	--	--	78	0	--	2.0	--	--	--	68	4	171	7.8	14	58
		11-14-67		7.1	--	--	--	--	--	--	34	0	--	.8	--	--	--	28	0	96	7.3	11	51
		12-15-67		215	--	--	--	--	--	--	12	0	--	.8	--	--	--	15	5	46	6.8	12	54
		1-22-68		27.1	--	--	--	--	--	--	25	0	--	1.6	--	--	--	34	13	74	7.0	8	46
		2-26-68		10.3	--	--	--	--	--	--	29	0	--	.8	--	--	--	34	10	89	7.6	6	42
2-4635.00	Hurricane Creek near Holt.	11- 9-65		6.1	--	--	--	--	--	--	2	0	--	4.0	--	--	--	68	66	182	6.0	17	62
		12-14-65		25.4	--	--	--	--	--	--	2	0	--	5.6	--	--	--	58	56	160	4.7	9	48
		2-10-66		43.8	--	--	--	--	--	--	3	0	--	2.8	--	--	--	28	26	76	6.7	12	53
		4- 6-66		129	--	--	--	--	--	--	4	0	--	1.4	--	--	--	20	17	51	7.4	13	55
		6- 6-66		16.9	--	--	--	--	--	--	2	0	--	3.2	--	--	--	65	63	153	7.5	24	76
		7- 7-66		14.3	--	--	--	--	--	--	4	0	--	1.6	--	--	--	60	57	145	5.7	31	87
		8-10-66		8.9	--	--	--	--	--	--	2	0	--	2.2	--	--	--	82	80	211	4.8	26	78
		9-22-66		12.9	--	--	--	--	--	--	2	0	--	2.2	--	--	--	52	50	139	5.1	19	66
		11-10-66		17.9	--	--	--	--	--	--	2	0	--	1.2	--	--	--	55	53	151	5.5	17	62
		12-15-66		29.0	--	--	--	--	--	--	4	0	--	3.0	--	--	--	38	35	104	6.3	4	40
		1-26-67		27.2	--	--	--	--	--	--	4	0	--	3.0	--	--	--	38	35	97	6.5	9	48

Table 1.--Chemical analyses of water from streams in Tuscaloosa County--Continued

75-458

Number	Stream name	Date of collection	Water bearing unit	Stream discharge (mgd)	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Temperature °C	Temperature °F
2-4635.00	Hurricane Creek near Holt.	3- 9-67		71.1	--	--	--	--	--	--	8	0	--	2.0	--	--	--	25	18	67	6.6	11	52
Continued		3-29-67		45.2	--	--	--	--	--	--	6	0	--	2.6	--	--	--	28	23	76	6.3	17	63
		4-17-67		12.3	--	--	--	--	--	--	19	0	--	1.6	--	--	--	62	46	153	6.6	23	74
		6-26-67		27.9	--	--	--	--	--	--	0	0	--	1.2	--	--	--	62	62	236	4.2	25	77
		9- 1-67		26.9	--	--	--	--	--	--	0	0	--	2.4	--	--	--	48	48	187	4.2	21	70
		10- 5-67		5.5	--	--	--	--	--	--	0	0	--	5.0	--	--	--	112	112	363	3.8	16	61
		10-24-67		4.0	--	--	--	--	--	--	0	0	--	2.8	--	--	--	131	131	480	3.6	16	61
		11-10-67		16.2	--	--	--	--	--	--	0	0	--	1.8	--	--	--	75	75	224	4.4	8	46
		12-15-67		375	--	--	--	--	--	--	2	0	--	1.0	--	--	--	21	19	69	5.0	11	52
		2-26-68		34.9	--	--	--	--	--	--	1	0	--	1.4	--	--	--	52	51	157	4.6	6	43
2-4638.50	Tyro Creek near New Lexington.	10-26-67		1.6	--	--	--	--	--	--	34	0	--	2.2	--	--	--	25	0	72	7.3	13	56
2-4640.00	North River near Samantha.	4-11-66		--	--	--	--	--	--	--	10	0	--	2.2	--	--	--	12	4	36	7.0	14	57
		12-12-66		--	--	--	--	--	--	--	10	0	--	2.6	--	--	--	15	7	44	6.7	8	46
		1-23-67		--	--	--	--	--	--	--	14	0	--	3.8	--	--	--	12	1	44	6.9	8	46
		3- 7-67		--	--	--	--	--	--	--	12	0	--	2.4	--	--	--	10	0	36	7.1	13	55
		4-17-67		--	--	--	--	--	--	--	14	0	--	5.2	--	--	--	12	1	54	6.8	23	74

