DEPARTMENT OF THE INTERIOR
JOHN BARTON PAYNE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

WATER-SUPPLY PAPER 452

SURFACE WATER SUPPLY OF THE UNITED STATES

1917

PART II. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS

NATHAN C. GROVER, Chief Hydraulic Engineer
GUY C. STEVENS and WARREN E. HALL
District Engineers

WASHINGTON
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SURFACE WATER SUPPLY OF SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO DRAINAGE BASINS, 1917.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of 14 reports presenting results of measurements of flow made on streams in the United States during the year ending September 30, 1917.

The data presented in these reports were collected by the United States Geological Survey under the following authority contained in the organic law (20 Stat. L., p. 394):

Provided, That this officer [the Director] shall have the direction of the Geological Survey and the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain.

The work was begun in 1886 in connection with special studies relating to irrigation in the arid west. Since the fiscal year ending June 30, 1895, successive sundry bills passed by Congress have carried the following item and appropriations:

For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

Annual appropriations for the fiscal years ended June 30, 1895–1918.

1895	$12,500
1896	20,000
1897 to 1900, inclusive	50,000
1901 to 1902, inclusive	100,000
1903 to 1906, inclusive	200,000
1907	150,000
1908 to 1910, inclusive	100,000
1911 to 1917, inclusive	150,000
1918	175,000

In the execution of the work many private and State organizations have cooperated either by furnishing data or by assisting in collecting data. Acknowledgements for cooperation of the first kind are made in connection with the description of each station affected; cooperation of the second kind is acknowledged on page 9.

Measurements of stream flow have been made at about 4,240 points in the United States and also at many points in Alaska and the Hawaiian Islands. In July, 1917, 1,180 gaging stations were being maintained by the Survey and the cooperating organizations.

Many miscellaneous discharge measurements are made at other points. In connection with this work data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in water-supply papers from time to time. Information in regard to publications relating to water resources is presented in the appendix to this report.

DEFINITION OF TERMS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups—(1) those that represent a rate of flow, as second-feet, gallons per minute, miners' inches, and discharge in second-feet per square mile, and (2) those that represent the actual quantity of water, as run-off in depth of inches, acre-feet, and millions of cubic feet. The principal terms used in this series of reports are second-feet, second-feet per square mile, run-off in inches, and acre-feet. They may be defined as follows:

"Second-feet" is an abbreviation for "cubic feet per second." A second-foot is the rate of discharge of water flowing in a channel of rectangular cross section 1 foot wide and 1 foot deep at an average velocity of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off (depth in inches)" is the depth to which an area would be covered if all the water flowing from it in a given period were uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth of inches.

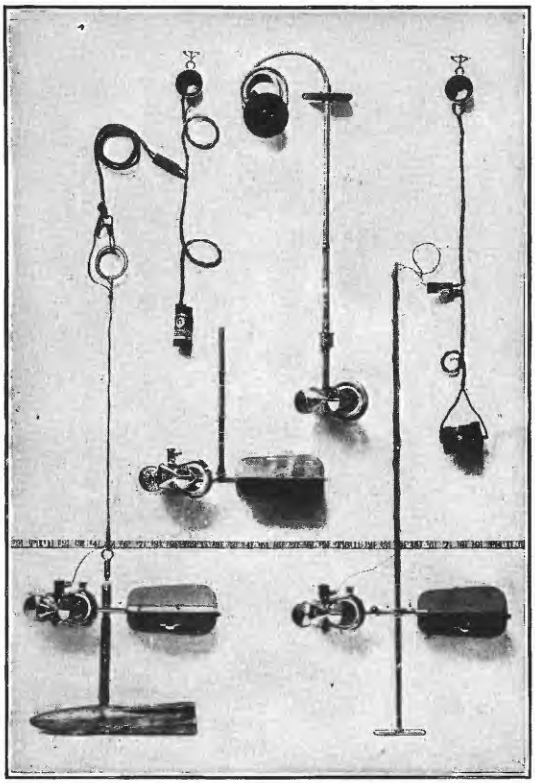
An "acre-foot," equivalent to 43,560 cubic feet, is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

The following terms not in common use are here defined:

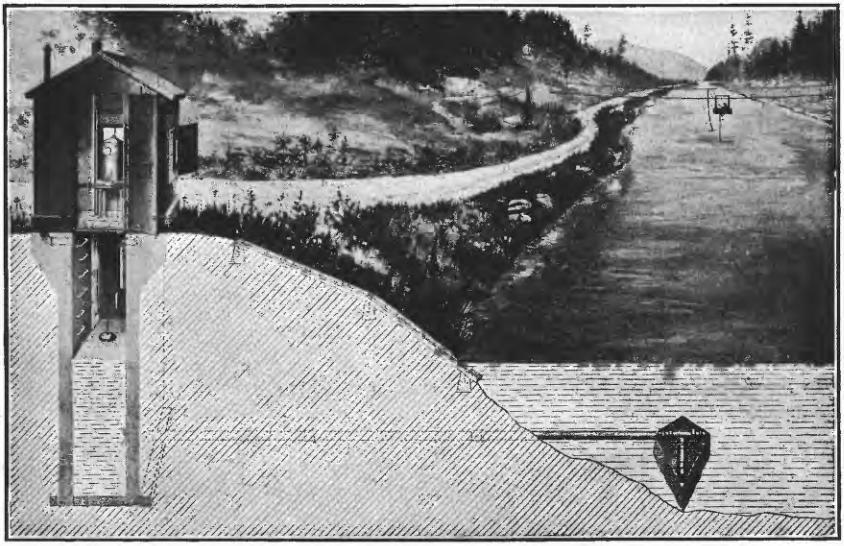
"Stage-discharge relation," an abbreviation for the term "relation of gage height to discharge."

"Control," a term used to designate the section or sections of the stream below the gage which determine the stage-discharge relation at the gage. It should be noted that the control may not be the same section or sections at all stages.

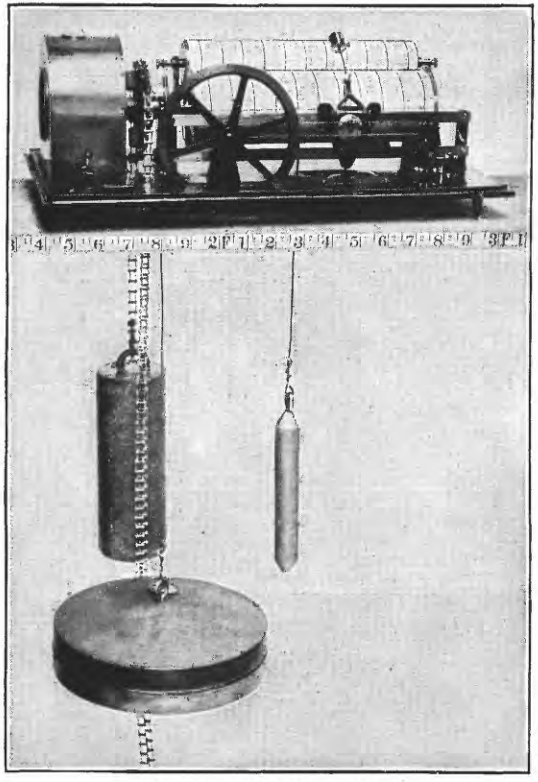
The "point of zero flow" for a given gaging station is that point on the gage—the gage height—to which the surface of the river would fall if there were no flow.



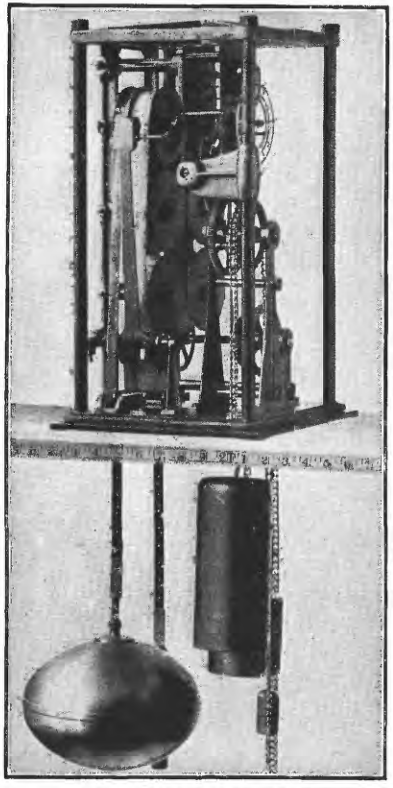
A. PRICE CURRENT METERS.



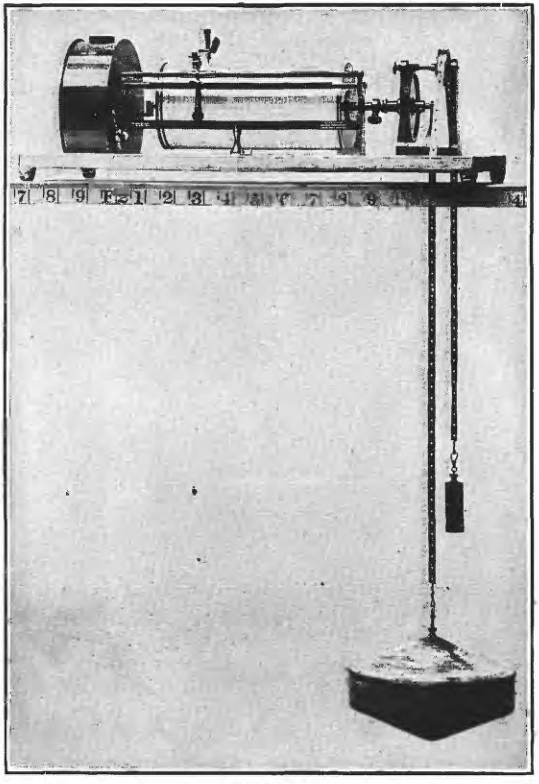
B. TYPICAL GAGING STATION.



A. STEVENS CONTINUOUS.



B. GURLEY PRINTING.



C. FRIEZ.

WATER-STAGE RECORDERS.

EXPLANATION OF DATA.

The data presented in this report cover the year beginning October 1, 1916, and ending September 30, 1917. At the beginning of January in most parts of the United States much of the precipitation in the preceding three months is stored as ground water in the form of snow or ice, or in ponds, lakes, and swamps, and this stored water passes off in the streams during the spring break-up. At the end of September, on the other hand, the only stored water available for run-off is possibly a small quantity in the ground; therefore the run-off for the year beginning October 1 is practically all derived from precipitation within that year.

The base data collected at gaging stations consist of records of stage, measurements of discharge, and general information used to supplement the gage heights and discharge measurements in determining the daily flow. The records of stage are obtained either from direct readings on a staff gage or from a water-stage recorder that gives a continuous record of the fluctuations. Measurements of discharge are made with a current meter. (See Pls. I, II.) The general methods are outlined in standard textbooks on the measurement of river discharge.

From the discharge measurements rating tables are prepared that give the discharge for any stage, and these rating tables, when applied to gage heights, give the discharge from which the daily, monthly, and yearly mean discharge is determined.

The data presented for each gaging station in the area covered by this report comprise a description of the station, a table giving results of discharge measurements, a table showing the daily discharge of the stream, and a table of monthly and yearly discharge and run-off.

If the base data are insufficient to determine the daily discharge, tables giving daily gage heights and results of discharge measurements are published.

The description of the station gives, in addition to statements regarding location and equipment, information in regard to any conditions that may affect the constancy of the discharge relation, covering such subjects as the occurrence of ice, the use of the stream for log driving, shifting of control, and the cause and effect of backwater; it gives also information as to diversions that decrease the flow at the gage, artificial regulation, maximum and minimum recorded stages, and the accuracy of the records.

The table of daily discharge gives, in general, the discharge in second-feet corresponding to the mean of the gage heights read each day. At stations on streams subject to sudden or rapid diurnal fluctuation the discharge obtained from the rating table and the mean daily gage height may not be the true mean discharge for the

day. If such stations are equipped with water-stage recorders the mean daily discharge may be obtained by averaging discharge at regular intervals during the day, or by using the discharge integrator, an instrument operating on the principle of the planimeter and containing as an essential element the rating curve of the station.

In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest. As the gage height is the mean for the day it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge was consequently larger than given in the maximum column. Likewise, in the column headed "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this average flow computations recorded in the remaining columns, which are defined on page 6, are based.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

The accuracy of stream-flow data depends primarily (1) on the permanence of the stage-discharge relation and (2) on the accuracy of observation of stage, measurements of flow, and interpretation of records.

A paragraph in the description of the station or footnotes added to the tables gives information regarding the (1) permanence of the stage-discharge relation, (2) precision with which the discharge rating curve is defined, (3) refinement of gage readings, (4) frequency of gage readings, and (5) methods of applying daily gage heights to the rating table to obtain the daily discharge.[1]

For the rating tables "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined," within 15 to 25 per cent. These notes are very general and are based on the plotting of the individual measurements with reference to the mean rating curve.

The monthly means for any station may represent with high accuracy the quantity of water flowing past the gage, but the figures showing discharge per square mile and depth of run-off in inches may be subject to gross errors caused by the inclusion of large noncontributing districts in the measured drainage area, by lack of information concerning water diverted for irrigation or other use, or by inability to interpret the effect of artificial regulation of the flow of the river above the station. "Second-feet per square mile" and "Run-off (depth in inches)" are therefore not computed if such errors appear probable. The computations are also omitted for stations on

[1] For a more detailed discussion of the accuracy of stream-flow data see Grover, N. C., and Hoyt, J. C., Accuracy of stream-flow data: U. S. Geol. Survey Water-Supply Paper 400, pp. 53–59, 1916.

streams draining areas in which the annual rainfall is less than 20 inches. All figures representing "second-feet per square mile" and "run-off (depth in inches)" previously published by the Survey should be used with caution because of possible inherent sources of error not known to the Survey.

The table of monthly discharge gives only a general idea of the flow at the station and should not be used for other than preliminary estimates; the tables of daily discharge allow more detailed studies of the variation in flow. It should be borne in mind, however, that the observations in each succeeding year may be expected to throw new light on data previously published.

COOPERATION.

Special acknowledgements are due for financial assistance rendered by the following corporations and individuals: Virginia Railway & Power Co., Alabama Geological Survey, Division of Drainage Investigations of the United States Department of Agriculture, United States Weather Bureau, Tallassee Power Co., Central Georgia Power Co., Columbus Power Co., Georgia Railway & Power Co., Juliette Milling Co., J. M. Middlebrooks, Sr., and Rhodhiss Manufacturing Co.

DIVISION OF WORK.

The data for stations in the James and Roanoke drainage basins were collected and prepared for publication under the direction of G. C. Stevens, district engineer, assisted by Lasley Lee, B. E. Jones, B. L. Hopkins and J. W. Moulton.

The field data for all drainage basins south of Roanoke River were collected under the direction of Warren E. Hall, district engineer, assisted by B. M. Hall, jr. The data were prepared for publication under the direction of C. G. Paulsen, district engineer, assisted by B. J. Peterson, A. H. Condron, and Miss E. M. Tiller.

GAGING-STATION RECORDS.

JAMES RIVER BASIN.

JAMES RIVER AT BUCHANAN, VA.

LOCATION.—At highway bridge near Chesapeake & Ohio Railway station at Buchanan, Botetourt County.

DRAINAGE AREA.—2,060 square miles.

RECORDS AVAILABLE.—August 18, 1895 to September 30, 1917.

GAGE.—Chain gage attached to highway bridge, installed November 21, 1903, to replace original wire gage read from August 18, 1895, to that date; read by D. D. Booze for United States Weather Bureau. Datum of gage lowered 2 feet April 3, 1897, to avoid negative readings. A span of the bridge and the gage were destroyed by flood on the night of March 27, 1913. A temporary gage was used from April 22 to September 15, 1913, when a new chain gage was installed.

DISCHARGE MEASUREMENTS.—Made from downstream side of two-span highway bridge.

CHANNEL AND CONTROL.—Bed under bridge is composed of rock overlain with a thick deposit of mud. Banks high; not overflowed except in extreme floods. Control of boulders and gravel several hundred feet below station. Stage-discharge relation not permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 17.6 feet March 5, (discharge, 58,100 second-feet); minimum stage, 1.9 feet several days in August and September (discharge, 340 second-feet).

1895-1917: Maximum stage recorded, 31.0 feet during the night of March 27, 1913, (determined by levels from flood marks October 2, 1914; discharge not determined); minimum stage, 1.2 feet (present gage datum) April 17 and May 2, 1896 (discharge, 260 second-feet).

ICE.—Stage-discharge relation occasionally affected by ice for short periods.

ACCURACY.—Stage-discharge relation shifted during the flood of March 5. Rating curve used October 1 to Match 4 well defined below and fairly well defined above 4,000 second-feet; curve used March 5 to September 30 fairly well defined throughout. Stage-discharge relation not affected by ice during year. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records fair.

COOPERATION.—Since July 15, 1906, gage-height records have been furnished by United States Weather Bureau.

Discharge measurements of James River at Buchanan, Va., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Dec. 8	Lee and Walters	2.33	535
June 29	B. E. Jones	2.36	612

Daily discharge, in second-feet, of James River at Buchanan, Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	820	510	450	3,250	3,050	7,100	3,470	2,560	3,470	640	715	340
2	730	510	450	2,860	11,100	16,500	2,900	3,470	2,220	640	640	340
3	730	510	450	2,500	7,100	19,900	2,560	3,470	1,780	570	880	340
4	650	450	450	2,500	3,450	21,100	2,390	3,270	1,650	570	715	340
5	650	450	450	3,250	2,500	58,100	2,900	3,270	1,520	570	640	340
6	580	450	450	4,100	2,330	18,300	11,700	3,080	1,400	570	570	340
7	580	450	450	3,660	2,330	10,800	11,700	3,080	1,290	505	505	340
8	510	450	450	3,250	2,170	9,320	7,640	2,900	1,180	505	505	505
9	510	450	450	3,050	1,860	8,200	6,580	2,900	1,180	505	505	570
10	450	450	450	2,860	1,590	7,640	5,540	2,720	1,520	505	505	505
11	450	450	450	2,500	1,460	7,100	5,040	2,560	1,520	445	505	505
12	450	450	450	2,170	1,340	6,580	4,560	2,390	1,400	445	505	445
13	450	450	450	1,860	1,220	9,320	4,100	2,220	1,400	445	505	445
14	450	450	450	1,860	1,110	12,700	3,670	2,070	1,290	445	445	445
15	450	450	450	2,500	1,010	10,500	3,470	1,920	1,180	445	445	445
16	450	450	450	2,330	1,010	8,760	3,270	1,780	1,080	445	445	390
17	450	450	450	2,170	910	9,320	3,080	1,650	975	570	445	390
18	450	450	450	2,010	730	12,700	2,900	1,650	880	715	445	390
19	820	450	510	2,010	650	9,900	2,720	1,520	795	795	445	390
20	3,050	450	730	1,860	580	7,640	2,560	1,520	795	795	445	390
21	2,500	450	820	1,860	2,170	6,060	2,390	1,520	715	715	445	390
22	1,860	450	910	3,660	3,660	5,540	2,220	1,400	715	715	390	390
23	1,220	450	1,010	7,920	5,040	5,040	2,070	1,400	715	795	390	390
24	910	450	910	5,290	7,100	7,100	1,920	1,400	715	880	390	340
25	730	450	910	3,250	15,000	12,700	1,780	1,400	715	975	390	340
26	650	450	820	2,500	9,900	9,320	1,650	1,400	715	975	390	340
27	650	450	730	2,170	6,840	7,100	1,650	1,920	640	880	390	340
28	580	450	650	2,010	4,800	5,800	1,520	2,560	640	880	390	340
29	580	450	2,170	2,010	.....	4,800	1,520	6,840	640	795	390	340
30	510	450	3,660	2,500	.....	4,100	1,400	5,800	640	795	390	340
31	510	.....	3,250	3,250	.....	3,670	.....	4,560	.....	715	340	.....

Monthly discharge of James River at Buchanan, Va., for the year ending Sept. 30, 1917.

[Drainage area, 2,060 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	3,050	450	786	0.382	0.44
November	510	450	456	.221	.25
December	3,660	450	812	.394	.45
January	7,920	1,860	2,870	1.39	1.60
February	15,000	580	3,640	1.77	1.84
March	58,100	3,670	11,100	5.39	6.21
April	11,700	1,400	3,700	1.80	2.01
May	6,840	1,400	2,590	1.26	1.45
June	3,470	640	1,180	.573	.64
July	975	445	653	.317	.37
August	880	340	487	.236	.27
September	570	340	392	.190	.21
The year	58,100	340	2,380	1.16	15.74

JAMES RIVER AT CARTERSVILLE, VA.

LOCATION.—At highway bridge between Pemberton and Cartersville, Cumberland County, about 50 miles above Richmond. Willis River enters from the south about a mile above station, and Rivanna River from the north about 7 miles above.

DRAINAGE AREA.—6,230 square miles.

RECORDS AVAILABLE.—January 1, 1899, to September 30, 1917.

GAGE.—Chain on downstream side and near Cartersville end of bridge; read by B. W. Palmore. Wire gage used previous to July 24, 1903.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Bed composed of rocks and sand; shifts somewhat during floods. Banks high; left bank is overflowed at a stage of about 20 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 19.9 feet at 9 a. m. March 6 (discharge, 66,300 second-feet); minimum stage, 0.78 foot at 9 a. m. September 25 and 26 (discharge, 958 second-feet).

1899–1917: Maximum stage recorded, 26.7 feet at 6 p. m. December 30, 1901 (discharge approximately 106,000 second-feet); minimum stage, 0.5 foot October 3, 1914 (discharge, 800 second-feet). A discharge of 603 second-feet (gage height 0.42 foot) was measured September 8, 1897, but gage-height record corresponding to this measurement is probably subject to error.

ICE.—Ice forms only during severe winters, but stage-discharge relation is seldom affected thereby.

ACCURACY.—Stage-discharge relation practically permanent during year; not affected by ice. Rating curve well defined between 1,300 and 40,000 second-feet, and is extended for high stages. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of James River at Cartersville, Va.. during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Dec. 7	Lee and Walters	1.35	1,920
June 30	B. E. Jones	2.63	4,090

Daily discharge, in second-feet, of James River at Cartersville, Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,400	1,790	2,300	9,190	6,870	12,200	9,730	5,690	9,460	2,830	2,300	1,630
2	5,020	1,790	2,300	8,920	7,610	15,200	7,870	6,150	7,110	2,130	2,130	1,470
3	4,190	1,790	2,130	9,460	7,610	29,300	7,360	6,390	10,000	1,880	2,040	1,390
4	2,650	1,790	1,880	6,630	7,360	39,700	6,870	6,870	7,870	2,130	4,600	1,630
5	2,470	1,880	1,790	5,240	7,110	62,200	8,920	11,400	5,690	1,960	4,390	1,630
6	1,790	1,630	1,960	5,460	6,390	64,900	32,900	10,600	4,810	2,470	2,470	2,130
7	1,550	1,630	1,880	6,390	5,460	43,700	30,700	7,360	5,020	1,960	1,790	3,590
8	1,550	1,550	1,710	7,870	5,020	24,700	27,500	6,870	4,390	1,880	1,630	2,040
9	1,470	1,470	1,630	8,130	4,810	20,600	19,000	7,610	3,990	1,630	1,470	2,470
10	1,390	1,630	1,550	8,130	4,600	20,300	15,500	8,920	5,020	1,880	2,830	3,400
11	1,210	1,550	1,630	6,390	4,390	19,000	13,400	8,650	8,920	1,960	2,830	1,960
12	1,310	1,630	1,960	5,020	3,990	15,500	11,400	8,920	10,800	2,300	2,650	1,630
13	1,470	1,790	2,830	4,390	3,210	14,000	10,600	8,390	10,300	1,880	1,710	1,630
14	1,390	1,960	2,470	5,920	3,210	15,500	11,400	7,360	5,460	1,630	1,390	1,550
15	1,470	1,790	2,300	8,390	3,500	16,800	11,700	8,130	5,460	1,880	1,180	1,470
16	1,310	1,790	2,130	7,360	3,790	23,000	10,600	5,920	5,020	1,960	1,310	1,630
17	1,470	1,960	2,130	5,690	3,990	22,300	9,730	5,920	5,460	2,470	1,310	1,470
18	1,550	1,630	1,960	5,240	3,990	27,800	8,390	5,240	5,020	2,650	1,630	1,470
19	2,300	1,790	1,790	5,240	3,790	32,900	7,870	4,600	4,600	2,130	1,470	1,250
20	5,920	1,550	1,790	5,690	3,400	22,300	7,360	4,190	3,210	1,960	1,310	1,310
21	5,020	1,630	2,300	5,240	4,600	17,100	5,920	3,990	3,210	2 470	1,310	1,250
22	4,810	1,710	4,190	5,690	4,810	17,400	6,150	3,590	3,210	3,020	1,280	1,390
23	4,390	1,390	11,700	5,690	9,460	12,200	6,390	3,590	3,590	4,810	1,120	1,390
24	3,210	1,470	11,700	5,920	9,190	12,800	5,920	3,490	3,020	5,020	10,000	990
25	3,020	1,710	6,150	11,100	15,200	19,000	5,920	3,210	2,650	4,600	3,400	974
26	2,830	1,790	5,460	8,650	20,000	27,500	5,690	3,210	2,300	5,460	2,830	990
27	2,130	1,790	4,810	6,870	21,600	21,600	5,690	3,400	2,470	3,990	1,390	1,170
28	1,960	1,880	4,810	5,920	11,700	17,700	5,460	3,990	3,990	3,990	1,290	1.280
29	1,960	2,130	5,460	5,690	.....	14,000	5,460	5,240	3,590	3,590	1,210	1,740
30	1,790	2,300	5,240	6,390	.....	11,700	5,920	8,130	4,600	2,650	1,130	1,630
31	1,550	.....	5,240	6,630	.....	10,300	.....	10,600	.....	2,130	1,630	.....

Monthly discharge of James River at Cartersville, Va., for the year ending Sept. 30, 1917.

[Drainage area, 6,230 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	5,920	1,210	2,500	0.401	0.46
November	2,390	1,390	1,740	.279	.31
December	11,700	1,630	3,460	.555	.64
January	11,100	4,390	6,730	1.08	1.24
February	21,600	3,210	7,030	1.13	1.18
March	64,900	10,300	23,300	3.74	4.31
April	32,900	5,460	10,900	1.75	1.95
May	11,400	3,210	6,370	1.02	1.18
June	10,800	2,300	5,340	.857	.96
July	5,460	1,630	2,690	.432	.50
August	4,600	1,120	2,230	.358	.41
September	3,590	974	1,650	.265	.30
The year	64,900	974	6,170	.990	13.44

ROANOKE RIVER BASIN.

ROANOKE RIVER AT ROANOKE, VA.

LOCATION.—At Walnut Street highway bridge in Roanoke, Roanoke County.

DRAINAGE AREA.—388 square miles.

RECORDS AVAILABLE.—July 10, 1896 to July 15, 1906; May 7, 1907 to September 30, 1917.

GAGE.—Chain on downstream side of Walnut Street bridge; read by employees of Roanoke Railway & Electric Co. Wire gage used previous to November 28, 1903.

DISCHARGE MEASUREMENTS.—Made from downstream side of Walnut Street bridge, or from Jefferson Street bridge, about one-third mile above. Measurement of overflow from Crystal Spring, which enters river between the two bridges, is added when discharge measurements are made at Jefferson Street bridge.

CHANNEL AND CONTROL.—Bed composed of coarse gravel and small boulders. Banks may be overflowed at extreme flood stages. Control, loose boulders; shifts slightly.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.2 feet at 7.30 a. m. March 5 (discharge, 5,870 second-feet); minimum, 0.53 foot at 6 a. m. August 31 (discharge, 46 second-feet).

1896–1917: Maximum stage recorded, 14.34 feet August 6, 1901 (discharge, 16,900 second-feet); minimum stage recorded, zero on morning of December 23, 1909, when flow was retarded by freezing (practically no water flowing).

ICE.—Ice seldom forms at station, but flow is sometimes retarded by freezing of headwaters.

ACCURACY.—Stage-discharge relation practically permanent throughout the year; not affected by ice. Rating curve fairly well defined below 2,000 second-feet, but definition is doubtful at high stages owing to lack of discharge measurements. Gage read to half-tenths or quarter-tenths once daily. Daily discharge ascertained by applying mean daily gage height to rating table. Results fair.

COOPERATION.—Gage-height records furnished by Roanoke Railway & Electric Co., J. W. Hancock, general manager.

Discharge measurements of Roanoke River at Roanoke, Va., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Dec. 9	Lee and Walters	0.83	102
June 25	B. E. Jones	.73	82.2

Daily discharge, in second-feet, of Roanoke River at Roanoke, Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	125	132	112	158	550	488	430	293	151	93	106	71
2	112	125	106	235	550	1,440	403	270	151	93	106	62
3	112	125	112	158	279	2,140	366	248	188	82	106	62
4	103	125	112	257	351	3,580	341	248	227	82	106	71
5	98	112	109	850	279	5,870	366	317	135	82	93	62
6	103	112	109	770	235	2,260	1,440	293	135	82	71	62
7	98	103	106	550	326	1,440	1,030	293	135	71	82	62
8	98	98	98	430	302	1,130	690	366	135	120	93	71
9	98	98	109	376	302	895	618	584	135	151	93	82
10	103	112	106	326	75	770	550	584	120	135	93	82
11	98	125	106	279	195	654	488	488	120	120	82	82
12	98	112	117	195	195	618	430	459	120	106	71	71
13	98	125	132	158	142	690	430	366	120	93	71	71
14	98	142	75	235	195	690	488	317	120	106	82	62
15	93	125	98	235	195	770	366	293	120	82	82	62
16	98	125	86	195	215	690	366	270	120	82	71	62
17	120	112	112	195	195	1,330	366	248	106	120	71	62
18	142	112	109	158	376	2,260	341	227	106	248	71	62
19	618	112	48	195	195	1,440	317	207	93	188	71	62
20	376	120	75	158	488	1,030	317	207	93	151	62	53
21	270	112	106	195	654	770	270	188	93	120	71	53
22	195	112	326	279	519	730	317	169	106	120	71	53
23	158	103	257	430	430	618	293	207	93	690	71	53
24	125	125	248	376	690	850	270	207	93	519	71	53
25	125	142	195	376	1,230	1,330	270	169	93	690	71	53
26	125	112	158	326	770	895	270	151	82	519	62	53
27	125	120	151	302	618	770	270	227	93	366	62	53
28	125	98	158	279	550	690	248	248	106	270	62	53
29	120	98	215	279	.....	584	293	430	106	169	53	53
30	151	125	235	770	.....	519	317	248	106	151	53	62
31	142	.....	195	618	.....	459	.....	188	.....	120	46	.....

Monthly discharge of Roanoke River at Roanoke, Va., for the year ending Sept. 30, 1917.

[Drainage area, 388 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	618	93	147	0.379	0.44
November	142	98	117	.302	.34
December	326	48	138	.356	.41
January	850	158	334	.861	.99
February	1,230	75	396	1.02	1.06
March	5,870	459	1,240	3.19	3.68
April	1,440	248	432	1.11	1.24
May	584	151	291	.750	.86
June	227	82	120	.309	.34
July	690	71	194	.500	.58
August	106	46	76.6	.197	.23
September	82	53	62.5	.161	.18
The year	5,870	46	296	.763	10.35

ROANOKE RIVER AT OLD GASTON, N. C.

LOCATION.—At bridge of Roanoke Railway Co. at Old Gaston, Northampton County, about three-fourths mile below mouth of Indian Creek, 1¼ miles north of Thelma, 2½ miles above mouth of Deep Creek, and 12 miles above Weldon.

DRAINAGE AREA.—8,350 square miles.

RECORDS AVAILABLE.—December 7, 1911, to September 30, 1917.

GAGE.—Chain gage attached to outside of guard timber on downstream side of second span from right end of deck-railroad bridge of Roanoke Railway Co.; read by R. A. Howell.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge to which gage is attached. Measuring section broken by 11 bridge piers.

CHANNEL AND CONTROL.—Channel fairly permanent; control, about a mile below gage, is of rock and probably permanent. Left bank subject to overflow in extreme floods, but a fair determination can be made of the overflow discharge around the bridge.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11.0 feet March 6 and 7 (discharge, 77,100 second-feet); minimum stage, 1.0 foot September 28 (discharge, 900 second-feet).

1911–1917: Maximum stage recorded, 16.6 feet at 7 a. m. March 18, 1912 (discharge, 210,000 second-feet); minimum stage, 0.95 foot at 6 a. m. October 1, 1914 (discharge, 790 second-feet).

Flood of 1877 highest known in this locality. No definite marks preserved at Old Gaston, but from authentic information regarding the crest height as observed in 1877 the approximate height has been determined as about 19 feet referred to present gage datum. The corresponding discharge is about 275,000 second-feet.

ICE.—Ice sometimes forms to considerable thickness at this station, but the stage-discharge relation is seldom affected thereby.

REGULATION.—During periods of low water there are variations in flow, probably due to weekly (Sunday) shutdown of large power plants farther up streams. These variations are observable at power plants at Roanoke Rapids and Weldon on Tuesdays or Wednesdays.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice. Rating curve well defined below 33,300 second-feet, and fairly well defined to 180,000 second-feet. Gage read to half-tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records excellent.

Discharge measurements of Roanoke River at Old Gaston, N. C., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Dec. 6	Lee and Walters	1.67	2,520
July 2	B. E. Jones	2.18	4,390

Daily discharge, in second-feet, of Roanoke River at Old Gaston, N. C., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,600	2,250	2,540	5,160	16,600	15,900	8,570	6,470	4,460	4,800	3,630	3,310
2	5,340	1,600	3,160	4,630	11,400	31,500	7,700	6,470	3,630	4,120	3,310	14,200
3	3,960	2,840	3,160	5,340	10,900	31,500	6,470	5,700	4,290	3,310	3,000	13,000
4	3,470	2,540	2,840	6,080	8,130	59,600	6,870	6,470	4,120	4,630	8,130	11,400
5	2,540	2,250	2,250	4,460	6,470	64,300	7,280	7,280	3,470	5,700	9,490	9,490
6	2,250	2,540	2,540	10,400	4,290	77,100	11,900	9,960	3,310	4,980	4,630	8,130
7	2,540	2,390	2,250	13,000	3,630	77,100	36,000	9,020	4,460	6,470	3,310	6,080
8	1,600	1,850	2,540	14,700	5,340	64,300	39,700	9,020	5,160	5,340	3,630	3,960
9	5,340	2,840	2,690	9,960	4,460	22,800	18,500	9,960	9,020	3,470	3,000	10,900
10	3,960	3,000	2,690	6,470	8,570	14,200	15,300	10,400	14,200	4,290	3,000	7,280
11	2,690	3,000	3,000	6,870	7,280	10,900	11,900	9,020	25,100	5,340	2,390	6,080
12	2,250	2,840	3,160	4,630	7,700	10,400	10,900	8,130	35,100	3,630	3,000	4,980
13	1,980	2,690	3,310	4,460	3,470	7,280	9,490	6,870	17,900	4,630	3,310	4,290
14	1,850	2,540	4,980	6,470	3,630	9,020	9,020	6,080	15,300	4,290	1,850	3,960
15	2,110	3,160	5,700	7,280	3,470	9,020	9,020	5,340	10,900	3,470	2,110	4,630
16	2,390	3,470	6,080	9,020	4,290	8,570	8,130	5,700	8,130	3,630	1,600	3,310
17	2,110	3,630	2,110	8,570	4,630	8,130	7,280	4,800	5,340	4,630	2,690	2,390
18	1,360	3,160	1,480	9,490	5,340	29,800	7,280	3,960	4,800	8,130	3,000	1,850
19	3,310	2,540	2,540	9,960	5,160	31,500	6,870	3,470	4,290	11,900	1,600	1,600
20	3,800	2,250	2,110	10,900	5,700	23,600	6,470	3,470	3,800	9,020	2,690	1,360
21	14,700	1,600	2,690	9,960	7,280	15,300	5,700	3,160	3,470	6,470	2,110	1,600
22	11,900	1,360	4,460	8,570	8,570	11,900	4,460	3,310	2,390	10,400	1,600	1,850
23	9,020	2,390	6,080	7,700	9,020	10,900	3,960	3,000	3,160	13,000	1,850	2,110
24	7,280	3,000	3,470	9,020	9,960	11,400	3,630	2,390	3,470	19,200	1,360	3,000
25	4,630	2,690	6,470	8,130	15,300	39,700	3,470	1,980	5,160	22,800	1,850	2,110
26	3,470	2,110	6,470	9,960	14,700	34,200	6,470	1,600	3,800	23,600	4,630	1,600
27	2,110	1,600	5,700	8,570	11,900	25,100	6,080	3,470	3,470	25,100	3,000	1,360
28	3,000	1,360	4,800	7,700	9,960	20,600	4,980	3,470	3,310	22,800	2,690	900
29	2,110	2,840	6,470	8,570	.....	14,200	5,700	3,800	3,630	14,700	1,600	1,360
30	3,000	2,250	6,470	13,000	.....	10,900	4,460	5,700	9,020	9,490	1,850	3,310
31	2,840	.....	5,700	15,300	.....	9,960	.....	6,470	.....	4,630	2,690	.....

Monthly discharge of Roanoke River at Old Gaston, N. C., for the year ending Sept. 30, 1917.

[Drainage area, 8,350 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	14,700	1,360	3,890	0.466	0.54
November	3,630	1,360	2,490	.298	.33
December	6,470	1,480	3,870	.463	.53
January	15,300	4,460	8,530	1.02	1.18
February	16,600	3,470	7,760	.929	.97
March	77,100	7,280	26,200	3.14	3.62
April	39,700	3,470	9,790	1.17	1.30
May	10,400	1,600	5,680	.680	.78
June	35,100	2,390	7,590	.909	1.01
July	25,100	3,310	8,970	1.07	1.23
August	9,490	1,360	3,050	.365	.42
September	14,200	900	4,710	.564	.63
The year	77,100	900	7,720	9.25	12.54

PEEDEE RIVER BASIN.

YADKIN RIVER AT DONNAHA, N. C.

LOCATION.—At toll bridge in Donnaha, Forsyth County, on road between Donnaha and East Bend, about a quarter of a mile west of Donnaha railroad station, 6 miles downstream from mouth of Ararat River, which enters from the left, and 60 miles upstream from gaging station at Salisbury, N. C.

DRAINAGE AREA.—1,600 square miles.

RECORDS AVAILABLE.—April 11, 1913, to September 30, 1917.

GAGE.—Vertical gage in four sections on left bank, 150 feet downstream from left end of toll bridge; read twice daily by J. F. Goolsby.

DISCHARGE MEASUREMENTS.—Prior to flood in July, 1916, measurements were made from the toll bridge; bridge washed out in July 1916; no measurements after that year.

CHANNEL AND CONTROL.—Bed composed of sand and bedrock; probably permanent, Current slightly obstructed by two old steel trusses lying about 150 and 400 feet. respectively, below bridge; obstruction probably permanent. Control is a rock ledge extending across river and forming a shoal about 450 feet below gage.

EXTREMES OF STAGE.—Maximum stage recorded during year, 13.3 feet at 8 a. m. September 1 (discharge not determined); minimum stage, 5.2 feet several days in August and September (discharge not determined).

1913–1917: Maximum stage recorded, 40.0 feet at 8 a. m. July 16, 1916, determined by observer who measured from flood marks down to water surface at a lower stage (discharge not determined); minimum stage, 4.65 feet at 4 p. m. September 30, 1914 (discharge, 678 second-feet).

ICE.—Never enough to affect stage-discharge relation.

REGULATION.—None except for a few small mill dams on tributaries.

Data inadequate for determination of discharge.

No discharge measurements were made at this station during the year.

Daily gage height, in feet, of Yadkin River at Donnaha, N. C., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.9	5.7	5.6	5.7	5.9	6.6	6.0	5.7	5.7	5.4	5.6	11.4
2	5.9	5.7	5.6	5.7	6.0	7.4	6.0	5.6	5.8	5.5	5.4	7.2
3	5.8	5.8	5.6	5.8	6.6	8.5	6.2	5.7	5.7	5.5	5.4	6.0
4	5.8	5.8	5.6	5.8	8.0	10.4	6.6	5.6	5.8	5.5	5.3	6.0
5	5.8	5.8	5.6	6.1	7.0	10.4	9.9	5.6	5.8	5.5	5.3	7.0
6	5.9	5.8	5.6	6.0	6.5	9.4	10.2	5.6	5.6	5.4	5.3	6.4
7	5.9	5.8	5.6	5.9	6.4	8.9	6.9	5.8	5.7	5.4	5.3	5.9
8	5.8	5.8	5.6	5.9	6.2	8.2	6.0	6.6	5.8	5.4	5.3	5.6
9	5.8	6.0	5.6	5.8	6.0	7.8	5.9	6.1	5.8	5.4	5.3	5.6
10	5.8	5.8	5.6	5.8	6.0	7.2	5.8	5.8	5.8	5.4	5.3	5.5
11	5.8	5.8	5.6	5.8	5.9	6.8	5.8	5.8	5.8	5.4	5.3	5.4
12	5.9	5.8	5.6	5.8	5.8	6.6	5.8	5.7	5.8	5.4	5.2	5.4
13	6.3	5.7	5.6	5.8	5.8	6.6	5.7	5.7	5.8	5.4	5.2	5.4
14	6.0	5.7	5.6	5.9	5.8	6.6	5.6	5.7	5.8	5.4	5.2	5.4
15	6.0	5.7	5.6	6.0	5.8	6.0	5.8	5.6	5.8	7.2	5.2	5.4
16	5.8	5.7	5.6	6.2	6.0	6.0	5.8	5.6	5.8	6.2	5.2	5.4
17	6.0	5.7	5.6	6.2	6.0	6.0	5.8	5.6	6.0	5.9	5.2	5.3
18	6.4	5.7	5.7	6.0	6.2	6.0	5.7	5.6	6.0	6.2	5.3	5.3
19	10.6	5.6	5.7	6.0	6.2	6.0	5.7	5.6	5.9	6.4	5.3	5.3
20	9.7	5.6	5.8	6.0	6.4	6.3	5.8	5.6	5.8	6.1	5.2	5.2
21	8.2	5.6	5.8	5.9	6.8	6.4	5.9	5.6	5.8	6.0	5.3	5.2
22	6.8	5.6	5.8	5.8	7.0	6.2	5.8	5.6	5.9	6.0	5.3	5.2
23	6.2	5.6	5.8	5.8	6.9	6.0	5.9	5.6	5.8	5.8	5.3	5.2
24	6.0	5.7	6.0	5.7	7.8	10.4	5.8	5.8	5.7	6.5	5.2	5.4
25	5.9	5.7	6.0	5.7	7.2	8.2	5.7	6.8	5.7	9.6	5.2	5.4
26	5.9	5.7	5.9	5.7	6.6	8.3	5.7	7.0	5.6	9.2	5.3	5.2
27	5.9	5.7	5.8	5.8	6.4	7.8	5.7	6.3	5.6	6.9	5.3	5.2
28	5.8	5.7	5.8	5.8	6.2	7.2	5.7	5.9	5.6	6.2	5.3	5.2
29	5.8	5.7	5.8	5.9	.....	6.6	5.7	5.9	5.6	6.1	5.3	5.2
30	5.8	5.7	5.8	5.9	.....	6.1	5.7	5.8	5.6	5.9	5.4	5.2
31	5.8	.....	5.7	5.9	.....	5.9	.....	5.7	.....	5.8	5.7	.....