Table 1.--Chemical analyses of water from streams in Tuscaloosa County--Continued

75-458

Number	Stream name	Date of collection	Water-bearing unit	Stream discharge (mgd)	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25° C)	pH	Temperature: °C	Temperature: °F
2-4640.00 Continued	North River near Samantha.	6-21-67		9.6	--	--	--	--	--	--	20	0	--	2.6	--	--	--	17	1	55	7.0	28	82
		8- 1-67		--	--	--	--	--	--	--	58	0	--	3.0	--	--	--	23	0	134	7.2	26	78
		10- 4-67		19.4	--	--	--	--	--	--	20	0	--	4.8	--	--	--	20	4	54	7.3	16	60
		11-11-67		--	--	--	--	--	--	--	16	0	--	2.2	--	--	--	18	5	56	7.2	10	50
		1-19-68		502	--	--	--	--	--	--	10	0	--	1.8	--	--	--	20	0	35	6.9	6	43
		2-28-68		150	--	--	--	--	--	--	13	0	--	1.6	--	--	--	14	3	37	6.8	5	41
2-4641.50	Turkey Creek near Samantha.	3-30-67		4.0	--	--	--	--	--	--	10	0	--	2.2	--	--	--	10	2	26	6.9	18	65
		10-24-67		1.2	--	--	--	--	--	--	12	0	--	1.8	--	--	--	11	1	26	7.0	13	55
2-4643.80	Binion Creek near Samantha.	3-30-67		29.0	--	--	--	--	--	--	8	0	--	3.0	--	--	--	8	1	25	7.5	18	65
		10-24-67		11.6	--	--	--	--	--	--	10	0	--	2.2	--	--	--	8	0	28	6.8	14	57
2-4645.00	North River near Tuscaloosa.	12- 2-65		35.0	--	--	--	--	--	--	12	0	--	5.6	--	--	--	15	5	35	7.3	7	45
		1-13-66		110	--	--	--	--	--	--	10	0	--	6.6	--	--	--	18	10	40	7.0	7	45
		3- 8-66		523	--	--	--	--	--	--	8	0	--	2.4	--	--	--	8	1	30	6.9	9	49
		5-23-66		243	--	--	--	--	--	--	10	0	--	2.2	--	--	--	15	7	34	6.9	22	72
		7-12-66		37.0	--	--	--	--	--	--	10	0	--	1.6	--	--	--	15	7	38	7.3	31	87
		8-10-66		26.1	--	--	--	--	--	--	12	0	--	1.6	--	--	--	18	8	33	7.1	26	78
		9-21-66		167	--	--	--	--	--	--	8	0	--	2.0	--	--	--	18	11	56	6.6	20	68
		11- 8-66		49.5	--	--	--	--	--	--	12	0	--	2.0	--	--	--	18	8	44	6.5	11	52

75-458

Table 1.--Chemical analyses of water from streams in Tuscaloosa County--Continued