YADKIN RIVER NEAR SALISBURY, N. C.

LOCATION.—At highway bridge known as Piedmont toll bridge, 1,000 feet upstream from Southern Railway bridge, 4 miles east of Spencer, 5 miles downstream from mouth of South Yadkin River, 6 miles east of Salisbury, Rowan County, and 26 miles upstream from American Aluminum Co.'s hydroelectric plant near Whitney, N. C.

DRAINAGE AREA.—3,400 square miles.

RECORDS AVAILABLE.—September 24, 1895, to December 31, 1909; September 1, 1911, to September 30, 1917.

GAGE.—Chain gage attached to highway bridge; read by J. T. Yarbrough. From the date of establishment to May 31, 1899, the gage was at the Southern Railway bridge, and from the latter date it was at the highway bridge until moved back to the railroad bridge early in 1903, where it remained until the end of 1905. Since January 1, 1906, the gage has been at the highway bridge at the datum originally established there in 1899. The last gage at the railroad bridge read the same as the gage at the highway bridge at gage height 3.2 feet, but not for higher and lower stages. Datum of the original gage at the railroad bridge somewhat uncertain.

DISCHARGE MEASUREMENTS.—Made from highway bridge. During the time that gage was at railroad bridge most of the measurements were made from that bridge. During flood of July, 1916, water rose over floor of highway bridge, making it necessary to use railroad bridge.

CHANNEL AND CONTROL.—Channel wide and rather rough. Control is a rock ledge about 500 feet below bridge, extending entirely across river.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11.2 feet at 6 p. m. March 5 (discharge, 45,800 second-feet); minimum stage, 1.71 feet at 7 a. m. August 30 (discharge, 1,180 second-feet).

1895–1909; 1911–1917: Maximum stage recorded, 23.8 feet at 1 a. m. July 18, 1916 (discharge, 121,000 second-feet); minimum stage, 1.2 feet September 20, October 5, November 22 and 26, 1897 (discharge, 900 second-feet).

ICE.—Never enough to affect stage-discharge relation.

REGULATION.—Flow during low stages may be slightly affected by developed powers on the river and tributaries above.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 20,000 second-feet and fairly well defined between 20,000 and 121,000 second-feet. Gage read to half-tenths twice daily; during high water read oftener. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

No discharge measurements were made during the year.

Daily discharge, in second-feet, of Yadkin River near Salisbury, N. C., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,790	3,070	2,930	3,210	8,800	8,800	4,400	4,090	2,660	2,660	2,930	33,200
2	3,210	2,930	2,930	2,930	8,400	15,600	4,400	4,240	2,540	2,410	3,210	34,400
3	2,930	2,800	2,660	3,210	5,050	15,200	5,740	3,790	2,660	1,940	8,800	18,000
4	2,800	2,660	2,800	3,940	3,500	20,500	4,090	3,640	3,500	2,800	6,460	4,400
5	2,930	2,660	2,660	4,400	3,500	43,400	6,460	4,400	2,930	6,460	3,790	3,790
6	2,800	3,070	2,660	8,000	2,930	32,600	24,600	4,400	2,660	3,640	2,930	5,740
7	2,660	2,660	2,540	7,220	3,210	12,400	14,700	3,790	2,660	2,410	2,410	3,360
8	2,660	2,660	2,800	5,050	4,090	8,000	7,220	4,090	2,660	2,170	2,410	3,070
9	2,800	2,660	2,410	3,500	4,090	6,840	8,800	4,090	2,540	2,660	2,660	2,930
10	2,660	2,800	2,660	3,790	3,640	5,740	7,220	3,790	3,640	3,790	3,210	3,210
11	2,800	2,660	3,070	3,500	2,930	5,050	5,740	3,500	5,390	2,660	2,660	2,800
12	2,660	2,930	3,500	3,210	2,930	5,050	5,050	3,360	5,050	2,170	2,170	2,800
13	2,540	2,930	5,050	2,930	2,930	5,740	5,050	3,210	3,210	2,170	2,170	2,170
14	2,410	2,660	4,090	3,500	2,930	5,390	5,050	3,210	2,660	2,930	2,060	2,060
15	2,660	2,930	3,210	4,090	3,070	5,050	4,720	3,210	5,050	8,800	2,290	1,940
16	2,660	2,930	2,930	3,940	3,500	4,720	4,400	3,210	4,720	8,000	2,800	2,060
17	2,660	2,660	2,660	4,090	3,360	7,220	4,090	3,070	3,360	5,740	2,660	2,060
18	3,500	2,660	3,070	5,740	3,210	13,400	4,090	2,930	2,800	6,840	2,170	1,940
19	6,460	2,660	2,660	5,390	3,790	8,800	3,940	2,930	2,410	9,600	1,940	2,060
20	18,500	2,930	2,290	4,240	6,840	6,100	3,790	2,930	2,410	7,220	1,940	1,940
21	6,840	2,540	2,540	4,240	10,800	5,050	3,210	2,930	2,410	5,740	1,840	1,730
22	4,400	2,660	4,720	4,090	7,220	5,050	3,500	2,660	2,660	6,460	1,940	1,630
23	3,790	2,660	5,390	4,406	5,050	5,050	4,090	3,500	2,540	10,800	1,840	1,730
24	3,500	2,800	4,090	4,090	9,600	16,000	3,790	3,790	2,410	9,600	1,940	1,840
25	3,210	3,210	3,500	4,400	9,600	29,000	3,640	3,210	2,540	8,800	2,060	1,840
26	3,210	2,930	3,210	4,240	5,740	15,600	3,790	2,660	2,170	11,200	1,630	1,630
27	3,210	2,930	3,210	3,640	5,050	8,000	4,090	2,660	2,060	6,100	1,840	1,630
28	2,930	2,660	3,360	3,500	4,090	8,800	3,940	2,930	2,660	4,720	1,530	2,060
29	2,930	2,660	4,720	5,050	.....	6,460	3,790	2,930	3,210	3,790	1,530	2,290
30	2,930	2,800	3,940	12,000	.....	5,390	3,500	2,930	3,640	3,210	1,530	2,540
31	2,930	.....	3,640	8,400	.....	5,050	.....	2,660	.....	2,930	9,200	.....

Monthly discharge of Yadkin River near Salisbury, N. C., for the year ending Sept. 30, 1917.

[Drainage area, 3,400 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	18,500	2,410	3,740	1.10	1.27
November	3,210	2,540	2,790	.821	.92
December	5,390	2,290	3,290	.968	1.12
January	12,000	2,930	4,640	1.36	1.57
February	10,800	2,930	4,990	1.47	1.53
March	43,400	4,720	11,100	3.26	3.76
April	24,600	3,210	5,700	1.68	1.87
May	4,400	2,660	3,380	.994	1.15
June	5,390	2,060	3,060	.900	1.00
July	11,200	1,940	5,170	1.52	1.75
August	9,200	1,530	2,860	.841	.97
September	34,400	1,630	5,100	1.50	1.67
The year	43,400	1,530	4,660	1.37	18.58

SANTEE RIVER BASIN.

CATAWBA RIVER AT RHODHISS, N. C.

LOCATION.—At new highway bridge 1,000 feet below dam of Rhodhiss Manufacturing Co., 1 mile from Carolina & North Western Railroad station in Rhodhiss, Caldwell County. The tailrace of the company's cotton mills empties into river 300 feet upstream from gage.

DRAINAGE AREA.—1,180 square miles (determined by Rhodhiss Manufacturing Co.).

RECORDS AVAILABLE.—April 13 to September 30, 1917.

GAGE.—Chain gage attached to upstream side of highway bridge; read by H. C. Cobb.

DISCHARGE MEASUREMENTS.—Made from the bridge.

CHANNEL AND CONTROL.—Bed composed of rock; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of records, 8.58 feet at 7 a. m., September 1 (discharge, 18,800 second-feet); minimum stage recorded, 1.35 feet at 12.30 p. m., August 30 (discharge, 635 second-feet).

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—Slight fluctuation at low stages caused by operation of power plant of the Rhodhiss Manufacturing Co.

ACCURACY.—Stage-discharge relation probably permanent. Rating curve fairly well defined between 700 and 1,300 second-feet and well defined between 1,300 and 10,000 second-feet; extended above 10,000 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except those below 1,000 second-feet, which are subject to error owing to regulation caused by operation of power plant, and those above 10,000 second-feet, which are fair.

Discharge measurements of Catawba River at Rhodhiss, N. C., during the year ending Sept. 30, 1917.

[Made by C. C. Babb.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 19	2.40	1,750	July 19	3.15	2,910
27	2.50	1,880	25	4.40	6,130
May 14	2.15	1,380	Aug. 18	1.65	780
June 26	2.00	1,150			

Daily discharge, in second-feet, of Catawba River at Rhodhiss, N. C., for the year ending Sept. 30, 1917.

Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	1,770	1,210	950	1,460	15,400
2	.....	1,610	1,160	900	1,540	2,650
3	.....	1,540	1,160	1,160	1,940	1,940
4	.....	1,540	1,160	1,610	1,460	1,690
5	.....	1,690	1,100	1,160	1,330	2,290
6	.....	1,460	1,330	1,050	1,210	1,540
7	.....	1,540	1,270	950	1,100	1,460
8	.....	1,540	1,210	1,770	1,330	1,270
9	.....	1,690	1,270	1,270	1,210	1,050
10	.....	1,540	2,290	1,100	1,460	1,210
11	.....	1,460	1,860	950	1,270	1,050
12	.....	1,400	1,400	1,000	1,160	1,000
13	2,290	1,400	1,210	1,540	1,050	950
14	2,290	1,330	1,160	1,460	1,050	1,000
15	2,110	1,330	1,160	1,540	1,050	950
16	1,940	1,330	1,160	1,460	1,160	975
17	1,770	1,270	1,210	1,160	1,050	900
18	1,770	1,330	1,160	2,290	900	950
19	1,770	1,270	1,100	3,230	880	950
20	1,770	1,270	1,100	2,290	858	950
21	1,690	1,270	1,050	2,290	900	1,000
22	1,770	1,400	1,100	2,470	1,050	1,210
23	1,610	1,610	1,100	3,880	1,000	1,540
24	1,610	1,400	1,160	3,030	1,000	1,160
25	1,610	1,270	1,050	6,100	1,100	1,000
26	1,860	1,050	1,160	3,230	1,100	950
27	1,940	1,270	950	2,290	1,050	1,000
28	1,610	1,540	1,000	2,290	1,000	1,610
29	1,610	1,270	1,000	2,020	815	1,690
30	1,860	1,210	1,000	1,540	778	1,860
31	.....	1,160	.....	1,460	858	.....

NOTE.—Discharge interpolated Apr. 15, 16, Aug. 5, 19, and Sept. 16.
Accuracy of records, Sept. 10-21, affected to some extent by regulation above gage.

Monthly discharge of Catawba River at Rhodhiss, N. C., for the year ending Sept. 30, 1917.

[Drainage area, 1,180 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
May	1,770	1,050	1,410	1.19	1.37
June	2,290	950	1,210	1.03	1.15
July	6,100	900	1,920	1.63	1.88
August	1,940	778	1,130	.958	1.10
September	15,400	900	1,770	1.50	1.67

EDISTO RIVER BASIN.

FOUR HOLE CREEK NEAR RIDGEVILLE, S. C.

LOCATION.—At Horseford's bridge, 3½ miles west of Ridgeville, Dorchester County, 5 miles upstream from Harley's bridge and 5¼ miles upstream from junction of creek with Edisto River.

DRAINAGE AREA.—600 square miles.

RECORDS AVAILABLE.—November 16, 1914, to September 30, 1917, when station was discontinued.

GAGE.—Gage No. 1, which is the upper gage, is a Gurley seven-day graph water-stage recorder, installed December 9, 1915, on left bank of creek, 200 feet downstream from Horseford's bridge; October 6 to December 8, 1915, reference staff gage was read occasionally; November 18, 1914, to December 8, 1915, Gurley printing gage; November 16 and 17, 1914, vertical staff; all gages at same site and datum.

Gage No. 2 is a Stevens water-stage recorder, installed January 9, 1915, on right bank 150 feet downstream from Harley's bridge, and 5 miles downstream from gage No. 1; datum same as gage No. 1.

DISCHARGE MEASUREMENTS.—Made from Horseford's bridge or by wading. At extremely high stages overflow channels are measured by wading or from a boat, and the main channel is measured from the bridge.

CHANNEL AND CONTROL.—Bottom hard; banks low and flat, overgrown with brush and trees. Below a stage of 13 feet flow is in one channel; between 13 and 17 feet flow is through three channels, and above 17 feet stream spreads over wide swamps. Gage height of zero flow, about 9.6 feet. Stage-discharge relation permanent below gage height 16 feet although there is no defined control; above 16 feet stage-discharge relation is affected by backwater from Edisto River.

EXTREMES OF DISCHARGE.—Maximum mean daily discharge during year, 1,670 second-feet March 2; minimum mean daily stage, from water-stage recorder No. 1, 9.83 feet June 30 and July 1 (discharge, 2.6 second-feet).

1914–1917: Maximum stage, from water-stage recorder No. 1, 24.75 feet at 6 p. m. July 29, 1916 (discharge, 13,400 second-feet); minimum stage from recorder No. 1, 9.65 feet June 14, 1916 (discharge, 1 second-foot).

ICE.—None.

ACCURACY.—Stage-discharge relation permanent for stages below 16 feet: stages above that point are affected by backwater from Edisto River. Rating curve well defined below 540 second-feet (16-foot stage); above this point a well-defined "normal curve" (see below) extends to 16,000 second-feet. Operation of water-stage recorder No. 1 has been satisfactory during the year except October 23–26 and August 12–24. Operation of water-stage recorder No. 2 has been satisfactory throughout the periods for which the records were used in determining daily discharge by slope method.

Daily discharge for stages below 16 feet ascertained by applying mean daily gage height, determined by inspecting gage-height graph from gage No. 1, to the rating table. Discharge for stages above 16 feet is affected by varying slope of stream surface due to backwater from Edisto River; discharge at such stages determined by "slope method."[1]

Records for most of the year are good.

Discharge measurements of Four Hole Creek near Ridgeville, S. C., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Nov. 15	Eason and Hall	10.82	28.9
July 16	F. G. Eason	14.62	310

[1] Hall, M. R., Hall, W. E., and Pierce, C. H., a method of determining the daily discharge of rivers of variable slope: U. S. Geol. Survey Water-Supply Paper 345, p. 53, 1915.

Daily discharge, in second-feet, of Four Hole Creek near Ridgeville, S. C., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	54	101	54	134	494	1,440	737	150	11	2.6	392	11
2	44	79	58	130	806	1,670	804	126	10	3.0	400	18
3	35	65	58	134	1,380	1,630	909	108	15	7.0	348	44
4	30	56	58	134	1,620	1,470	964	108	42	14	270	40
5	41	50	58	134	1,520	1,310	997	225	36	21	198	30
6	40	47	58	154	1,310	1,250	983	245	22	28	134	38
7	35	44	58	158	1,090	1,260	915	235	25	178	85	58
8	32	41	58	162	964	1,330	826	275	44	385	58	73
9	30	38	58	162	865	1,390	772	290	79	534	56	79
10	28	35	59	162	799	1,370	765	260	98	524	54	88
11	24	34	60	166	747	1,280	713	206	122	520	65	158
12	23	32	72	166	725	1,230	632	162	88	392	70	190
13	20	32	88	166	693	1,200	606	126	65	318	70	332
14	18	30	94	170	666	1,160	631	108	46	305	79	945
15	16	32	98	174	648	1,090	642	98	36	300	91	1,230
16	14	41	101	178	622	990	662	94	30	305	94	1,030
17	13	40	104	182	581	882	655	98	26	348	88	801
18	12	36	104	182	556	759	641	98	21	438	82	430
19	36	34	112	182	569	682	627	91	18	540	70	295
20	82	32	115	178	624	616	662	85	16	755	59	210
21	88	30	122	178	666	520	552	79	13	787	48	154
22	115	29	126	174	669	490	517	68	11	686	38	115
23	174	30	130	178	662	452	463	54	9.4	438	29	88
24	225	34	134	186	653	430	460	42	8.0	340	20	65
25	270	36	142	210	678	480	392	33	6.6	270	14	50
26	285	34	150	255	768	591	340	26	4.6	230	12	41
27	280	33	158	275	900	651	295	23	3.4	210	17	34
28	240	32	158	300	1,150	732	260	20	3.0	206	17	40
29	190	36	158	340	.....	788	225	19	2.8	215	9.2	138
30	154	44	154	400	.....	768	186	18	2.6	255	3.2	280
31	138	.....	142	470	.....	745	.....	14	.....	325	3.8	.....

NOTE.—Discharge determined as follows: For discharges below 540 second-feet, determined from a well-defined rating curve; Feb. 1 to Mar. 20, Mar. 26 to Apr. 23, July 9, 10, 20–22, and Sept. 14–17, by applying slope corrections to a fairly well-defined normal rating curve, the slope correction being accurately determined from continuous gage-height record at both gages.

Monthly discharge of Four Hole Creek near Ridgeville, S. C., for the year ending Sept. 30, 1917.

[Drainage area, 600 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	285	12	89.9	0.150	0.17
November	101	29	41.2	.069	.08
December	158	54	100	.167	.19
January	470	130	199	.332	.38
February	1,620	494	837	1.40	1.46
March	1,670	430	989	1.65	1.90
April	997	186	628	1.05	1.17
May	290	14	116	.193	.22
June	122	2.6	30.5	.051	.06
July	787	2.6	319	.532	.61
August	400	3.2	95.9	.160	.18
September	1,230	11	237	.395	.44
The year	1,670	2.6	303	.505	6.86

NOTE.—The correct discharge for July 21, 1916, is 4,650 second-feet and not 8,360 second-feet as published in Water-Supply Paper 432, p. 23. Correct discharge for the month, 4,000 second-feet, or 6.67 second-feet per square mile, corresponding to a run-off of 7.69 inches from the drainage basin above station. Mean discharge for the year ending Sept. 30, 1916, is 675 second-feet, or 1.12 second-feet per square mile, corresponding to a run-off of 15.31 inches from the drainage basin above station.

SAVANNAH RIVER BASIN.

CHATTOOGA RIVER NEAR TALLULAH FALLS, GA.

LOCATION.—About 300 feet above mouth of Camp Creek, 5½ miles above junction with Tallulah River, and 8 miles east of Tallulah Falls, Rabun County.

DRAINAGE AREA.—256 square miles (measured on topographic maps).

RECORDS AVAILABLE.—January 1 to September 30, 1917.

GAGE.—Gurley 7-day recording gage installed on right bank August 17, 1917. On the same date a new vertical staff gage was installed about 30 feet upstream to which all recording gage records are referred. Prior to August 17, 1917 readings were taken from an old vertical staff gage at same location as new staff gage and set at the same datum. Gage read by employees of Georgia Railway & Power Co.

DISCHARGE MEASUREMENTS.—Made from cable at gage location.

CHANNEL AND CONTROL.—Section under cable may shift somewhat but stage-discharge relation is kept permanent by a solid rock shoal about 100 feet below gage.

EXTREMES OF DISCHARGE.—Maximum mean daily stage recorded during year, 12.2 feet March 24 (discharge, about 12,000 second-feet); minimum mean daily stage recorded, 0.98 foot August 29 (discharge, 383 second-feet).

ICE.—Stage-discharge relation not affected by ice.

ACCURACY.—Stage-discharge relation permanent. Gage read once daily to tenths from January 1 to August 17; after that date record obtained from Gurley recording gage. Rating curve well defined between 280 and 2,000 second-feet. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except for few days in February, March and April when discharge is above 2,000 second-feet. After August 17 records are excellent.

COOPERATION.—Gage-height record furnished by Georgia Railway & Power Co.

Discharge measurements of Chattooga River near Tallulah Falls, Ga., during the year ending Sept. 30, 1917.

[Made by H. L. Wills.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
July 4	1.20	464
4	1.58	640

Daily discharge, in second-feet, of Chattooga River near Tallulah Falls, Ga., for the year ending Sept. 30, 1917.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	810	1,780	1,480	1,700	1,330	705	470	515	2,250
2	755	1,120	1,260	1,700	1,060	1,400	430	705	1,260
3	705	870	1,190	1,550	990	705	430	755	990
4	870	930	4,800	1,480	1,190	705	430	1,190	810
5	1,120	755	2,960	3,650	1,060	655	470	705	705
6	1,120	810	2,010	2,090	990	605	430	605	630
7	930	810	1,780	1,850	930	605	470	705	592
8	810	810	1,780	1,780	990	605	515	930	551
9	755	755	1,620	1,620	930	755	430	755	546
10	755	705	1,480	1,550	870	1,060	390	705	605
11	705	705	1,400	1,480	870	755	430	605	506
12	655	705	1,400	1,480	870	655	390	560	474
13	655	655	1,480	1,480	810	605	390	515	462
14	1,620	655	1,400	1,400	810	705	390	515	434
15	1,400	930	1,330	1,330	810	655	390	515	434
16	1,700	755	1,260	1,260	755	560	390	605	450
17	1,260	705	1,930	1,260	755	560	390	560	422
18	1,120	1,190	1,480	1,260	755	560	560	488	406
19	990	2,090	1,330	1,190	755	560	1,400	462	398
20	930	4,800	1,260	1,190	705	755	755	454	394
21	930	1,850	2,090	1,190	705	560	810	462	394
22	1,120	1,400	1,480	1,120	705	755	1,700	430	430
23	930	1,400	2,010	1,120	1,060	560	870	434	426
24	930	2,250	12,000	1,060	705	515	705	430	398
25	870	1,400	3,150	1,060	705	515	655	398	394
26	810	1,260	2,420	1,190	705	470	705	390	386
27	810	1,190	3,750	1,060	705	470	560	386	446
28	755	1,120	2,330	990	705	470	560	386	840
29	930	.....	2,090	1,190	705	470	515	383	592
30	870	.....	1,930	990	655	470	515	390	500
31	810	.....	1,780	.....	655	.....	515	705	.....

Monthly discharge of Chattooga River near Tallulah Falls, Ga., for the year ending Sept. 30, 1917.

[Drainage area, 256 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	1,700	655	949	3.71	4.28
February	4,800	655	1,230	4.80	5.00
March	12,000	1,190	2,250	8.79	10.13
April	3,650	990	1,440	5.62	6.27
May	1,330	655	847	3.31	3.82
June	1,400	470	648	2.53	2.82
July	1,700	390	583	2.28	2.63
August	1,190	383	569	2.22	2.56
September	2,250	386	604	2.36	2.63

TALLULAH RIVER NEAR SEED, GA.

LOCATION.—One-fourth mile upstream from head of Rabun Lake, 1 mile downstream from Bridge Creek, 5 miles north of Seed, Rabun County, 6 miles due west of Lakemont railroad station, and 10 miles upstream from Rabun (Mathis) dam.

DRAINAGE AREA.—127 square miles (measured on topographic maps).

RECORDS AVAILABLE.—January 6, 1916, to September 30, 1917.

GAGE.—A staff gage in three sections on right bank; read by employees of Georgia Railway & Power Co.

DISCHARGE MEASUREMENTS.—At low and medium stages made from cable about 200 feet upstream; flood measurements made from suspension footbridge 1 mile downstream from gage.

CHANNEL AND CONTROL.—Bed composed of rock, sand, and gravel; rather rough but permanent. Control is a ledge which extends across river and over which water drops sharply, about 250 feet downstream from gage; probably permanent. Point of zero flow, gage height −0.5 foot.

EXTREMES OF DISCHARGE.—Maximum mean daily stage recorded during year, 5.37 feet March 24 (discharge, 4,430 second-feet); minimum mean daily stage recorded, 0.96 foot August 29 (discharge, 144 second-feet).

1916–17: Maximum stage recorded, 8.2 feet at 6 p. m. July 9, 1916 (discharge, 8,010 second-feet); minimum mean daily stage recorded, that of August 29, 1917.

ICE.—Never enough to affect stage-discharge relation.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined between 100 and 5,500 second-feet. Gage read to hundredths three times daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Tallulah River near Seed, Ga., during the year ending Sept. 30, 1917.

[Made by Warren E. Hall.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Oct. 6	1.18	242
Nov. 8	1.14	238

Daily discharge, in second-feet, of Tallulah River near Seed, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	250	256	292	462	1,400	908	995	705	376	210	230	825
2	240	235	268	418	785	825	950	560	364	210	256	560
3	240	220	245	462	630	1,400	908	560	364	205	280	495
4	230	210	240	630	595	3,950	865	825	340	210	280	388
5	245	205	256	950	528	2,140	1,920	630	316	205	225	340
6	245	200	230	825	560	1,500	1,310	560	310	245	225	286
7	235	200	215	630	495	1,220	1,080	560	340	225	316	256
8	230	200	225	528	495	1,220	1,080	560	495	205	352	245
9	230	200	630	462	462	1,040	995	528	668	196	310	245
10	225	200	394	430	430	995	908	495	495	187	280	210
11	215	200	334	406	424	908	865	495	376	179	235	205
12	210	230	334	376	406	865	825	495	340	175	215	192
13	200	225	286	358	394	865	865	462	316	179	200	183
14	200	225	256	825	400	865	785	462	462	175	200	179
15	200	220	268	785	560	785	745	430	352	175	225	192
16	200	205	240	995	430	785	705	430	310	175	220	225
17	200	200	240	745	424	1,220	705	418	304	240	210	183
18	240	196	268	668	865	908	668	406	292	394	187	175
19	785	192	250	630	1,310	825	668	394	286	376	183	166
20	352	192	235	560	2,360	785	668	394	292	495	200	162
21	245	187	316	560	1,310	1,310	630	382	370	560	187	158
22	268	192	528	745	950	1,040	630	394	304	528	171	292
23	230	705	370	630	865	1,220	595	412	268	364	171	215
24	225	364	328	595	1,130	4,430	595	376	250	292	166	187
25	220	280	316	528	865	1,810	595	370	256	262	158	171
26	210	245	304	495	785	1,500	668	376	235	346	151	166
27	200	230	370	462	705	1,600	560	364	225	280	151	274
28	200	256	1,080	462	668	1,500	560	424	230	250	151	745
29	250	418	745	595	.....	1,220	668	358	256	230	144	430
30	400	346	528	528	.....	1,130	595	334	418	292	183	322
31	340	.....	430	495	.....	1,040	.....	388	.....	256	495	.....

Monthly discharge of Tallulah River near Seed, Ga., for the year ending Sept. 30, 1917.

[Drainage area, 127 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	785	200	257	2.02	2.33
November	705	187	248	1.95	2.18
December	1,080	215	356	2.80	3.23
January	995	358	588	4.63	5.34
February	2,360	394	758	5.97	6.22
March	4,430	785	1,350	10.60	12.22
April	1,920	560	820	6.46	7.21
May	825	334	469	3.69	4.25
June	668	225	340	2.68	2.99
July	560	175	268	2.11	2.43
August	495	144	224	1.76	2.03
September	825	158	289	2.28	2.54
The year	4,430	144	496	3.91	52.97

TALLULAH RIVER NEAR LAKEMONT, GA.

LOCATION.—One-fourth mile downstream from Rabun dam (originally called Mathis dam), 1 mile upstream from mouth of Tiger Creek, and 1½ miles from Lakemont, Rabun County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—January 13, 1916, to September 30, 1917.

GAGE.—A Barrett & Lawrence water-stage recorder, with 10-foot range of stage, at rock-filled log crib, originally a bridge abutment, on left bank of river; referred to vertical staff gage 20 feet upstream.

DISCHARGE MEASUREMENTS.—Made from cable 5 feet downstream from gage.

CHANNEL AND CONTROL.—Bed rough and rocky, necessitating careful work in making discharge measurements. Control is a rock shoal 50 feet downstream from gage. Part of shoal is loose rock, and high water in last part of 1915 changed stage-discharge relation by changing the position of these rocks.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 9.10 feet at 4 a. m. March 24 (discharge, 8,320 second-feet); minimum flow somewhat less than 5 second-feet during part of January 21.

1916–1917: Maximum stage recorded, 10.4 feet at 8.30 p. m. July 9, 1916 (discharge, 10,900 second-feet); minimum flow somewhat less than 5 second-feet at certain times when sluice gates at storage dam one-fourth mile upstream were shut and no water passed over crest of dam.

ICE.—Never enough to affect stage-discharge relation.

REGULATION.—The Rabun dam, one-fourth mile upstream, makes a very large reservoir which is used solely for storage in operating the great hydroelectric plant 7 miles downstream. Water is impounded or let loose at will of operators; consequently fluctuations are great, sudden, and frequent.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined between 50 and 4,000 second-feet. Operation of water-stage recorder not entirely satisfactory on account of poor attention by observer. Daily discharge ascertained by use of discharge integrator. Records fair.

Discharge measurements of Tallulah River near Lakemont, Ga., during the year ending Sept. 30, 1917.

[Made by Warren E. Hall.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Oct. 8	1.04	73.9
Nov. 5	1.55	174

Daily discharge, in second-feet, of Tallulah River near Lakemont, Ga., for the year ending Sept. 30, 1917.

Day.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	400	826	860	1,000	624	767	126	448	32
2	.....	.....	684	830	970	498	233	551	255	50
3	.....	.....	580	1,450	940	795	78	573	190	104
4	.....	272	590	4,200	930	515	393	277	107	174
5	.....	283	500	2,200	1,880	625	366	490	48	188
6	.....	101	630	1,410	1,220	339	480	455	340	212
7	.....	45	.....	1,260	1,100	496	500	132	350	263
8	457	312	655	1,210	1,010	607	397	37	400	65
9	235	.....	934	1,020	980	508	165	345	449	68
10	.....	.....	696	955	850	735	78	355	454	192
11	390	374	230	930	870	605	396	285	192	242
12	445	466	1,160	880	850	345	433	402	55	480
13	610	237	1,330	910	870	121	463	230	540	320
14	.....	47	1,100	865	780	1,050	450	63	500	416
15	.....	240	805	800	790	1,070	526	53	440	84
16	.....	180	870	825	745	1,160	164	385	330	78
17	.....	246	435	1,140	734	1,220	73	308	395	440
18	.....	274	10	810	743	965	517	287	125	425
19	.....	446	300	815	684	356	510	152	70	395
20	.....	224	170	830	703	34	414	208	310	380
21	.....	225	940	775	700	1,080	380	76	370	435
22	570	345	940	1,360	650	980	452	27	320	135
23	167	460	1,260	1,340	600	643	182	190	319	84
24	61	395	900	5,090	780	700	95	305	309	370
25	173	480	860	1,570	1,100	660	511	405	102	410
26	298	478	715	1,460	715	347	512	255	.....	359
27	272	252	695	1,940	793	96	510	246	.....	315
28	381	44	665	1,380	462	835	502	104	263	146
29	184	506	.....	1,280	32	1,130	565	63	344	31
30	163	445	.....	1,120	623	1,140	180	291	343	36
31	68	445	.....	1,100	.....	945	.....	445	224	.....

NOTE.—Gage-height record incomplete for Jan. 1, 8, and Feb. 6; discharge estimated for part of day. No gage-height record Jan. 2, 3, 9, 10, Feb. 7, Aug. 26 and 27.

Monthly discharge, in second-feet, of Tallulah River near Lakemont, Ga., for the year ending Sept. 30, 1917.

Month.	Maximum.	Minimum.	Mean.	Month.	Maximum.	Minimum.	Mean.
March	5,090	800	1,370	June	767	73	376
April	1,880	32	837	July	573	27	262
May	1,220	34	685	September	480	31	231

TIGER CREEK AT LAKEMONT, GA.

LOCATION.—100 feet from old Mathis postoffice, 100 feet upstream from Tallulah Falls Railway bridge, 600 feet downstream from Phillips's grist-mill dam, 800 feet upstream from junction of creek with Tallulah River, and one-fourth mile downstream from Lakemont post office, Rabun County.

DRAINAGE AREA.—29 square miles (measured on topographic maps). Revised since publication in Water-Supply Paper 432.

RECORDS AVAILABLE.—January 11, 1916, to September 30, 1917.

GAGE.—Staff gage in two sections, on right bank; read by employee of Georgia Railway & Power Co.

DISCHARGE MEASUREMENTS.—Made from cable one-fourth mile upstream from gage, in front of Lakemont railroad station.

CHANNEL AND CONTROL.—Bed rocky and rough at gage. Under gaging cable bed is sandy and shifting. Control is solid rock shoal just below gage; permanent. Backwater from very high floods on Tallulah River probably affects stage-discharge relation. This condition arises very infrequently however.

EXTREMES OF DISCHARGE.—Maximum mean daily stage during year, 3.89 feet March 24 (discharge, 800 second-feet); minimum mean daily stage, 1.26 feet July 17 (discharge, 38 second-feet).

1916–1917: Maximum stage about 7.0 feet (over top of gage) at 9 p. m. July 9, 1916 (discharge not determined); minimum mean daily stage, that of July 17, 1917.

ICE.—Never enough to affect stage-discharge relation.

REGULATION.—Phillips's mill, which is infrequently operated, can cause considerable variation in stage. Gage read only when mill is not running. As the pond above dam has practically no storage, the gage heights accurately indicate natural flow.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice. Rating curve well defined below but extended above 600 second-feet. Gage read to half-tenths four times daily—6 a. m., noon, 6 p. m., and midnight. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

COOPERATION.—Gage-height record furnished by Georgia Railway & Power Co.

Discharge measurements of Tiger Creek at Lakemont, Ga., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 8	Warren E. Hall	1.32	44.6
Nov. 4	....do	1.33	46.9
5	....do	1.30	43.0
July 9	Hall and Fritz	1.26	36.8
Aug. 2	Hall and Nelson	2.82	451.

Daily discharge, in second-feet, of Tiger Creek at Lakemont, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	46	42	57	66	132	114	154	91	66	42	52	127
2	52	42	50	61	98	105	135	91	65	42	256	157
3	55	42	46	61	87	275	117	91	63	42	69	87
4	46	42	43	63	75	276	157	109	60	42	65	71
5	42	42	48	77	73	278	291	100	57	42	57	68
6	42	42	48	71	66	192	174	96	57	42	57	55
7	42	42	42	65	63	168	154	98	57	42	69	57
8	42	42	57	61	65	168	165	91	89	42	69	55
9	42	42	69	58	63	130	154	87	77	42	58	52
10	42	42	50	55	63	112	146	85	71	42	55	51
11	42	42	50	55	61	114	127	81	61	42	55	51
12	42	52	55	51	58	109	124	77	60	42	55	50
13	42	52	48	71	58	102	130	73	57	42	55	48
14	42	54	48	105	58	112	127	71	75	42	51	48
15	42	47	48	165	65	114	117	71	58	41	50	50
16	42	42	48	137	63	114	114	71	55	39	48	50
17	42	42	48	102	57	165	114	69	55	38	48	47
18	122	42	50	83	68	127	109	63	52	73	48	47
19	102	42	50	75	195	117	102	61	48	91	52	47
20	73	42	48	71	336	105	102	60	48	75	55	43
21	71	42	57	71	130	198	102	61	63	143	50	42
22	57	42	63	87	100	130	102	73	51	91	48	47
23	50	69	61	71	162	272	102	69	48	61	43	43
24	42	55	55	73	171	800	102	63	48	55	42	42
25	42	48	55	66	122	213	102	63	48	55	42	42
26	42	47	55	63	100	198	105	63	46	51	42	40
27	42	42	91	63	91	291	102	63	43	48	42	96
28	42	52	154	63	83	168	93	66	43	48	42	85
29	46	71	91	81	.....	160	124	57	43	48	40	61
30	43	63	73	69	.....	157	117	55	42	48	77	52
31	42	.....	68	81	.....	154	.....	61	.....	65	352	.....

Monthly discharge of Tiger Creek at Lakemont, Ga., for the year ending Sept. 30, 1917.

[Drainage area, 29 square miles.a]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	122	42	50.4	1.74	2.01
November	71	42	46.9	1.62	1.81
December	154	42	58.9	2.03	2.34
January	165	51	75.5	2.60	3.00
February	336	57	98.7	3.40	3.54
March	800	102	185	6.38	7.36
April	291	93	129	4.45	4.96
May	109	55	75.2	2.59	2.99
June	89	42	56.9	1.96	2.19
July	143	38	53.5	1.84	2.12
August	352	40	69.2	2.39	2.76
September	157	40	60.4	2.08	2.32
The year	800	38	79.9	2.76	37.40

a Revised since publication in Water-Supply Paper 432.

ALTAMAHA RIVER BASIN.

OCMULGEE RIVER AT JULIETTE, GA.

LOCATION.—1 mile below Juliette railroad station, 1 mile below Juliette Cotton Mills, which are on left side of river opposite Juliette, 2½ miles below mouth of Towaliga River, and 20 miles upstream from Macon, Ga. Ocmulgee River forms line between Jones and Monroe counties.

DRAINAGE AREA.—2,100 square miles (measured on post route map of Georgia).

RECORDS AVAILABLE.—June 3, 1916, to September 30, 1917.

GAGE.—Stevens continuous water-stage recorder on left bank of river, referred to a staff gage inside concrete well.

DISCHARGE MEASUREMENTS.—Made from a cable about 150 feet upstream from gage.

CHANNEL AND CONTROL.—Bed composed of sand and solid rock at gage section. Banks high; subject to overflow at about gage height 15 feet. A rock shoal about one-half mile downstream forms a control which keeps stage-discharge relation permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year from water-stage recorder, 20.17 feet at 11 p. m. March 27 (discharge, 27,600 second-feet); minimum stage from water-stage recorder, 3.47 feet at 1.30 p. m. September 17 (discharge, 638 second-feet).

1916–1917: Maximum stage from water-stage recorder, 26.4 feet at 3 p. m. July 10, 1916 (discharge, 42,400 second-feet); minimum stage from water-stage recorder, 3.07 feet at 2 p. m. July 19, 1916 (discharge, 435 second-feet).

Maximum stage of which there is any record, 32.0 feet during flood of 1886 (discharge determined from extension of rating curve, about 55,800 second-feet). This stage was determined with wye level from marks pointed out by local residents and is not reliable.

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—There is considerable regulation from three separate sources. Greatest fluctuations are caused by operation of the hydroelectric plant about 30 miles upstream, near Jackson, Ga. Minor diurnal fluctuations are caused by operation of mills at Juliette, 1 mile upstream, and the hydroelectric plant on Towaliga River at High Falls, about 15 miles away.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice. Rating curve well defined below 45,000 second-feet. Operation of water-stage recorder good except for periods for which no records are given. Daily discharge October 1 to July 30 determined by use of discharge integrator; July 31 to September 30 by averaging discharge for intervals of the day. Records good.

Discharge measurements of Ocmulgee River at Juliette, Ga., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Nov. 27	Warren E. Hall and B. M. Hall	3.94	927
May 30	Warren E. Hall	4.36	1,310

Daily discharge, in second-feet, of Ocmulgee River at Juliette, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	935	1,230	1,510	1,200	4,160	3,200	4,330	1,930	1,680	1,280	1,150	1,560
2	1,160	1,230	1,320	1,890	5,410	4,040	4,380	1,900	1,520	1,300	1,450	1,320
3	1,610	1,260	990	1,900	4,530	7,560	3,830	1,920	968	1,480	1,300	1,220
4	1,680	1,290	1,020	1,940	3,280	18,400	4,180	2,070	1,180	1,160	1,280	1,280
5	1,750	.....	1,300	1,940	2,980	26,300	.....	2,900	1,550	1,190	844	1,230
6	1,660	.....	1,280	1,740	2,840	19,300	.....	3,910	1,610	1,510	1,150	1,240
7	1,530	.....	1,310	1,120	2,870	10,300	.....	3,900	1,610	1,450	1,560	1,290
8	974	.....	1,420	1,460	2,720	6,690	.....	3,290	1,660	979	1,910	1,200
9	1,210	.....	1,630	2,010	2,690	5,030	.....	2,710	1,580	1,170	6,570	918
10	1,540	.....	1,080	1,990	2,300	3,950	.....	2,050	2,320	1,550	7,370	1,060
11	1,560	.....	1,200	2,020	1,580	3,240	4,260	1,940	1,550	1,520	4,890	1,350
12	1,560	.....	1,790	2,070	2,020	3,720	3,690	1,720	1,800	1,470	2,700	1,320
13	1,510	.....	1,720	1,880	2,500	3,680	3,120	1,170	1,790	1,480	2,100	1,310
14	1,470	.....	1,680	1,360	2,390	3,160	2,130	1,520	1,820	1,380	1,860	1,340
15	970	.....	1,690	1,650	2,320	2,470	1,810	1,970	1,760	918	1,940	1,240
16	1,110	.....	1,540	2,550	2,220	2,440	3,430	1,820	1,540	1,120	1,800	881
17	1,540	.....	984	2,610	2,040	2,260	3,190	1,740	995	1,390	1,920	968
18	1,610	.....	1,220	2,250	2,060	1,750	2,900	1,690	1,330	1,370	1,740	1,220
19	2,310	.....	1,730	2,200	2,370	2,250	2,760	1,700	1,740	1,300	1,090	1,120
20	1,600	.....	1,760	2,000	10,300	2,770	2,710	.....	1,790	1,380	1,470	1,140
21	1,430	.....	1,770	1,330	14,600	3,260	2,500	.....	1,870	1,280	1,760	1,100
22	1,010	.....	1,740	1,860	12,500	7,550	1,990	.....	1,580	908	1,720	1,050
23	989	.....	1,370	2,440	8,500	7,490	2,600	.....	1,550	1,050	1,810	1,140
24	1,240	.....	946	8,030	6,690	8,690	2,720	.....	1,060	1,260	1,980	1,010
25	1,240	.....	800	7,800	6,150	12,400	2,510	.....	1,170	1,600	1,740	1,360
26	1,230	.....	1,020	4,280	6,330	14,100	2,400	.....	1,630	1,740	1,140	1,940
27	1,240	1,080	1,670	3,770	4,830	24,900	2,310	.....	2,290	1,360	1,040	1,360
28	1,110	1,190	1,880	2,910	3,630	25,400	1,840	.....	1,560	1,180	1,230	1,580
29	908	1,280	1,980	3,210	.....	17,600	1,230	1,810	1,910	818	1,240	3,460
30	953	1,540	1,740	4,360	.....	9,650	1,490	1,740	1,910	1,020	1,230	7,400
31	1,200	.....	1,080	4,020	.....	6,040	.....	1,690	.....	1,250	1,920	.....