Number	Stream name or well number	Date of collection	Water bearing unit	Stream discharge (mgd) or well depth (feet)	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Temperature: °C	Temperature: °F
2-4645.00 Continued	North River near Tuscaloosa.	12-15-66		162	--	--	--	--	--	--	12	0	--	3.6	--	--	--	10	0	41	7.1	6	42
		1-23-67		122	--	--	--	--	--	--	12	0	--	2.8	--	--	--	12	2	38	6.9	8	46
		3- 8-67		359	--	--	--	--	--	--	14	0	--	1.6	--	--	--	12	1	37	7.0	11	52
		3-30-67		134	--	--	--	--	--	--	14	0	--	3.0	--	--	--	12	1	36	7.3	17	62
		4-17-67		60.9	--	--	--	--	--	--	14	0	--	2.0	--	--	--	12	1	39	6.8	26	78
		6-21-67		14.8	--	--	--	--	--	--	12	0	--	1.8	--	--	--	11	1	36	7.1	30	86
		8- 1-67		38.9	--	--	--	--	--	--	12	0	--	3.2	--	--	--	13	3	47	6.3	27	81
		8-31-67		148	--	--	--	--	--	--	12	0	--	3.2	--	--	--	19	9	42	7.2	21	70
		10- 4-67		32.3	--	--	--	--	--	--	16	0	--	4.4	--	--	--	15	2	41	7.1	19	66
		10-23-67		31.7	--	--	--	--	--	--	14	0	--	2.4	--	--	--	11	0	40	6.8	13	56
		11-11-67		63.3	--	--	--	--	--	--	18	0	--	2.4	--	--	--	16	1	50	6.9	8	47
		2-28-68		131	--	--	--	--	--	--	10	0	--	2.0	--	--	--	12	4	33	6.6	5	41
2-4650.00	Black Warrior River at Tuscaloosa.	11- 9-65		2,040	--	--	--	--	--	--	42	0	--	7.2	--	--	--	65	31	185	6.7	19	66
		12-13-65		1,290	--	--	--	--	--	--	32	0	--	7.0	--	--	--	55	29	178	7.1	12	54
		2-14-66		31,700	--	--	--	--	--	--	24	0	--	3.6	--	--	--	42	22	127	7.4	11	51
		4-13-66		1,710	--	--	--	--	--	--	26	0	--	3.8	--	--	--	49	28	152	7.4	21	70
		5-25-66		7,500	--	--	--	--	--	--	20	0	--	2.4	--	--	--	32	16	78	7.5	20	68
		7-11-66		426	--	--	--	--	--	--	31	0	--	3.0	--	--	--	58	32	138	7.4	29	84

Table 1.--Chemical analyses of water from streams in Tuscaloosa County--Continued

75-458

Number	Stream name	Date of collection	Water-bearing unit	Stream discharge (mgd)	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Temperature: °C	Temperature: °F
2-4650.00 Continued	Black Warrior River at Tuscaloosa.	8-11-66		545	--	--	--	--	--	--	44	0	--	4.8	--	--	--	62	26	186	7.1	--	--
		9-23-66		1,090	--	--	--	--	--	--	34	0	--	4.0	--	--	--	55	27	166	7.3	24	75
		10/3-17/66		1,630	5.6	0.00	14	5.6	11	4.0	33	0	44	6.4	0.3	5.4	112	58	31	185	--	--	--
		10/18-31/66		2,320	5.7	.00	13	5.0	9.7	2.9	29	0	41	4.3	.3	4.4	100	53	29	168	6.4	--	--
		11/1-30/66		2,060	5.9	.01	12	4.9	6.6	3.2	27	0	36	3.0	.2	4.2	89	50	28	160	6.3	--	--
		12/1-9, 11-31/66		2,370	.4	--	10	4.9	8.6	3.0	16	6	35	4.8	.4	3.2	81	45	22	153	8.9	--	--
		12-10-66		8,660	--	--	13	5.5	--	--	36	0	--	4.8	--	--	--	55	25	184	7.3	13	56
		1/1-7/67		3,220	4.1	--	12	4.4	9.4	1.8	24	0	36	4.8	.3	5.4	90	48	28	157	7.1	--	--
		1/8-31/67		3,800	.2	--	11	3.0	8.0	1.6	6	12	30	4.4	.3	.8	68	40	15	140	9.6	--	--
		2/1-18, 21-23/67		7,280	3.3	--	13	3.0	8.9	1.4	32	0	32	4.8	.4	1.2	84	45	12	156	7.1	--	--
		2/19-20, 24-28/67		8,480	1.7	--	8.0	4.9	7.0	1.3	24	0	26	3.8	.3	.5	66	40	20	116	6.7	--	--
		3/1-12/67		6,240	5.8	--	7.0	3.5	6.0	1.1	20	0	20	3.0	.2	2.2	59	32	16	98	6.9	--	--
		3/13-31/67		2,980	6.9	--	9.0	3.0	8.0	1.1	22	0	29	3.4	.3	3.1	75	35	17	124	7.0	--	--
		4/1-30/67		2,480	6.5	--	7.5	5.2	8.0	1.0	28	0	31	3.4	.1	2.1	72	40	17	144	6.7	--	--
		5/1-18/67		4,290	6.9	--	15	3.5	9.5	1.6	38	0	31	4.2	.2	5.6	90	52	21	183	7.2	--	--
		5/19-31/67		3,380	6.3	--	12	4.4	8.6	1.7	28	0	36	3.8	.2	5.2	86	48	25	169	7.2	--	--

Table 1.--Chemical analyses of water from streams in Tuscaloosa County--Continued

75-458

Number	Stream name	Date of collection	Water-bearing unit	Stream discharge (mgd)	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Temperature °C	Temperature °F
2-4650.00	Black Warrior River	6/1-30/67		1,540	5.2	--	11	4.0	--	--	32	0	34	3.2	0.1	2.9	83	44	16	119	6.8	--	--
	Continued. at Tuscaloosa.	7/1-10/67		2,880	6.7	--	6.5	8.0	7.7	1.7	26	0	36	4.4	.1	3.1	81	49	28	165	6.8	--	--
		7/11-31/67		2,890	5.6	--	14	5.1	9.3	2.3	30	0	41	5.0	.2	4.4	96	56	31	190	6.8	--	--
		8/1-12,14-21, 23,25-26, 28-30/67		5,220	7.7	--	12	5.1	--	--	28	0	39	4.2	.2	4.1	89	51	27	161	7.1	--	--
		8/13,22,24, 27/67		6,330	6.0	--	12	4.4	--	--	26	0	37	3.8	.2	3.6	84	48	27	146	7.0	--	--
		8-31-67		4,080	--	--	--	--	--	--	22	0	--	8.2	--	--	--	48	30	148	7.2	24	76
		9/1-10/67		3,270	7.2	--	6.0	8.0	6.4	1.7	26	0	34	3.0	.2	3.2	76	48	27	150	6.9	--	--
		9/11-30/67		2,170	7.0	--	10	4.4	4.8	1.5	25	0	28	2.8	.1	2.5	66	43	22	129	7.1	--	--
		10/1-31/67		1,490	6.9	0.00	8.3	4.7	11	1.8	27	0	36	4.5	.1	2.7	89	40	18	136	6.8	--	--
		11/1-10/67		3,400	6.1	.00	11	3.8	12	2.0	26	0	40	4.7	.2	4.6	97	43	22	149	6.8	--	--
		11/11-30/67		3,210	5.8	.00	14	4.6	16	2.4	30	0	52	5.1	.3	5.5	121	54	29	184	6.8	--	--
		12/1-8/67		10,700	6.9	.04	12	4.6	12	2.1	30	0	43	4.8	.2	3.4	104	49	24	159	6.8	--	--
		12/9-11, 14,18/67		13,400	7.3	.00	9.5	3.5	9.4	1.5	26	0	31	3.6	.1	1.9	81	38	17	122	6.8	--	--
		12/12,13, 15-17, 19-31/67		24,000	6.4	.02	8.3	2.7	8.8	1.3	21	0	29	3.4	.0	2.0	72	32	15	107	6.7	--	--

Table 1.--Chemical analyses of water from streams in Tuscaloosa County--Continued