NOTE.—No records Nov. 5–26, Apr. 5–10, and May 20–28; water-stage recorder not in operation.

Monthly discharge, in second-feet, of Ocmulgee at Juliette, Ga., for the year ending Sept. 30, 1917.

Month.	Maximum.	Minimum.	Mean.	Month.	Maximum.	Mnimum.	Mean.
October	2,310	908	1,350	June	2,320	968	1,610
December	1,980	800	1,420	July	1,740	818	1,290
January	8,030	1,120	2,640	August	7,370	844	2,030
February	14,600	1,580	4,530	September	7,400	881	1,520
March	26,300	1,750	8,700				

OCONEE RIVER NEAR GREENSBORO, GA.

LOCATION.—At highway bridge, 1½ miles downstream from Town Creek, 4 miles upstream from mouth of Apalachee River, and 5 miles west of Greensboro, Greene County, on road to Madison, Ga.

DRAINAGE AREA.—1,100 square miles.

RECORDS AVAILABLE.—July 25, 1903, to September 30, 1917.

GAGE.—Chain gage attached to bridge; read by F. M. Chambers.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Bed composed chiefly of sand; slightly shifting. Control section not known.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 19.3 feet at 4 p. m. March 7 (discharge, 15,200 second-feet); minimum stage, 0.7 foot at 4 p. m. September 16 (discharge, 252 second-feet).

1903–1917: Maximum stage recorded, 35.4 feet August 26, 1908 (discharge not determined). Discharge for this stage published in Water Supply Papers 382 and 402, and determinations of discharge for stages above 13 feet prior to 1913, as published in previous water supply papers, are too small, the error increasing with the stage. Minimum stage recorded, 0.35 foot September 18 and October 8, 1911 (discharge, 172 second-feet).

REGULATION.—Considerable diurnal fluctuation caused by operation of power plants.

ACCURACY.—A change in the stage-discharge relation shown by current-meter measurements made in 1918, occurred some time after November 5, 1915, the date of the last previous discharge measurement. Comparison with records for the station at Milledgeville indicates that the change was caused probably by the high water in March, 1917. The rating curve which had previously been used from May, 1914, to September 30, 1916, was therefore used to March 7, 1917; curve fairly well defined below 1,500 second-feet above which it was extended parallel to previous curve. Curve used March 8 to September 30, well defined between 225 and 6,000 second-feet; based on current meter measurements made in 1918. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records prior to March only fair owing to possible doubt as to applicability of rating curve used. Records good March to September.

No discharge measurements were made at this station during the year.

Daily discharge, in second-feet, of Oconee River near Greensboro, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	395	614	940	752	2,160	1,460	2,120	960	890	550	490	3,650
2	366	582	681	752	3,390	2,370	1,980	960	890	550	750	1,500
3	366	518	550	681	3,030	4,400	1,820	890	820	550	1,110	1,190
4	366	487	550	647	1,710	7,030	1,640	855	750	550	1,280	820
5	366	456	425	716	1,300	11,800	6,540	1,360	715	995	855	896
6	487	518	456	716	1,660	12,700	10,900	1,110	647	550	614	890
7	366	487	582	752	825	10,500	9,620	1,110	550	432	680	582
8	283	487	487	681	901	8,620	7,100	1,190	582	432	4,090	432
9	310	456	980	614	940	2,120	2,880	1,030	614	490	2,880	715
10	366	487	1,140	614	901	2,020	2,280	960	820	404	1,780	1,880
11	338	487	980	550	752	1,720	1,920	890	960	490	1,030	1,360
12	310	518	752	550	863	1,590	1,820	890	820	432	750	925
13	283	487	788	550	681	2,120	1,640	855	614	490	680	550
14	283	582	752	518	582	1,920	1,640	820	550	460	1,540	404
15	310	550	681	681	752	1,500	1,640	820	490	326	1,460	378
16	338	487	614	1,660	681	1,360	1,500	750	490	432	2,550	314
17	425	487	550	2,160	681	2,360	1,360	750	520	404	2,080	378
18	366	425	614	1,819	1,140	1,640	1,280	750	490	490	1,360	460
19	681	425	752	1,420	2,970	1,540	1,190	750	550	1,030	820	432
20	1,660	425	681	1,220	6,360	1,280	1,190	750	550	820	785	352
21	1,380	456	752	980	8,820	1,460	1,150	750	1,360	1,280	820	432
22	752	487	681	980	9,700	4,160	1,280	750	820	960	680	1,110
23	518	487	614	1,260	9,830	3,960	1,360	855	1,280	1,280	614	820
24	456	518	550	2,490	5,680	5,410	1,150	2,120	820	1,110	582	614
25	456	487	550	2,550	5,680	7,700	1,110	1,320	520	680	490	460
26	456	487	550	2,110	6,180	8,980	1,030	1,030	490	995	326	432
27	366	518	550	1,300	3,450	10,700	960	890	490	582	326	378
28	338	518	550	980	2,060	13,400	960	1,070	490	820	432	1,360
29	310	582	752	1,060	.....	10,900	960	1,030	550	550	352	4,480
30	425	647	1,180	1,380	.....	7,100	960	1,110	1,540	550	326	6,000
31	647	.....	825	1,220	.....	3,350	.....	820	.....	614	750	.....

Monthly discharge of Oconee River near Greensboro, Ga., for the year ending Sept. 30, 1917.

[Drainage area 1,100 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,660	283	476	0.433	0.50
November	647	425	505	.459	.51
December	1,180	425	694	.631	.73
January	2,550	518	1,110	1.01	1.16
February	9,830	582	2,970	2.70	2.81
March	13,400	1,280	5,040	4.58	5.28
April	10,900	960	2,430	2.21	2.47
May	2,120	750	974	.885	1.02
June	1,540	490	722	.656	.73
July	1,280	404	655	.595	.69
August	4,090	326	1,070	.973	1.12
September	6,000	314	1,140	1.04	1.16
The year	13,400	283	1,470	1.34	18.18

OCONEE RIVER AT FRALEYS FERRY, NEAR MILLEDGEVILLE, GA.

LOCATION.—At Fraleys Ferry, in Baldwin County, 4 miles downstream from mouth of Little River and 6 miles upstream from Milledgeville.

DRAINAGE AREA.—2,840 square miles.

RECORDS AVAILABLE.—May 23, 1906, to December 31, 1908; October 6, 1909, to September 30, 1917.

GAGE.—A combination sloping and vertical rod gage on left bank. Low-water section, inclined, is 75 feet upstream from ferry cable and extends to 8.5 feet; vertical section, 8.5 to 10.0 feet, at same site. High-water section, 10.0 to 20.0 feet, attached to tree 75 feet upstream from inclined section. Read by H. A. Taylor.

DISCHARGE MEASUREMENTS.—Made from ferryboat.

CHANNEL AND CONTROL.—Sandy and shifting at measuring section. Control formed by a rock ledge extending across river 200 feet downstream; fairly permanent.

EXTREMES OF DISCHARGE.—No record of maximum stage (water over top of gage); minimum stage recorded, 4.6 feet at 7 a. m. October 17 (discharge, 595 second-feet).

1906–1917: Maximum stage recorded May 23, 1906, to December 31, 1908, and October 6, 1909, to September 30, 1917, approximately 24.6 feet March 17, 1913 (discharge, determined from extension of rating curve, about 49,700 second-feet); minimum stage recorded, 4.1 feet at 6 a. m. September 14, 1914 (discharge, 410 second-feet).

REGULATION.—Operation of power plants at great distance upstream can cause only slight fluctuations.

ACCURACY.—Current meter measurements made in 1918 show that the stage-discharge relation as expressed by the rating curve used up to September 30, 1916, has changed slightly, the change being about 10 per cent at stage of 800 second-feet and decreasing with increase in stage. Rating curve used during the year very well defined below 2,000 second-feet by measurements made in 1918 and fairly well defined between 2,000 and 5,500 second-feet; extended above the latter point. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good for discharge up to 5,500 second-feet; above that point subject to error.

No discharge measurements made at this station during the year.

Daily discharge, in second-feet, of Oconee River at Fraleys Ferry, near Milledgeville, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,790	1,320	2,210	1,920	4,030	4,030	4,600	2,360	1,790	1,540	1,170	3,000
2	1,380	1,220	1,790	1,790	6,540	5,740	4,220	2,060	1,660	1,320	1,920	4,790
3	972	1,220	1,540	1,920	5,360	8,390	4,030	2,060	1,540	1,320	2,360	2,680
4	880	1,120	1,380	2,060	4,600	14,900	3,670	2,210	1,540	1,540	3,330	1,790
5	880	1,120	1,320	1,790	3,500	23,800	.....	3,160	1,430	1,540	2,520	1,920
6	880	1,020	1,320	1,920	2,520	18,700	.....	2,840	1,430	1,320	2,360	1,660
7	750	972	1,320	1,920	2,520	14,600	.....	3,500	1,540	1,430	1,790	1,380
8	835	925	1,430	1,790	2,520	8,390	.....	4,790	1,430	1,540	5,360	925
9	880	1,020	1,920	1,790	2,520	6,340	7,550	2,840	1,540	1,540	5,170	.....
10	1,020	1,020	2,520	1,660	2,520	4,410	5,360	2,360	2,360	1,270	5,360	.....
11	1,540	1,020	2,360	1,430	2,360	3,850	4,600	2,060	2,360	1,120	3,000	.....
12	1,220	1,020	2,360	1,320	2,210	3,670	4,220	2,060	2,060	1,020	2,060	.....
13	835	1,020	2,840	1,540	2,060	3,500	4,030	2,060	1,790	925	1,660	.....
14	835	1,120	2,210	1,540	1,920	4,220	3,850	2,060	1,540	835	1,660	.....
15	835	1,790	1,920	1,790	1,790	3,670	3,670	1,920	1,430	1,020	2,520	.....
16	792	1,540	1,920	2,360	2,360	3,330	3,500	1,790	1,320	1,020	3,160	670
17	632	1,070	1,790	4,980	3,000	3,330	3,000	1,790	1,170	925	4,030	670
18	835	1,120	1,540	4,600	3,330	3,500	2,840	1,790	1,120	1,270	3,000	670
19	925	1,020	1,540	3,670	4,790	3,330	3,000	1,660	1,120	2,060	1,790	750
20	1,920	1,020	1,660	2,680	10,800	3,000	2,840	1,540	1,220	2,520	2,060	750
21	3,000	1,120	1,790	2,520	13,200	3,330	2,680	1,540	1,920	2,360	1,790	670
22	2,060	1,120	1,920	2,680	12,200	5,170	2,840	1,430	2,360	2,060	1,270	670
23	1,430	1,120	1,790	3,850	10,600	6,340	2,680	1,430	2,840	1,920	1,170	1,020
24	1,270	1,220	1,660	10,300	10,100	7,140	2,680	1,790	3,000	2,360	1,120	1,540
25	1,120	1,170	1,540	14,900	7,760	10,600	2,520	2,520	1,540	2,060	925	1,320
26	1,120	1,120	1,660	7,970	7,550	11,200	2,520	1,660	1,430	2,520	880	1,320
27	1,120	1,020	1,540	4,410	7,140	22,700	2,360	1,540	1,790	2,360	792	1,270
28	1,120	1,120	1,540	3,500	6,340	21,000	2,360	2,360	1,540	1,790	792	5,170
29	972	1,170	1,790	3,000	.....	18,200	2,210	3,160	1,920	1,540	835	.....
30	925	1,380	2,060	5,170	.....	12,900	2,680	2,360	1,920	1,220	750	.....
31	1,070	.....	2,360	4,410	.....	7,340	.....	2,060	.....	1,270	750	.....

NOTE.—Water overtopped the gage Apr. 5–8 and Sept. 29 and 30; discharge above 9,700 second-feet. No gage-height record Sept. 9–15.

Monthly discharge of Oconee River at Fraleys Ferry, near Milledgeville, Ga., for the year ending Sept. 30, 1917.

[Drainage area 2,840 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	3,000	632	1,160	0.408	0.47
November	1,790	925	1,140	.401	.45
December	2,840	1,320	1,820	.641	.74
January	14,900	1,320	3,460	1.22	1.41
February	13,200	1,790	5,220	1.84	1.92
March	23,800	3,000	8,730	3.07	3.54
May	4,790	1,430	2,220	.782	.90
June	3,000	1,120	1,720	.606	.68
July	2,520	835	1,570	.553	.64
August	5,360	750	2,170	.764	.88

APALACHICOLA RIVER BASIN.

CHATTAHOOCHEE RIVER NEAR GAINESVILLE, GA.

LOCATION.—At Clarke's covered wooden highway bridge, 500 feet downstream from Gainesville & Northwestern Railway bridge, 4 miles northeast of Gainesville, Hall County, 6 miles upstream from Dunlap dam of Georgia Railway & Power Co., and about 12 miles above mouth of Chestatee River.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—January 1 to September 30, 1917. From June 26, 1901, to December 31, 1903, a station was operated at Thompson's bridge about 5 miles downstream.

GAGE.—Vertical staff attached to the upstream side of the wooden bridge; read by A. E. Maynard.

DISCHARGE MEASUREMENTS.—Made from boat a short distance below gage.

CHANNEL AND CONTROL.—Bed fairly permanent. Banks subject to overflow at a stage of about 12 feet. Backwater from Dunlap dam, 6 miles downstream, probably affects stage-discharge relation.

EXTREMES OF STAGE.—Maximum mean daily stage recorded, 12.93 feet March 24; minimum mean daily stage recorded, 0.45 foot September 28.

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—Owing to probable backwater effect from Dunlap dam, gage-height record should be used with caution.

COOPERATION.—Gage-height record furnished by the Georgia Railway & Power Co.

Data inadequate for determination of discharge.

No discharge measurements were made at this station during the year.

Daily gage height, in feet, of Chattahoochee River near Gainesville, Ga., for the year ending Sept. 30, 1917.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.09	6.05	4.10	3.50	2.73	2.48	1.50	0.85	4.45
2	1.02	3.70	3.10	3.40	2.14	3.47	1.55	1.65	3.50
3	1.04	2.60	4.35	3.30	2.09	2.03	1.45	1.69	3.80
4	1.56	2.40	10.66	3.00	2.94	1.86	1.58	1.50	4.78
5	1.24	2.25	8.00	9.30	3.15	1.77	1.75	1.35	2.58
6	2.11	2.00	4.65	5.45	2.32	1.28	1.68	.95	1.30
7	1.67	2.04	3.85	3.60	2.10	1.15	2.05	1.65	1.28
8	1.20	1.90	3.85	3.75	2.19	1.84	1.70	2.89	1.40
9	.94	1.84	3.45	3.65	2.05	3.05	1.25	2.95	2.40
10	.93	1.62	3.20	3.30	2.05	4.15	1.25	2.83	1.25
11	.89	1.87	3.12	3.20	1.97	2.65	1.05	2.20	.90
12	.73	1.47	2.95	3.10	2.03	1.94	.90	1.43	1.25
13	.67	1.45	2.85	3.30	1.99	1.25	.93	.85	.69
14	3.15	1.51	2.80	3.10	1.97	2.15	1.20	.85	.93
15	2.54	1.83	2.70	3.00	1.82	2.35	1.71	3.03	.80
16	5.95	1.78	2.60	2.80	1.80	1.95	1.60	2.90	.85
17	3.55	1.71	2.75	2.80	1.76	1.75	1.25	2.60	.75
18	2.62	2.13	2.85	2.70	1.73	2.10	1.80	1.90	.80
19	2.25	5.00	2.85	2.65	1.32	1.95	3.75	.85	.73
20	2.00	7.90	2.65	2.29	3.20	2.50	2.60	2.20	.80
21	1.80	5.05	4.25	2.59	1.36	1.45	3.25	2.25	.80
22	2.35	3.30	3.85	2.60	1.33	2.35	3.90	1.36	1.13
23	2.13	3.05	5.65	2.45	2.34	2.35	2.80	.90	1.22
24	2.02	11.55	12.93	2.45	1.80	2.15	2.65	1.48	.55
25	2.03	4.65	7.15	2.20	1.78	1.73	2.35	1.03	.72
26	1.72	3.60	4.85	2.55	1.95	1.65	2.35	.88	.80
27	1.44	3.26	9.05	2.38	1.75	2.50	2.15	.75	.95
28	1.33	3.00	5.30	2.30	2.39	2.55	2.10	.65	.45
29	1.39	.....	4.25	2.30	1.55	2.65	1.22	.82	3.15
30	2.12	.....	3.80	2.35	1.13	1.50	1.20	.85	3.02
31	1.71	.....	4.90	.....	1.40	.....	1.10	2.73	.....

CHATTAHOOCHEE RIVER NEAR NORCROSS, GA.

LOCATION.—At Medlock's bridge, 1½ miles upstream from mouth of John Creek, 4½ miles north of Norcross, Gwinnett County, and about 5 miles above Suwanee Creek. The river forms the boundary between Gwinnett and Milton counties.

DRAINAGE AREA.—1,170 square miles.

RECORDS AVAILABLE.—January 9, 1903, to September 30, 1917.

GAGE.—Chain gage on toll bridge, read by W. O. Medlock. January 1 to September 30, 1916, a Dexter water-stage recorder on right bank just above bridge, and referred to chain gage, was also used for recording stages below 7 feet.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Bed sandy; shifts. Low-water control is a rock shoal about 2½ miles downstream; at higher stages shifting clay banks and other conditions may cause changes in the stage-discharge relation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 16.9 feet at 4 p. m., March 25 (discharge, 24,200 second-feet); minimum stage, 1.5 feet at 6.30 a. m., August 27 (discharge, 730 second-feet).

1903–1917: Maximum stage recorded, 21.4 feet at 2.30 p. m., December 30, 1915 (discharge, 36,200 second-feet); minimum stage recorded, 1.02 feet, October 21, 1911 (discharge, 294 second-feet).

ICE.—Never enough to affect stage-discharge relation.

REGULATION.—Diurnal fluctuation is caused by operation of hydroelectric plants on Chattahoochee and Chestatee rivers near Gainesville, Ga. Discharge January 1 to September 30, 1916, determined from records of water-stage recorder, agree very closely with that obtained by using mean daily gage heights from two readings of chain gage per day. Errors in mean monthly discharge obtained by using records from chain gage varied from −1.6 per cent for February and May to +1.4 per cent for June. This study indicates that for medium and high stages estimates of discharge for former years as computed from records of the chain gage are probably not seriously in error owing to diurnal fluctuation in stage. The effect on the accuracy of records for low stage has not been determined.

ACCURACY.—Stage-discharge relation changed during high water in March. Rating curve used October 1 to March 25 well defined between 1,000 and 36,000 second-feet; curve used March 26 to September 30 well defined between 700 and 10,000 second-feet, and fairly well defined between 10,000 and 40,000 second-feet. Gage read to hundredths twice a day. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair, January, February, and March; good for rest of year.

Discharge measurements of Chattahoochee River near Norcross, Ga., during the year ending Sept. 30, 1917.