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Number	Stream name	Date of collection	Water-bearing unit	Stream discharge (mgd)	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25° C)	pH	Temperature °C	Temperature °F
2-4650.00 Contimed.	Black Warrior River at Tuscaloosa.	1/1-2,4-6, 9,11,13, 18-29/68		16,900	7.0	0.00	7.9	2.5	5.6	3.2	18	0	22	4.0	0.1	0.7	62	30	15	99	6.2	--	--
		1/3,7,8,10, 30,31/68		22,600	6.9	.01	9.6	2.4	6.4	3.2	22	0	25	4.0	.1	.1	69	34	16	114	6.3	--	--
		1/13-17/68		20,400	5.6	.01	5.1	2.7	3.8	3.1	14	0	18	3.2	.1	.1	49	24	13	82	6.0	--	--
		2/1-23/68		3,780	6.2	.00	8.4	3.2	6.1	3.1	20	0	24	4.1	.1	1.9	67	34	18	118	6.6	--	--
		2/24-29/68		2,860	5.9	.00	9.3	3.6	8.4	3.3	25	0	33	3.6	.2	.6	80	38	17	140	6.3	--	--
		3/1-3,6-8, 11,12,14-16,26-29/68		6,590	7.5	--	9.5	4.9	1/ 7.4	--	22	0	34	2.8	.1	2.8	80	44	26	133	6.7	--	--
		3/4,5,9,10, 13,24,25,30, 31/68		6,330	7.6	--	8.5	4.1	1/ 8.9	--	25	0	30	3.2	.1	1.1	76	38	17	120	6.7	--	--
		3/17-23/68		5,880	7.8	--	14	5.6	1/ 11	--	24	0	51	4.0	.2	3.7	109	58	38	182	6.7	--	--
		4/1-5,11,12, 19-30/68		6,390	7.2	--	8.0	4.4	1/ 7.7	--	26	0	27	2.4	.1	2.2	72	38	17	114	6.9	--	--
		4/6-10/68		8,780	7.7	--	7.0	3.0	1/ 5.9	--	19	0	22	2.0	.1	1.4	58	30	14	99	6.8	--	--
		4/13-18/68		5,930	8.2	--	10	4.6	1/ 7.0	--	25	0	31	3.0	.1	2.2	78	44	23	127	6.9	--	--
		5/1-5,15, 20-31/68		5,590	7.3	--	8.0	3.4	1/ 7.1	--	24	0	24	2.0	.1	2.0	66	34	14	104	7.0	--	--

Table 1.--Chemical analyses of water from streams in Tuscaloosa County--Continued

75-458

Number	Stream name	Date of collection	Water-bearing unit	Stream discharge (mgd)	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Temperature °C	Temperature °F
2-4652.00 Continued	Lake Creek near Northport.	9-21-66		3.6	--	--	--	--	--	--	8	0	--	1.4	--	--	--	8	1	23	8.0	23	74
		12-14-66		4.9	--	--	--	--	--	--	6	0	--	1.2	--	--	--	8	3	26	7.1	9	48
2-4652.05	Jay Creek near Coker.	11- 8-65		.4	--	--	--	--	--	--	12	0	--	5.2	--	--	--	10	0	30	6.6	18	64
		12-13-65		1.0	--	--	--	--	--	--	6	0	--	5.2	--	--	--	8	3	25	7.0	--	--
		2-10-66		5.8	--	--	--	--	--	--	6	0	--	2.4	--	--	--	11	6	25	7.2	13	55
		4- 6-66		3.1	--	--	--	--	--	--	4	0	--	2.4	--	--	--	6	3	19	7.3	15	59
		7-18-66		.8	--	--	--	--	--	--	6	0	--	2.4	--	--	--	10	5	24	7.1	26	78
		9-21-66		.8	--	--	--	--	--	--	8	0	--	2.4	--	--	--	12	5	30	7.5	18	65
		12-14-66		1.4	--	--	--	--	--	--	8	0	--	2.2	--	--	--	12	5	26	6.8	9	48
2-4652.80	Black Warrior River near Fosters.	3-29-67		--	--	--	--	--	--	--	24	0	--	4.0	--	--	--	40	20	123	7.3	20	68
		10-25-67		3,500	--	--	--	--	--	--	50	0	--	4.2	--	--	--	72	31	143	7.4	20	68
-4654.00	Big Sandy Creek at Duncanville.	3-29-67		33.6	--	--	--	--	--	--	60	0	--	2.4	--	--	--	52	3	112	7.4	18	65
		10-26-67		22.0	--	--	--	--	--	--	74	0	--	1.8	--	--	--	68	7	140	7.9	12	54
2-4654.92	Grant Creek near Fosters.	3-29-67		15.6	--	--	--	--	--	--	10	0	--	3.0	--	--	--	8	0	31	7.3	19	67
		10-26-67		9.7	--	--	--	--	--	--	9	0	--	2.4	--	--	--	9	2	27	6.7	12	54

1/ Calculated Na plus K, reported as Na.