[Made by Warren E. Hall.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Oct. 12	2.27	1,300
Dec. 5	2.53	1,520
July 14	2.20	1,270

Daily discharge, in second-feet, of Chattahoochee River near Norcross, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,250	1,680	1,840	2,000	5,510	3,580	4,090	2,640	2,280	1,560	1,470	3,240
2	1,250	1,390	1,460	2,000	7,040	3,480	4,090	2,460	2,940	1,390	1,390	4,550
3	1,180	1,320	1,530	1,840	3,120	6,340	3,870	2,460	2,460	1,390	1,560	3,540
4	1,180	1,320	1,460	2,000	2,640	12,400	3,760	2,550	2,280	1,390	1,740	2,460
5	1,250	1,390	1,390	2,080	2,400	16,000	10,900	3,340	2,100	1,230	1,650	2,100
6	1,250	1,110	2,160	2,160	2,480	8,350	11,100	2,640	1,920	1,390	1,740	1,740
7	1,180	1,110	1,680	2,240	2,160	4,760	5,750	2,550	1,920	1,470	2,010	1,560
8	1,110	1,250	1,530	2,000	2,080	4,190	5,150	2,460	1,920	1,560	4,550	1,740
9	1,250	1,180	3,300	1,920	2,080	3,880	5,030	2,460	2,550	1,390	5,510	1,650
10	1,250	1,180	2,720	1,760	2,000	3,390	4,310	2,370	3,140	1,310	2,740	1,560
11	1,250	1,180	2,000	1,760	2,000	3,040	3,760	2,280	2,840	1,230	2,100	1,560
12	1,180	1,250	1,840	1,680	1,840	3,120	3,760	2,280	2,190	1,230	1,740	1,310
13	1,180	1,250	1,760	1,680	1,840	3,040	3,760	2,280	2,100	1,740	1,740	1,150
14	1,180	1,460	1,680	2,320	1,840	2,960	4,200	2,190	1,830	1,150	1,560	1,150
15	1,180	1,250	1,390	3,390	2,080	2,880	3,440	2,190	2,010	1,230	1,740	1,230
16	1,040	1,250	1,320	6,900	2,320	2,720	3,340	2,100	1,920	1,080	2,280	1,230
17	1,180	1,180	1,250	5,250	2,080	2,800	3,240	2,100	1,740	1,390	2,190	1,080
18	1,110	1,180	1,680	3,300	2,160	3,680	3,140	2,100	1,740	1,740	1,740	1,080
19	2,480	1,180	1,600	2,880	5,000	3,040	3,040	2,190	1,740	3,870	1,560	1,080
20	2,800	1,110	1,680	2,560	16,200	2,800	3,040	1,920	2,740	3,340	1,470	1,080
21	1,600	1,180	1,760	2,320	11,400	3,680	2,940	1,920	2,190	2,840	1,560	1,080
22	1,390	1,110	1,680	2,960	4,520	6,200	2,940	1,920	1,920	3,650	1,560	1,150
23	1,250	1,250	1,840	2,880	3,390	7,460	2,940	2,370	1,830	3,040	1,470	1,230
24	1,250	1,600	1,760	2,960	12,800	12,100	2,840	2,280	1,650	2,190	1,390	1,080
25	1,320	1,680	1,680	2,640	12,800	21,500	2,740	2,010	1,650	1,920	1,310	1,230
26	1,250	1,390	1,680	2,400	4,300	10,300	2,840	2,280	1,560	2,550	1,310	1,080
27	1,250	1,250	1,600	2,160	3,390	11,400	2,840	2,460	1,560	1,920	1,010	1,080
28	1,250	1,250	2,240	2,080	3,040	11,100	2,640	2,840	1,830	1,650	1,230	6,250
29	1,250	1,600	4,190	2,160	.....	6,120	2,640	2,280	1,740	1,560	1,040	4,200
30	1,390	1,840	2,880	2,240	.....	5,030	2,640	2,100	1,740	1,390	1,080	2,280
31	1,760	.....	2,240	2,240	.....	4,550	.....	1,920	.....	1,390	1,390	.....

Monthly discharge of Chattahoochee River near Norcross, Ga., for the year ending Sept. 30, 1917.

[Drainage area, 1,170 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,800	1,040	1,340	1.15	1.33
November	1,840	1,110	1,310	1.12	1.25
December	4,190	1,250	1,900	1.62	1.87
January	6,900	1,680	2,540	2.17	2.50
February	16,200	1,840	4,450	3.80	3.96
March	21,500	2,720	6,320	5.40	6.23
April	11,100	2,640	4,030	3.44	3.84
May	3,340	1,920	2,320	1.98	2.28
June	3,140	1,560	2,070	1.77	1.98
July	3,870	1,080	1,810	1.55	1.79
August	5,510	1,010	1,830	1.56	1.80
September	6,250	1,080	1,890	1.62	1.81
The year	21,500	1,010	2,640	2.26	30.64

CHATTAHOOCHEE RIVER AT WEST POINT, GA.

LOCATION.—At West Point waterworks pumping plant, just below Oseligee Creek, one-fourth mile east of Alabama-Georgia State line, in Troup County, and 1 mile upstream from West Point railroad station. Prior to October 20, 1912, station was at Montgomery Street Bridge in West Point.

DRAINAGE AREA.—3,300 square miles.

RECORDS AVAILABLE.—July 30, 1896, to September 30, 1917.

GAGE.—Staff gage on left bank. By using a telescope the observer reads gage from pump house on right bank. October 20, 1912, to 1915, the gage was a vertical staff in two sections, a low-water section (0 to 6 feet) on right side of river and a high-water section on left side at same site as present gage and directly across river from low-water section. Datum of gage 0.2 foot above that of present gage. Prior to October 20, 1912, a chain gage at the Montgomery Street Bridge in West Point was used. Gage read by J. H. Miller.

DISCHARGE MEASUREMENTS.—Made from Montgomery Street Bridge 1 mile downstream. No tributaries enter between gage and bridge.

CHANNEL AND CONTROL.—Bed rough and rocky; fairly permanent. Banks subject to overflow at high stages. Control is a rock ledge extending across river just below gage, and is probably not affected by Langdale Dam 5 miles downstream. The old chain gage was abandoned in 1912 because of backwater from this dam.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 19.6 feet at 7 a. m. March 28 (discharge, 43,000 second-feet); minimum mean daily stage recorded, 2.4 feet July 15 (discharge, 1,470 second-feet).

1896–1917: Maximum stage recorded (old gage), 25.0 feet December 30, 1901 (discharge, 88,600 second-feet); minimum stage recorded (old gage), 0.8 foot September 18–21, 1896 (discharge, 780 second-feet).

REGULATION.—Operation of power plants a great distance upstream causes some diurnal fluctuation, but a mean of three daily readings is probably very accurate.

ACCURACY.—Stage-discharge relation changed slightly during high water in March. Rating curve used October 1 to March 28 well defined between 2,500 and 30,000 second-feet; extended above. Curve used March 29 to September 30 well defined between 1,700 and 30,000 second-feet. Gage read to tenths three times daily; during high water read oftener. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

COOPERATION.—Gage-height record furnished by Columbus Power Co. of Columbus, Ga.

The following discharge measurement was made by Warren E. Hall:

November 24, 1916: Gage height, 3.51 feet; discharge, 3,200 second-feet.

Daily discharge, in second-feet, of Chattahoochee River at West Point, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,160	2,990	5,080	6,280	7,500	7,750	11,000	5,500	5,500	8,000	3,220	5,010
2	2,830	3,160	4,840	5,800	12,200	10,200	10,500	5,500	6,000	7,000	2,850	4,060
3	2,260	2,990	3,940	5,560	14,800	18,800	10,000	5,250	5,750	5,750	2,850	6,000
4	2,400	2,830	3,340	5,080	11,000	35,200	10,000	6,000	5,010	5,250	2,200	9,000
5	2,260	2,540	3,160	4,840	15,800	38,800	33,000	6,500	4,060	4,770	3,420	5,750
6	2,260	2,260	3,160	6,280	6,280	33,200	35,200	8,250	3,840	4,060	5,500	4,290
7	2,260	2,540	3,160	6,040	5,560	20,000	27,500	7,250	3,630	5,250	16,500	3,220
8	2,400	2,540	3,940	5,320	5,560	18,800	22,800	6,000	3,630	5,750	10,500	3,030
9	2,260	2,260	9,000	4,600	5,560	11,500	15,200	5,500	3,220	5,250	13,500	2,850
10	2,260	2,260	10,500	4,370	5,320	9,750	13,000	5,250	5,010	3,630	15,000	4,290
11	1,880	2,540	7,500	4,150	4,840	9,000	11,000	5,010	5,500	3,220	10,800	3,420
12	2,130	2,680	6,040	3,730	4,370	7,750	10,000	4,770	4,060	2,200	6,000	2,680
13	2,130	3,730	5,080	3,530	4,370	8,000	9,500	4,770	4,290	3,220	4,290	2,510
14	2,000	3,160	4,150	5,560	4,150	7,500	9,750	4,290	5,750	2,200	3,420	2,200
15	2,130	2,990	3,730	6,520	4,370	7,250	9,250	4,770	4,060	1,470	3,420	1,660
16	1,670	2,830	3,730	11,500	4,600	6,760	8,750	4,530	3,220	3,220	3,840	2,200
17	1,880	2,680	3,730	18,200	4,600	6,760	8,250	4,290	3,030	2,510	6,000	1,930
18	2,000	2,680	3,160	16,800	6,040	6,760	7,750	4,060	3,630	2,510	5,250	1,680
19	7,000	2,540	3,160	12,000	9,000	7,000	7,500	5,010	3,420	2,510	4,290	1,570
20	5,320	2,400	4,150	9,250	18,500	7,250	7,250	4,060	3,030	2,850	3,840	1,800
21	4,840	2,400	3,730	7,750	26,000	7,500	8,000	4,290	3,630	2,850	4,770	1,800
22	4,600	2,400	3,940	8,250	36,000	17,000	7,250	3,420	3,630	2,850	3,030	1,680
23	3,160	2,680	3,730	11,500	24,800	16,000	6,500	5,010	3,840	3,220	3,220	2,350
24	2,830	3,160	3,730	12,800	16,500	20,000	6,500	4,290	3,840	2,510	2,680	5,500
25	2,540	3,160	3,730	13,800	18,500	27,500	6,250	4,290	3,420	3,220	2,680	21,200
26	2,400	3,340	3,730	10,800	20,800	27,200	6,250	4,060	2,680	2,850	2,350	7,250
27	2,400	3,340	3,340	7,000	18,200	40,200	6,000	4,060	4,060	3,220	2,200	4,290
28	2,400	2,830	5,080	7,000	9,250	42,800	6,000	5,750	4,770	2,850	2,200	25,800
29	2,540	4,600	9,500	6,520	.....	33,800	6,000	5,500	3,630	3,220	2,060	32,500
30	2,540	6,280	9,000	8,500	.....	22,500	5,500	5,250	5,500	2,850	2,060	24,000
31	3,730	.....	9,000	7,500	.....	12,800	.....	4,290	.....	3,220	3,030	.....

Monthly discharge of Chattahoochee River at West Point, Ga., for the year ending Sept. 30, 1917.

[Drainage area, 3,300 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	7,000	1,670	2,790	0.845	0.97
November	6,280	2,260	2,960	.897	1.00
December	10,500	3,160	4,940	1.50	1.73
January	18,200	3,530	7,960	2.41	2.78
February	36,000	4,150	11,600	3.52	3.66
March	42,800	6,760	17,600	5.33	6.14
April	35,200	5,500	11,400	3.45	3.85
May	8,250	3,420	5,060	1.53	1.76
June	6,000	2,680	4,150	1.26	1.41
July	8,000	1,470	3,660	1.11	1.28
August	16,500	2,060	5,060	1.53	1.76
September	32,500	1,570	6,520	1.98	2.21
The year	42,800	1,470	6,940	2.10	28.55

CHESTATEE RIVER AT NEW BRIDGE, GA.

LOCATION.—Just below dam of Georgia Railway & Power Co. at New Bridge, Lumpkin County, 2 miles above mouth of Yellow Creek, 10 miles by direct route above confluence with Chattahoochee River and 14 miles northwest of Gainesville.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—January 1 to September 30, 1917.

GAGE.—Vertical staff in tail race of the Georgia Railway & Power Co.'s power plant; read to tenths twice daily by J. M. Hulsey.

DISCHARGE MEASUREMENTS.—Made from boat at a section 800 feet below gage.

CHANNEL AND CONTROL.—Bed of river rough and rocky.

EXTREMES OF STAGE.—Maximum mean daily stage recorded during year, 5.2 feet March 4; minimum mean daily stage recorded, 1.2 feet September 21.

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—Owing to large diurnal fluctuations caused by operation of the power plant of the Georgia Railway & Power Co., gage heights should be used with caution. Also owing to the fact that the gage is located in the tail race, the stage-discharge relationship is not permanent when water is flowing over dam,

COOPERATION.—Gage-height record furnished by Georgia Railway & Power Co.

Data inadequate for determination of discharge.

No discharge measurements were made at this station during the year.

Daily gage height, in feet, of Chestatee River at New Bridge, Ga., for the period Jan. 1 to Sept. 30, 1917.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.15	3.30	2.75	2.60	2.10	1.95	1.70	2.20	2.80
2	2.10	2.65	2.75	2.55	2.10	2.00	2.00	2.20	1.50
3	2.20	2.30	3.25	2.50	2.20	2.00	1.70	2.10	1.60
4	2.25	2.25	5.20	2.50	2.50	2.00	1.70	2.10	1.55
5	2.30	2.15	3.25	3.30	2.35	1.95	1.70	2.20	1.40
6	2.45	2.20	3.55	2.85	2.10	2.05	1.70	2.20	1.40
7	2.25	2.20	2.70	2.65	2.20	2.05	1.70	2.20	1.40
8	2.10	2.20	2.80	2.75	2.15	2.40	2.00	2.60	1.60
9	2.20	2.20	2.60	2.65	2.05	2.35	2.00	2.45	1.55
10	2.20	2.10	2.60	2.55	2.00	2.35	1.90	2.20	1.40
11	1.90	2.00	2.50	2.50	2.00	2.05	1.65	2.20	1.60
12	1.85	2.15	2.50	2.50	2.00	2.00	1.65	2.20	1.50
13	1.80	2.20	2.45	2.55	2.00	2.00	1.60	1.90	1.55
14	3.00	2.20	2.40	2.50	2.00	2.15	1.85	1.90	1.45
15	2.35	2.45	2.30	2.40	1.90	2.15	1.95	2.50	1.40
16	3.15	2.30	2.85	2.40	1.90	2.15	1.60	2.15	1.45
17	2.75	2.15	2.55	2.30	2.00	2.15	2.20	2.10	1.40
18	2.50	2.15	2.45	2.30	2.00	2.15	3.25	1.75	1.45
19	2.45	2.95	2.40	2.30	2.00	2.20	2.30	1.65	1.40
20	2.30	3.30	2.40	2.30	1.05	2.25	2.25	1.70	1.45
21	2.30	2.95	2.85	2.30	1.50	2.10	2.30	1.65	1.20
22	2.65	2.75	2.65	2.25	1.95	2.15	2.80	1.65	1.40
23	2.50	3.00	3.15	2.20	2.05	2.10	2.25	1.60	1.40
24	2.40	3.10	3.95	2.20	1.90	2.15	2.15	1.65	1.40
25	2.30	2.70	3.25	2.20	1.90	2.15	2.20	1.65	1.40
26	2.20	2.80	3.20	2.20	1.90	1.90	2.20	1.55	1.45
27	2.15	2.75	3.30	2.20	1.85	2.25	1.90	1.50	1.40
28	2.10	2.60	3.20	2.20	2.00	2.25	1.85	1.50	2.85
29	2.15	.....	3.35	2.20	1.75	2.25	1.85	1.50	2.00
30	2.10	.....	2.70	2.20	1.85	1.60	1.85	1.45	1.85
31	2.05	.....	2.60	.....	2.30	.....	1.85	1.55	.....

FLINT RIVER NEAR WOODBURY, GA.

LOCATION.—At Macon & Birmingham Railroad bridge one-fourth mile downstream from mouth of Elkins Creek, one-third mile upstream from mouth of Cane Creek, and 3 miles east of Woodbury, Pike County.

DRAINAGE AREA.—1,090 square miles.

RECORDS AVAILABLE.—March 29, 1900, to September 30, 1917.

GAGE.—Vertical staff in four sections on left bank about 300 feet above railroad bridge; read by E. T. Riggins. Datum of gage, 660 feet above mean sea level.

DISCHARGE MEASUREMENTS.—Made from downstream side of railroad bridge, which does not make a right angle with the current.

CHANNEL AND CONTROL.—Bottom consists chiefly of rock; rough; current irregular. Control formed by a shoal 1 mile downstream; shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.1 feet at 7 a. m. March 5 (discharge, 18,100 second-feet); minimum stage, 0.2 foot several days in October, 1916, and September, 1917 (discharge, 325 second-feet).

1900–1917: Maximum stage recorded, 16.2 feet March 15, 1913 (discharge, 35,300 second-feet); minimum stage, 0.4 foot October 8–10, 1911 (discharge, 86 second-feet).

REGULATION.—Some slight diurnal fluctuations may be caused by operation of small mills on tributary streams.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve used beginning October 1, 1916, based on current-meter measurements made in 1918; well defined between 200 and 4,000 second-feet; fairly well defined between 4,000 and 24,000 second-feet. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

No discharge measurements were made at this station during the year.

Daily discharge, in second-feet, of Flint River near Woodbury, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	325	540	1,600	1,400	3,450	1,820	2,300	860	690	1,820	480	540
2	325	540	1,400	1,400	3,150	3,150	2,050	860	610	860	540	1,130
3	325	540	1,220	1,310	2,710	6,040	2,050	860	540	540	480	690
4	325	540	1,130	1,310	2,300	14,700	2,430	860	540	540	540	690
5	325	480	950	1,400	1,820	17,800	10,100	950	540	540	480	540
6	325	480	860	1,600	1,400	15,000	14,700	1,040	540	540	690	540
7	325	480	610	1,400	1,220	10,900	13,500	1,040	540	540	2,570	690
8	370	480	540	1,220	1,220	5,170	8,520	1,220	480	540	4,050	690
9	370	480	2,710	1,220	1,400	3,150	4,840	1,130	480	540	4,360	540
10	480	480	2,850	1,130	1,400	2,170	2,850	1,040	1,040	540	3,600	1,040
11	420	480	2,170	1,130	1,220	1,930	2,300	1,040	860	540	2,570	860
12	370	540	1,710	1,040	1,220	1,820	2,050	860	770	420	1,400	690
13	370	690	1,400	860	1,220	1,600	1,820	860	690	420	1,130	480
14	370	690	1,040	1,040	1,130	1,500	1,710	860	950	420	1,220	420
15	325	690	860	1,220	1,040	1,500	1,600	860	770	420	1,040	370
16	325	610	950	1,710	1,040	1,500	1,500	690	690	420	1,400	370
17	325	540	860	3,750	1,040	1,500	1,400	690	540	420	2,050	370
18	420	540	860	3,450	1,820	1,400	1,310	690	420	2,050	1,930	370
19	2,850	540	950	3,150	2,300	1,400	1,220	690	480	3,450	1,820	325
20	2,300	540	1,040	2,300	2,850	1,400	1,220	690	690	3,150	1,710	325
21	1,220	540	1,040	2,050	5,000	1,600	1,220	610	770	2,300	1,130	325
22	860	540	1,130	2,050	6,040	3,150	1,220	610	860	2,050	690	325
23	690	540	1,040	2,430	5,510	4,840	1,130	610	1,400	2,050	610	540
24	540	690	1,040	5,340	4,200	6,040	1,040	610	860	1,600	540	690
25	480	690	950	6,960	3,150	6,040	1,040	610	690	1,600	480	1,710
26	480	690	950	5,000	2,570	6,220	1,040	690	610	1,040	480	2,300
27	480	610	860	3,600	1,930	12,600	1,040	690	540	690	420	1,600
28	480	690	1,040	2,570	1,710	15,200	950	860	1,040	770	420	1,820
29	480	1,600	1,710	2,050	.....	13,300	950	1,040	1,130	1,040	370	4,360
30	480	2,050	1,820	1,930	.....	8,740	860	770	1,820	690	370	7,530
31	540	.....	1,600	2,050	.....	4,050	.....	690	.....	540	420	.....

Monthly discharge of Flint River near Woodbury, Ga., for the year ending Sept. 30, 1917.

[Drainage area, 1,090 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,850	325	590	0.541	0.62
November	2,050	480	651	.597	.67
December	2,850	540	1,260	1.16	1.34
January	6,960	860	2,230	2.05	2.36
February	6,040	1,040	2,320	2.13	2.22
March	17,800	1,400	5,720	5.25	6.05
April	14,700	860	3,000	2.75	3.07
May	1,220	610	825	.757	.87
June	1,820	420	753	.691	.77
July	3,450	420	1,070	.982	1.13
August	4,360	370	1,290	1.18	1.36
September	7,530	325	1,100	1.01	1.13
The year	17,800	325	1,730	1.59	21.59

FLINT RIVER NEAR CULLODEN, GA.

LOCATION.—At Grays Ferry, in Upson County, 1½ miles upstream from mouth of Auchumpkee Creek and 14 miles southwest of Culloden.

DRAINAGE AREA.—2,000 square miles.

RECORDS AVAILABLE.—July 1, 1911, to September 30, 1917.

GAGE.—A vertical staff in four sections on left bank at old ferry landing; read by Lonie Williams.

DISCHARGE MEASUREMENTS.—Made from rowboat held in place by a small galvanized cable stretched across river.

CHANNEL AND CONTROL.—Bed sandy and shifting at gage. Control is a rock ledge half a mile downstream; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 20.7 feet at 7 a. m., March 5 (discharge, about 36,800 second-feet); minimum stage, 1.7 feet at 5 p. m. September 22 (discharge, 470 second-feet).

1911–1917: Maximum stage recorded, 33.3 feet during night of July 9, 1916 (discharge not determined); minimum stage, 1.0 foot, October 8, 1911 (discharge, 165 second-feet).

ACCURACY.—Discharge measurements made in spring of 1918 indicate that there has been a change in stage-discharge relation represented by the rating curve based on measurements made up to 1914. Change is probably caused by the high water in July, 1916. Rating curve used beginning October 1, 1916, well defined below 4,000 second-feet. Above 4,000 second-feet rating curve is an extension. Gage read twice daily to tenths. Daily discharge ascertained by applying mean daily gage height to rating table. Records for low water good; those for discharge above 4,000 second-feet subject to error.

No discharge measurements were made at this station during the year.

Daily discharge, in second-feet, of Flint River near Culloden, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	562	810	2,320	2,320	4,140	3,030	3,840	1,380	1,080	2,770	885	2,540
2	530	810	2,100	2,100	4,620	5,460	3,290	1,290	1,080	1,880	848	1,380
3	530	735	1,670	1,880	3,550	8,460	3,290	1,290	1,040	1,290	1,040	1,240
4	530	735	1,380	1,770	3,290	26,100	2,770	1,380	960	1,040	998	1,160
5	530	700	1,340	1,670	2,650	35,300	16,400	1,470	960	960	922	998
6	530	595	1,200	1,670	2,320	26,100	23,900	1,570	885	1,040	885	848
7	530	595	1,080	2,100	2,100	16,800	20,100	1,880	810	1,160	3,030	1,040
8	530	595	1,160	2,100	1,880	9,800	14,200	2,100	810	1,040	4,780	998
9	530	595	3,840	1,880	1,990	5,460	8,840	1,880	772	885	5,110	960
10	562	595	3,550	1,670	1,990	3,840	5,460	1,570	1,880	885	4,460	1,040
11	630	595	3,160	1,420	1,880	3,290	3,840	1,380	1,880	922	3,420	1,340
12	630	772	2,540	1,380	1,770	3,030	3,290	1,380	1,420	960	2,100	998
13	530	1,080	2,320	1,340	1,670	2,540	3,030	1,290	1,200	772	1,470	772
14	530	1,080	1,770	1,290	1,470	2,540	2,770	1,290	1,160	700	1,470	665
15	530	1,040	1,470	1,470	1,420	2,430	2,540	1,240	1,240	772	1,470	595
16	530	922	1,380	1,880	1,670	2,320	2,320	1,160	960	595	1,420	595
17	530	848	1,380	2,210	1,670	2,320	2,210	1,120	810	595	2,210	595
18	665	810	1,290	3,990	3,160	2,320	2,100	1,120	810	1,670	2,320	595
19	1,990	810	1,380	4,460	5,460	2,210	1,990	1,120	810	5,280	2,100	562
20	3,550	772	1,380	3,840	6,940	2,100	1,990	1,040	848	4,140	5,640	530
21	1,880	735	1,380	3,290	8,080	2,100	1,880	1,040	1,080	3,290	3,290	530
22	1,290	735	1,470	2,540	8,080	3,840	1,880	1,040	1,160	2,210	1,340	500
23	1,040	848	1,570	3,840	7,700	6,000	1,880	1,670	1,770	2,320	1,120	595
24	922	922	1,380	9,220	7,700	8,460	1,670	1,290	1,420	2,430	960	885
25	1,080	1,040	1,380	17,700	4,780	8,460	1,670	1,040	1,200	2,100	885	1,670
26	700	960	1,380	10,000	3,550	8,650	1,570	1,120	998	2,770	810	2,540
27	665	885	1,290	6,750	3,030	14,400	1,470	1,160	1,200	1,670	735	2,320
28	665	885	1,290	3,990	2,650	23,000	1,470	1,120	1,240	1,290	700	2,320
29	665	1,200	1,880	3,160	.....	18,100	1,380	1,670	1,380	1,990	595	5,460
30	700	2,540	2,430	2,900	.....	12,900	1,380	1,380	4,460	1,340	595	7,530
31	735	.....	2,320	2,900	.....	7,320	.....	1,290	.....	998	595	.....

Monthly discharge of Flint River near Culloden, Ga., for the year ending Sept. 30, 1917.

[Drainage area, 2,000 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	3,550	530	833	0.416	0.48
November	2,540	595	875	.438	.49
December	3,840	1,080	1,790	.895	1.03
January	17,700	1,290	3,510	1.76	2.03
February	8,080	1,420	3,610	1.80	1.87
March	35,300	2,100	8,990	4.50	5.19
April	23,900	1,380	4,810	2.40	2.68
May	2,100	1,040	1,350	.675	.78
June	4,460	772	1,240	.620	.69
July	5,280	595	1,670	.835	.96
August	5,640	595	1,880	.940	1.08
September	7,530	500	1,460	.730	.81
The year	35,300	500	2,670	1.34	18.09

FLINT RIVER AT ALBANY, GA.

LOCATION.—At Dougherty County highway bridge in Albany, 700 feet below Atlantic Coast Line Railroad bridge and 2 miles downstream from mouth of Muckafoonee Creek.

DRAINAGE AREA.—5,000 square miles.

RECORDS AVAILABLE.—April 10, 1893, to September 30, 1917 (United States Weather Bureau gage heights). Discharge measurements were begun by the Geological Survey in 1901, and determinations of daily discharge have been made from January 1, 1902, to September 30, 1915.

GAGE.—Chain gage, installed at the bridge April 20, 1904; read once daily by D. W. Brosnan. Original staff gage was washed out in 1898; again damaged in 1902, and on June 18 of that year a new gage was installed by the United States Weather Bureau at a datum 0.75 foot lower than that of the former gage. All gage heights for 1902 published by the United States Weather Bureau and the United States Geological Survey refer to the new datum. Present gage conforms with the United States Weather Bureau gage.

DISCHARGE MEASUREMENTS.—Fairly accurate measurements can be made at the section at the Atlantic Coast Line bridge, although it is very rough and train switching in the yard interferes with the work. The section at the Georgia Northern Railway bridge, 1 mile above, at which measurements are sometimes made, is considered better, especially for medium and low stages.

CHANNEL AND CONTROL.—Channel at and below gage may shift slightly but control is such that conditions of flow are practically permanent except for changes caused by dredging below gage. The river overflows banks but only under the approaches to the bridge.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 20.8 feet at 7 a. m., March 11 (discharge not determined); minimum stage, −0.5 foot, October 4, 10–12, and 17 (discharge not determined).

1902–1917: Maximum stage recorded, 30.3 feet at 7 a. m., March 21, 1913 (discharge, 53,700 second-feet); minimum stage, −1.1 feet, October 9–12, 1911 (discharge, 1,110 second-feet).

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—Power developments on Muckalee Creek, which joins Flint River about 2 miles above the station, cause considerable diurnal fluctuation, especially at low stages. It is probable that the flow is also affected by other power plants farther up the river.

No discharge measurements were made at this station during the year, but three measurements made in 1918 indicate a decided change in the stage-discharge relation as expressed by the curve used from 1912 to 1915. This change was caused by dredging operations carried on by the U. S. Army Engineers during the summer of 1915. Discharge records for 1915 as published in Water Supply Paper 402 were determined from the old rating curve and should, therefore, be used with caution. Determination of discharge for 1917 is not possible until additional current-meter measurements can be obtained.

Daily gage height, in feet, of Flint River at Albany, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.3	−0.2	0.4	2.1	11.0	11.3	16.3	2.3	1.0	1.9	1.5	1.3
2	.4	− .2	.8	2.6	10.4	10.5	16.9	2.5	1.1	2.4	1.2	1.3
3	− .4	.0	1.3	2.7	7.2	9.0	16.9	2.4	1.0	3.0	.8	1.4
4	− .5	− .1	1.9	2.5	6.0	7.2	16.0	2.2	.8	2.8	.7	2.0
5	− .1	− .1	1.6	1.6	5.6	8.0	13.8	2.8	.6	3.4	1.4	2.4
6	.1	− .1	1.6	1.7	6.1	11.3	11.8	3.8	.4	3.3	3.4	2.5
7	.0	− .2	1.4	2.0	5.8	13.7	10.1	4.6	.3	3.9	5.7	1.6
8	− .1	.0	1.2	2.4	5.2	15.6	10.0	5.2	.2	3.8	6.2	1.6
9	− .3	.2	.9	2.6	4.6	18.0	12.3	5.1	.3	3.0	7.0	.9
10	− .5	.2	1.0	2.5	4.2	20.0	13.8	4.4	.4	2.0	7.5	.4
11	− .5	.1	1.4	2.3	3.3	20.8	15.5	3.9	.1	1.8	7.4	.6
12	− .5	− .1	2.4	2.0	3.1	20.1	16.4	3.4	− .1	1.8	6.8	.3
13	− .3	− .3	3.1	1.6	3.1	17.6	16.1	3.0	.9	1.4	6.0	.3
14	.1	− .3	3.3	1.6	3.2	13.8	14.4	2.6	1.5	.5	5.4	.6
15	− .4	− .1	3.3	1.7	3.2	10.3	12.2	2.1	1.1	.5	3.7	.5
16	− .4	.3	2.9	1.9	3.3	7.0	9.6	2.1	.6	.7	2.7	.4
17	− .5	.4	2.5	1.6	3.0	6.2	7.5	1.6	1.0	.7	2.7	.3
18	− .4	.1	2.2	2.4	4.5	5.6	6.4	1.4	1.6	.5	3.4	.0
19	− .4	.0	2.0	2.6	6.8	5.5	5.6	1.2	1.1	.8	4.0	−.2
20	− .2	.0	2.0	3.4	9.0	5.0	5.0	1.0	.8	.8	4.5	.0
21	.1	− .1	1.7	3.9	11.0	4.9	4.5	1.7	.0	2.8	5.2	.0
22	1.2	− .2	1.7	4.4	13.2	5.0	4.2	.9	.2	4.6	5.7	.0
23	2.4	.2	1.7	4.5	15.3	4.8	3.9	.7	.0	5.2	5.8	.0
24	1.8	.3	1.6	4.8	15.4	5.4	3.4	.5	.1	5.1	6.7	.0
25	1.0	.3	1.5	6.3	14.6	6.6	3.4	.9	.3	4.5	6.0	−.1
26	.5	.7	1.8	7.4	13.5	7.4	3.1	1.3	.7	3.6	4.4	.2
27	.2	.9	1.9	8.9	12.8	10.0	2.8	1.2	.9	3.3	2.5	.4
28	.2	.9	1.9	9.3	12.1	13.7	2.9	1.0	.4	2.9	1.4	1.2
29	.1	.6	2.4	9.6	.....	16.2	2.6	.7	.8	2.7	1.4	2.2
30	− .1	.4	2.0	10.4	.....	16.5	2.3	.6	1.2	3.1	1.3	3.4
31	− .1	.....	2.0	11.3	.....	16.4	.....	.8	.....	2.1	.9	.....

LITTLE POTATO (TOBLER) CREEK NEAR YATESVILLE, GA.

LOCATION.—At Tobler mills, 1 mile downstream from Macon & Birmingham Railroad bridge, 2 miles north of Yatesville, Upson County, and 15 miles upstream from junction of creek with Flint River.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—November 4, 1914, to September 30, 1917.

GAGE.—Vertical staff on right bank just below penstock of Tobler mills; read by J. K. Sanders.

DISCHARGE MEASUREMENTS.—Made from steel highway bridge across mill pond about 600 feet above gage during medium and high stages; by wading during low stages.

CHANNEL AND CONTROL.—Bed composed of boulders and solid rock. Control formed by solid rock shoal; permanent.

EXTREMES OF STAGE.—Maximum stage recorded during year, 2.6 feet at 5.30 p. m. April 5 (discharge not determined); minimum stage, 0.4 foot November 4–23, 25–28, and December 3–8 (discharge not determined).

1914–1917: Maximum stage recorded, 3.3 feet at 5.30 a. m. July 8 and 5 p. m. July 18, 1916 (discharge not determined); minimum stage, 0.3 foot at 6 a. m. September 29, 1915 (discharge not determined).

REGULATION.—Operation of Tobler mills causes large fluctuations in stage. Gage is read in the morning before operation of mill in order to obtain readings which more nearly represent the natural stage.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Owing to storage in mill pond, gage heights do not indicate the mean for day accurately, particularly at low water. Therefore the gage-height record should be used with caution.

The following discharge measurement was made by Warren E. Hall:

July 25, 1917: Gage height, 0.30 foot; discharge, 0.5 second-foot.

Daily gage height, in feet, of Little Potato (Tobler) Creek near Yatesville, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.6	0.5	0.5	0.5	1.0	0.9	0.9	0.7	0.7	0.7	0.7	0.5
2	.6	.5	.5	.5	.6	1.5	.9	.7	.7	.7	.7	.6
3	.6	.5	.4	.5	.6	.9	.9	.7	.6	.7	.78	.6
4	.6	.4	.4	.6	.6	2.1	.9	.7	.6	.7	.75	.6
5	.6	.4	.4	.6	.6	2.0	2.6	.7	.6	.6	.7	.6
6	.6	.4	.4	.6	.6	1.2	1.4	.7	.6	.6	.7	.6
7	.6	.4	.4	.6	.6	.9	1.2	.7	.7	.6	1.1	.65
8	.6	.4	.4	.6	.6	.9	1.0	.8	.7	.6	1.1	.6
9	.6	.4	.5	.6	.6	.9	1.0	.8	.6	.6	1.0	.65
10	.6	.4	.5	.6	.6	.9	.9	.8	1.7	.6	.75	.62
11	.6	.4	.5	.5	.5	.9	.9	.7	.9	.6	.7	.6
12	.6	.4	.5	.5	.5	.9	.8	.7	.8	.6	.7	.6
13	.6	.4	.5	.5	.7	.9	.8	.7	.7	.6	.7	.6
14	.6	.4	.5	.6	.7	.8	.8	.7	.7	.6	.6	.6
15	.6	.4	.5	.6	.7	.8	.8	.7	.7	.6	.62	.6
16	.5	.4	.5	.7	.7	.8	.8	.7	.7	.55	.6	.6
17	.5	.4	.5	.9	.7	.8	.7	.7	.7	.55	.6	.6
18	.5	.4	.5	.9	.1	.8	.7	.7	.7	.7	.6	.52
19	.7	.4	.5	.9	.2	.8	.7	.7	.6	1.1	.6	.55
20	.6	.4	.5	.6	1.1	.8	.8	.7	.6	.7	.85	.5
21	.6	.4	.5	.6	1.3	.8	.8	.7	.6	.8	.6	.5
22	.6	.4	.5	.9	1.2	1.1	.7	.65	.6	.65	.6	.5
23	.6	.4	.5	.9	.9	.9	.7	.65	.7	.7	.6	.5
24	.6	.5	.5	2.0	.9	1.4	.7	.65	.7	.7	.55	.7
25	.5	.4	.5	2.0	.9	.9	.7	.65	.7	.65	.5	.6
26	.5	.4	.5	1.2	.9	.9	.8	.65	.7	1.05	.5	.6
27	.5	.4	.5	1.0	.9	1.7	.8	.7	.7	.75	.5	.6
28	.5	.4	.5	.6	.9	.9	.8	.7	.7	.7	.6	.6
29	.6	.5	.5	.6	.....	.9	.7	.7	.7	.7	.6	1.6
30	.6	.5	.5	.6	.....	.9	.7	.7	.7	.7	.6	.8
31	.6	.....	.5	.6	.....	.9	.....	.7	.....	.7	.6	.....

ESCAMBIA RIVER BASIN.

CONECUH RIVER AT BECK, ALA.

LOCATION.—At Simmons Bridge at Beck, Covington County, 8 miles west of Andalusia, a station on Central of Georgia and Louisville & Nashville railroads, and 12 miles downstream from mouth of Patsaliga Creek.

DRAINAGE AREA.—1,290 square miles.

RECORDS AVAILABLE.—August 24, 1904 to September 30, 1917.

GAGE.—Chain gage attached to upstream side of wagon bridge; read by A. W. Lambert.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Channel cut in soft bedrock; practically permanent. Both banks subject to overflow at very high stages. Location of control not known.

EXTREMES OF DISCHARGE.—Maximum stage (no gage height) September 30 (discharge interpolated, 13,800 second-feet); minimum stage, 1.3 feet at 8 a. m. June 25 (discharge, 262 second-feet).

1904–1917: Maximum stage (no gage height) March 18, 1913 (discharge, 26,000 second-feet, estimated by comparison with Pea River at Pera, Ala.); minimum stage, 0.7 foot October 4, 1904 (discharge, 187 second-feet).

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—The flow may at times be affected by logging operations.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve based on discharge measurements made prior to 1911 and checked by two discharge measurements made subsequent to 1917, is fairly well defined between 225 and 7,000 second-feet above which it is extended. Station was not visited from October 18, 1911, to June 22, 1918. Graduated corrections due to elongation of chain have been applied to gage heights. Gage read to tenths once daily except Sundays. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

No discharge measurements were made during the year.

Daily discharge, in second-feet, of Conecuh River at Beck, Ala., for the years ending Sept. 30, 1914–1917.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1913–14.									
1	874	998	2,510	1,120	874	262	278	262	914
2	834	1,010	2,590	1,040	834	262	278	270	874
3	1,300	1,080	2,540	1,040	742	278	247	278	757
4	1,320	1,120	2,370	996	650	262	250	313	650
5	1,350	1,040	2,430	976	650	262	258	352	585
6	1,260	1,300	2,370	955	617	295	262	332	618
7	1,170	2,000	2,320	834	585	345	247	332	650
8	1,040	2,240	2,160	795	650	395	373	395	617
9	1,040	2,480	2,000	955	650	469	395	474	585
10	996	2,970	1,890	1,040	865	524	373	554	469
11	955	2,860	1,730	996	1,080	443	262	585	650
12	914	2,750	1,780	1,020	834	373	248	617	650
13	795	2,860	1,830	1,040	650	332	233	585	512
14	684	2,970	1,680	1,120	617	305	247	585	373
15	650	2,920	1,730	2,100	585	278	262	585	332
16	650	2,860	1,780	2,000	524	262	373	618	332
17	617	2,750	2,210	1,780	460	262	262	650	313
18	601	2,640	2,270	1,730	395	352	247	684	524
19	585	2,480	2,210	1,940	373	278	234	720	554
20	585	2,430	2,100	2,160	332	262	220	1,040	525
21	585	2,320	2,050	2,000	332	270	220	874	496
22	554	2,280	1,840	1,730	295	278	233	1,080	418
23	524	2,200	1,640	1,490	295	295	233	1,100	469
24	650	2,160	1,540	1,400	286	295	220	1,120	1,170
25	762	2,100	1,490	1,210	278	295	220	1,040	1,830
26	874	2,320	1,350	1,020	278	278	214	955	1,680
27	1,040	2,320	1,260	834	262	262	208	874	1,580
28	1,040	2,430	1,210	795	262	262	220	914	1,490
29	996	.....	1,160	720	262	262	233	955	1,350
30	914	.....	1,120	874	262	262	278	802	1,680
31	955	.....	1,120	.....	262	.....	262	650	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1914–15.												
1	1,680	539	1,890	2,050	4,190	3,240	2,590	469	795	659	249	352
2	2,100	524	1,890	2,050	4,420	3,240	2,640	456	757	617	233	313
3	2,270	469	1,890	2,130	4,750	3,130	2,480	443	757	650	247	313
4	2,220	469	1,940	2,210	4,360	3,080	2,340	418	757	736	874	352
5	2,160	418	2,050	2,100	4,080	7,260	2,210	469	757	910	617	684
6	2,050	418	1,940	2,270	4,030	7,030	2,160	469	876	996	524	1,350
7	1,890	395	1,830	2,480	4,000	6,320	2,000	496	996	1,080	395	1,680
8	1,730	446	1,730	2,430	3,970	5,610	1,830	6,630	684	1,210	395	1,830
9	1,730	496	1,640	2,320	3,860	5,040	1,730	6,520	617	1,350	395	1,830
10	1,640	524	1,590	2,300	3,800	5,150	1,680	6,410	585	1,400	352	1,730
11	1,470	585	1,440	2,270	3,690	5,100	1,580	5,320	496	1,350	373	1,590
12	1,300	585	1,400	2,480	3,520	4,920	1,490	4,870	469	1,300	395	1,360
13	795	650	1,440	2,590	3,300	4,810	1,260	4,190	456	1,780	395	1,120
14	795	684	1,490	2,370	3,190	4,480	1,210	3,860	443	1,120	469	617
15	757	779	1,440	2,270	3,080	4,140	1,170	3,020	395	914	456	524
16	874	874	1,350	2,160	3,240	3,630	1,120	2,640	443	795	443	469
17	914	914	1,400	3,290	3,350	3,350	1,120	2,270	443	617	469	496
18	1,040	996	1,350	4,420	3,350	3,080	1,060	1,640	395	586	418	443
19	1,170	996	1,400	6,410	3,300	2,700	996	1,440	395	554	418	443
20	1,170	996	1,260	6,240	3,190	2,540	914	1,170	384	469	443	443
21	1,170	914	1,120	5,840	3,160	2,380	914	955	373	617	469	443
22	1,080	854	1,040	6,060	3,110	2,210	834	834	373	585	576	395
23	1,040	795	955	6,690	3,080	2,050	834	726	332	469	684	332
24	914	720	955	7,040	3,300	1,940	757	617	313	395	617	332
25	874	720	795	7,380	3,300	1,890	687	585	352	336	554	295
26	834	668	955	7,200	3,130	1,640	617	554	373	278	554	271
27	757	617	976	6,800	3,130	1,590	585	496	546	278	496	247
28	720	720	996	5,270	3,180	1,520	554	496	720	295	469	247
29	650	920	1,490	4,750	.....	1,440	585	443	617	247	432	247
30	650	1,120	1,640	4,470	.....	1,440	496	531	834	295	395	332
31	554	.....	2,050	4,330	.....	2,480	.....	707	.....	247	395	.....

Daily discharge, in second feet, of Conecuh River at Beck, Ala. for the years ending Sept. 30, 1914–1917—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1915–16.												
1	2,970	1,540	650	6,060	1,590	1,590	8,230	554	395	352	3,240	443
2	2,210	1,120	650	7,000	2,370	1,640	6,460	554	373	468	2,590	443
3	2,000	874	585	7,940	3,410	1,640	4,700	524	352	585	3,240	582
4	1,780	795	554	6,980	3,350	1,780	3,520	617	332	443	3,130	720
5	1,540	720	554	5,550	3,300	1,800	2,750	650	313	524	2,640	1,300
6	1,730	684	554	4,750	3,970	1,830	2,320	684	313	955	2,860	757
7	1,680	650	554	3,080	4,640	1,640	2,050	619	295	4,700	3,080	585
8	1,490	617	524	2,640	4,590	2,050	2,540	554	262	15,600	3,750	524
9	1,300	617	524	2,210	3,630	2,100	2,270	524	262	15,000	4,470	496
10	1,030	585	524	1,780	2,860	1,890	2,000	469	262	14,500	3,910	525
11	757	554	524	1,640	2,270	2,100	1,780	443	254	13,400	3,630	554
12	684	554	510	1,590	1,830	1,940	1,680	395	247	12,400	3,080	443
13	585	554	496	2,640	1,800	1,780	1,490	395	247	11,400	2,920	418
14	585	539	524	2,750	1,780	1,490	1,260	384	313	11,000	2,750	469
15	1,260	524	524	2,320	1,680	1,300	1,170	373	332	9,880	2,590	524
16	1,040	554	496	2,480	1,440	1,210	1,080	352	418	9,140	1,540	524
17	812	524	524	2,640	1,400	1,080	996	373	373	8,400	1,260	496
18	585	524	1,730	2,910	1,350	996	914	352	408	8,230	1,040	469
19	554	834	1,760	2,480	1,260	976	834	373	443	9,430	874	443
20	6,180	684	1,780	2,000	1,170	955	795	373	373	7,200	779	418
21	4,470	684	1,730	1,830	1,080	914	1,590	421	373	4,810	684	418
22	2,100	684	1,730	1,780	1,080	874	1,680	469	352	3,800	650	395
23	1,890	650	1,680	2,080	1,080	874	1,520	2,590	313	4,110	617	373
24	1,940	617	1,640	2,370	1,590	834	1,350	1,350	418	4,420	554	362
25	2,000	585	1,680	2,050	1,680	834	1,120	1,120	385	4,750	524	352
26	2,160	524	1,610	1,940	1,300	2,010	914	1,040	352	4,750	496	332
27	2,700	795	1,540	1,830	1,190	3,190	834	757	395	4,530	482	352
28	3,350	758	1,300	1,640	1,080	4,870	720	656	313	5,660	469	352
29	3,350	720	7,430	1,590	1,210	5,040	650	554	373	7,090	524	418
30	2,590	684	6,920	1,470	.....	5,660	602	469	395	5,860	469	352
31	2,060	.....	6,980	1,350	.....	7,200	.....	395	.....	4,640	443	.....
1916–17.												
1	342	418	684	1,210	2,860	5,440	6,040	757	373	342	1,730	1,440
2	332	418	757	1,210	2,700	8,860	5,380	720	373	352	1,730	1,100
3	313	495	776	1,080	2,370	8,520	5,040	650	352	352	1,260	757
4	313	418	795	996	2,180	9,710	4,250	757	332	1,640	996	684
5	295	396	684	955	2,000	10,900	5,440	1,210	313	617	1,980	585
6	313	373	617	996	1,830	10,700	6,060	1,240	313	1,170	2,970	554
7	295	373	554	976	1,680	10,700	6,350	1,260	295	955	3,130	554
8	295	352	1,210	955	1,540	10,200	5,860	1,300	313	1,020	3,080	524
9	295	352	1,680	914	1,440	11,500	5,380	1,170	278	1,080	3,410	484
10	278	373	1,360	874	1,300	11,000	4,700	1,170	326	874	3,690	443
11	278	352	1,040	834	1,240	8,880	4,700	1,080	373	720	4,030	395
12	295	362	996	757	1,170	6,750	4,590	1,080	332	585	4,280	373
13	278	373	955	757	1,120	4,920	4,030	957	313	585	4,530	418
14	278	395	914	898	1,080	3,800	3,300	834	295	914	3,800	395
15	278	395	1,210	1,040	1,400	3,240	3,080	757	332	977	2,810	373
16	278	395	996	1,170	1,540	2,810	2,860	720	313	1,040	2,910	343
17	278	373	955	1,260	1,540	2,540	2,430	617	313	914	2,970	313
18	373	373	914	1,260	4,080	2,320	2,050	585	313	834	1,830	332
19	2,480	373	834	1,260	6,630	2,100	1,780	554	295	914	1,960	313
20	1,440	373	795	1,170	7,770	1,890	1,590	525	373	1,040	2,100	313
21	1,210	373	874	1,190	7,490	1,780	1,400	496	352	1,210	1,640	313
22	1,240	395	795	1,210	6,520	3,020	1,330	496	332	1,580	1,400	278
23	1,260	469	757	4,140	5,950	2,370	1,260	469	295	1,940	1,440	286
24	1,080	585	876	4,250	6,980	2,320	1,120	443	278	2,050	1,490	295
25	874	524	996	4,030	6,950	2,860	1,080	443	262	2,860	1,640	295
26	757	554	1,040	3,350	6,920	3,410	1,040	418	278	2,270	1,560	313
27	650	585	955	3,020	6,520	4,250	996	406	262	2,430	1,490	332
28	554	585	834	2,960	5,780	7,940	955	395	262	2,320	1,260	914
29	586	617	2,810	2,910	.....	8,400	875	418	278	1,980	874	13,200
30	617	617	1,680	2,970	.....	8,120	795	395	332	1,640	757	13,800
31	413	.....	1,440	3,020	.....	6,690	.....	373	.....	1,440	996	.....

NOTE.—Daily discharge interpolated for Sundays when gage was not read, and for the following days when there was no reading: Jan. 1, Feb. 23, May 30, July 4 and Nov. 26, 1914; Jan. 1, Feb. 22, May 31, July 5, and Sept. 6, 1915.

Maximum stage of 30.1 feet at 8 a. m. July 8, 1916, as indicated in Water Supply Paper 432 as being the maximum stage recorded for the year ending Sept. 30, 1916, is changed to 29.9 feet (discharge 15,600 second-feet) owing to correction to gage height caused by elongation of gage chain. Likewise the minimum stage recorded for the same year is changed from 1.4 feet to 1.2 feet at 8 a. m June 12–13 (discharge 247 second-feet).

Monthly discharge of Conecuh River at Beck, Ala., for the years ending Sept. 30, 1914-1917.

[Drainage area, 1,290 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1914.					
January	1,350	524	875	0.678	0.78
February	2,970	.....	2,210	1.71	1.78
March	2,590	1,120	1,880	1.46	1.68
April	2,160	720	1,260	.977	1.09
May	1,080	262	517	.400	.46
June	521	262	309	.240	.27
July	395	208	261	.202	.23
August	1,120	262	664	515	.59
September	1,830	313	788	.611	.68
1914–15.					
October	2,270	554	1,260	0.977	1.13
November	1,120	395	694	.538	.60
December	2,050	795	1,460	1.13	1.30
January	7,380	2,050	3,960	3.07	3.54
February	4,750	3,080	3,570	2.77	2.88
March	7,260	1,440	3,500	2.71	3.12
April	2,640	496	1,350	1.05	1.17
May	6,630	418	1,940	1.50	1.73
June	996	313	558	.433	.48
July	1,780	247	746	.578	.67
August	874	233	458	.355	.41
September	1,830	247	703	.545	.61
The year	7,380	233	1,680	1.30	17.64
1915–16.					
October	6,180	554	1,920	1.49	1.72
November	1,540	524	692	.536	.60
December	7,430	496	1,570	1.22	1.41
January	7,940	1,350	2,950	2.29	2.64
February	4,640	1,080	2,100	1.63	1.76
March	7,200	834	2,070	1.60	1.84
April	8,230	.....	1,990	1.54	1.72
May	2,590	352	625	.484	.56
June	443	247	341	.264	.29
July	15,600	352	6,710	5.20	6.00
August	4,470	443	1,910	1.48	1.71
September	1,300	332	495	.384	.43
The year	15,600	247	1,960	1.52	20.68
1916–17.					
October	2,480	278	600	0.465	0.54
November	617	352	431	.334	.37
December	2,810	554	1,030	.798	.92
January	4,250	757	1,730	1.34	1.54
February	7,770	1,080	3,590	2.78	2.90
March	11,500	1,780	6,060	4.70	5.42
April	6,350	795	3,190	2.47	2.76
May	1,300	373	732	.567	.65
June	373	262	315	.244	.27
July	2,860	.....	1,250	.970	1.12
August	4,530	757	2,250	1.74	2.01
September	.....	278	1,360	1.05	1.17
The year	.....	262	1,870	1.45	19.67

MOBILE RIVER BASIN.

OOSTANAULA RIVER AT RESACA, GA.

LOCATION.—At Nashville, Chattanooga & St. Louis Railroad bridge in Resaca, Gordon County, 400 feet upstream from Dixie highway bridge, a mile above Camp Creek, and 3 miles below the junction of Conasauga and Coosawattee Rivers, which form Oostanaula River.

DRAINAGE AREA.—1,610 square miles.

RECORDS AVAILABLE.—1891 to 1898 (gage heights by the United States Weather Bureau and discharge measurements and gage heights by the United States Geological Survey); 1899 to 1904, partial records of gage heights; continuous records, January 1, 1905, to September 30, 1917.

GAGE.—Heavy vertical timber attached to the downstream side of midstream pier of railroad bridge.

DISCHARGE MEASUREMENTS.—Made from the Dixie highway bridge.

CHANNEL AND CONTROL.—Bed composed of sand; somewhat shifting. Right bank is a high bluff not subject to overflow; left bank high but is overflowed at very high stages. Location of control is not exactly known. Stage-discharge relation has changed slightly.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 30.2 feet March 6 (discharge, 26,800 second-feet); minimum stage recorded, 1.9 feet October 16 (discharge, 545 second-feet).

1896–1917: Maximum stage recorded,[1] 31.7 feet March 15, 1909 (discharge, 39,200 second-feet); minimum stage, 0.95 foot during discharge measurement September 26, 1904 (discharge, 273 second-feet).

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—Practically none from the few small mills upstream.

ACCURACY.—A change in the stage-discharge relation below 2,800 second-feet, shown by current meter measurements made in 1918 and 1919, occured sometime after November 1, 1915, the date of the last previous discharge measurements. The change probably occured during the high water in March 1917, the highest intervening flood. The rating curve used from April 1, 1913 to September 30, 1916, was therefore used to March 6, 1917 and is well defined between 500 and 8,000 second-feet, above which it is extended as a tangent. Curve used March 7 to September 30 is well defined between 450 and 8,000 second-feet, and is the same as the previous curve above 2,800 second-feet. Gage read to tenths once daily. Gage heights at low stages subject to error owing to poor conditions of lower part of gage. Daily discharge ascertained by applying mean daily gage heights to rating table. Records fair.

No discharge measurements were made during the year.

[1] Gage-height records not obtainable during the following periods: May 1 to July 31, 1896; May 1 to October 31, 1899: July 1 to October 31, 1900: May 1 to November 12, 1901, and January 1, 1902 to December 31, 1904.

Daily discharge in second-feet, of Oostanaula River at Resaca, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	830	1,110	1,410	3,270	7,250	5,870	7,730	2,500	4,110	1,760	1,760	2,500
2	830	780	1,350	3,190	14,300	11,500	6,690	2,420	2,240	1,380	1,690	2,420
3	780	830	1,110	3,270	10,600	14,100	5,870	2,500	1,760	1,440	3,270	2,500
4	830	830	1,110	8,690	5,870	19,100	4,980	2,500	1,760	1,380	2,420	1,690
5	830	780	1,050	5,780	4,450	25,000	10,100	4,020	1,690	1,440	1,760	1,140
6	780	830	1,750	5,690	4,110	26,800	7,730	2,500	1,760	1,380	1,690	1,080
7	830	780	1,050	5,330	3,190	24,500	11,500	21420	1,690	3,270	1,760	1,140
8	830	830	1,110	4,110	3,270	21,100	7,730	2,500	1,760	1,690	3,190	1,080
9	780	780	2,420	3,600	2,800	15,500	6,690	2,420	2,420	1,760	8,500	1,140
10	1,750	830	1,750	3,270	2,490	7,730	5,870	2,500	7,730	1,690	4,720	1,080
11	1,110	830	1,750	2,490	2,490	4,980	5,870	2,500	3,270	1,760	2,500	870
12	830	780	1,680	2,040	2,420	4,890	4,890	2,420	2,420	1,690	2,420	600
13	780	830	1,750	2,110	2,490	4,980	4,980	2,500	2,500	1,760	1,760	640
14	590	1,110	1,750	5,870	2,960	4,980	4,540	1,760	1,760	1,690	1,690	600
15	590	1,050	1,350	6,230	2,570	5,330	4,020	2,040	1,690	1,760	1,760	640
16	545	1,110	1,110	9,170	3,270	4,980	4,110	2,120	1,760	1,690	1,690	600
17	590	1,050	1,050	10,100	3,190	4,890	4,020	2,040	1,690	1,760	1,760	640
18	590	1,110	1,110	7,730	3,680	9,660	3,850	2,120	1,760	1,690	1,690	1,690
19	1,050	780	2,420	5,780	8,110	8,590	3,600	2,040	1,690	2,500	1,760	640
20	1,750	830	1,750	5,870	15,900	5,870	3,270	1,900	2,500	2,420	1,080	600
21	1,410	830	1,610	5,420	18,600	5,870	3,270	1,140	2,120	2,500	1,140	640
22	1,110	780	2,040	7,160	18,500	11,500	3,190	1,080	2,420	2,420	1,080	600
23	1,050	830	2,110	11,100	15,600	12,600	3,270	1,760	2,500	2,500	1,140	640
24	830	2,110	2,110	9,660	12,600	18,100	3,270	1,760	1,760	2,420	1,080	1,690
25	830	1,680	1,680	6,690	10,100	22,500	2,800	1,690	1,690	2,500	1,140	1,140
26	780	1,410	1,750	4,980	6,320	24,600	2,730	1,760	1,760	2,420	1,080	1,080
27	830	1,350	1,680	3,600	4,890	23,500	2,420	1,690	1,690	2,500	870	1,140
28	830	1,410	3,270	2,490	4,540	22,600	2,500	1,760	1,760	3,190	600	4,020
29	780	1,350	10,500	2,420	.....	22,000	2,420	1,690	1,690	2,500	640	5,870
30	830	1,750	8,690	4,980	.....	19,600	2,500	1,760	1,760	1,690	600	2,420
31	1,750	.....	5,870	4,980	.....	15,600	.....	1,760	.....	1,760	640	.....

Monthly discharge of Oostanaula River at Resaca, Ga., for the year ending Sept. 30, 1917.

[Drainage area 1,610 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,750	545	920	0.571	0.66
November	2,110	780	1,050	.652	.73
December	10,500	1,050	2,290	1.64	1.64
January	11,100	2,040	5,390	3.35	3.86
February	18,600	2,420	7,020	4.36	4.54
March	26,800	4,890	13,800	8.57	9.88
April	11,500	2,420	4,880	3.03	3.38
May	4,020	1,080	2,120	1.32	1.52
June	7,730	1,690	2,240	1.39	1.55
July	3,270	1,380	2,010	1.25	1.44
August	8,500	600	1,900	1.18	1.36
September	5,870	600	1,420	.882	.98
The year	26,800	545	3,740	2.32	31.54

COOSA RIVER AT RIVERSIDE, ALA.

LOCATION.—At Southern Railway bridge at Riverside, St. Clair County, 1 mile upstream from mouth of Blue Eye Creek, 4 miles downstream from Lock 4, and 5 miles upstream from Lock 5.

DRAINAGE AREA.—7,060 square miles.

RECORDS AVAILABLE.—September 25, 1896, to November 30, 1916.

GAGE.—Chain gage attached to right end of downstream side of railroad bridge. The original wire gage was located near middle of river.

DISCHARGE MEASUREMENTS.—Made from downstream side of railroad bridge.

CHANNEL AND CONTROL.—Bed of stream rocky; permanent. Control composed of rock ledges below bridge; permanent.

EXTREMES OF DISCHARGE.—1896–1916: Maximum stage recorded, 21.4 feet at 12 m. July 10, 1916 (discharge, 82,600 second-feet, determined by extending high-water portion of rating curve as a tangent and may be somewhat too small); minimum stage, 0.35 foot October 20 to November 1, 1904 (discharge, 1,220 second-feet).

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—Flow is not noticeably affected by operation of navigation locks; lock seldom operated.

ACCURACY.—Stage-discharge relation practically permanent, not affected by ice. Rating curve well defined below 50,000 second-feet; above that point curve is an extension. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

The rating curve has not been checked by discharge measurements since 1911, but comparison of records for this station with records for the station at Childersburg from 1914 to 1916 indicates that there has not been any change in stage-discharge relation. Determination of discharge after November 30, 1916, not possible owing to serious backwater effect from construction operations at Lock 5, 5 miles below station.

Daily discharge, in second-feet, of Coosa River at Riverside, Ala., for the period Oct. 1 to Nov. 30, 1916.

Day.	Oct.	Nov.	Day.	Oct.	Nov.	Day.	Oct.	Nov.
1	6,540	3,010	11	3,010	3,010	21	2,810	3,220
2	6,840	4,900	12	3,220	3,220	22	7,440	3,430
3	4,640	6,250	13	2,810	3,010	23	6,540	3,220
4	3,890	4,640	14	3,010	3,220	24	5,420	3,430
5	3,660	3,660	15	2,810	3,010	25	3,660	3,890
6	3,660	3,220	16	3,010	3,010	26	3,660	4,380
7	3,430	3,430	17	2,810	3,430	27	3,430	5,420
8	3,660	3,010	18	3,010	3,430	28	3,220	6,250
9	3,220	3,220	19	2,810	3,660	29	3,220	5,700
10	3,220	3,010	20	3,010	3,430	30	3,010	5,160
						31	3,010	.....

Monthly discharge of Coosa River at Riverside, Ala., for the period Oct. 1 to Nov. 30, 1916.

[Drainage area, 7,060 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	7,440	2,810	3,800	0.538	0.62
November	6,250	3,010	3,830	.542	.60

COOSA RIVER AT CHILDERSBURG, ALA.

LOCATION.—At Central of Georgia Railway bridge half a mile west of Childersburg, Talladega County, 35 miles above site of lock 12, and 75.3 miles above Wetumpka.

DRAINAGE AREA.—8,390 square miles (determined by Alabama Power Co.).

RECORDS AVAILABLE.—February 22, 1914, to September 30, 1917.

GAGE.—Gurley printing water-stage recorder attached to downstream end of second pier from right bank of river, installed on May 5, 1914. Prior to that date readings were taken from a vertical staff gage fastened to upstream side of same pier to which Gurley gage is now attached. Datum of Gurley gage is about 0.1 foot higher than that of the staff gage. This difference in datum is believed constant since 1914. All records from 1915 to 1917 are referred to datum of Gurley gage. Sea-level elevation of zero of staff gage is 421 feet (United States Army Engineers' datum).

DISCHARGE MEASUREMENTS.—Made from the bridge.

CHANNEL AND CONTROL.—Channel straight for half a mile below gage. Left bank high; right bank subject to overflow at extreme high stages. Control not well defined; bed of stream probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 20.8 feet from 11 to 12 a. m. March 5 and 7 to 9 p. m. April 5 (discharge not determined); minimum stage from water-stage recorder, 1.6 feet from 6 p. m. September 24 to 11 a. m. September 27 (discharge, 3,470 second-feet).

1914–1917: Maximum stage from water-stage recorder, 24.7 feet from 3 to 9 and 11 to 12 p. m. July 11, 1916 (discharge not determined owing to lack of data for extending rating curve); minimum discharge, 2,370 second-feet, September 20, 1914.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve based on four discharge measurements made in 1918 and is well defined between 3,000 and 20,000 second-feet; extended above 20,000 second-feet. Operation of water-stage recorder satisfactory except for periods indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage height obtained by averaging hourly gage height or, for days of large variations in stage, by averaging the discharge for intervals of the day. Records good except those above 25,000 second-feet, which should be used with caution.

COOPERATION.—Gage-height records furnished by the Alabama Power Co.

No discharge measurements were made at this station during the year.

Daily discharge, in second-feet, of Coosa River at Childersburg, Ala., for the years ending Sept. 30, 1915–1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1914–15.												
1	3,250	3,250	5,900	45,600	30,800	19,600	10,500	5,500	6,750	7,000	3,800	5,370
2	3,470	3,040	6,460	36,100	52,400	16,600	10,200	5,630	6,180	7,500	3,800	5,900
3	3,360	3,040	7,330	25,000	59,400	15,100	9,850	5,500	6,180	8,500	3,800	5,110
4	3,140	3,040	11,000	17,700	60,000	14,400	9,850	5,370	6,460	9,850	4,040	4,860
5	3,040	3,040	17,000	14,400	60,000	23,200	9,520	5,110	6,750	13,700	3,800	9,850
6	3,040	3,040	22,400	14,800	61,100	29,900	8,870	5,110	.....	20,800	3,800	14,400
7	2,840	3,040	29,000	24,500	56,500	29,900	8,550	12,000	.....	18,900	4,040	20,800
8	2,940	3,040	30,400	29,400	48,900	28,600	8,240	37,100	.....	18,100	3,920	18,900
9	3,250	2,940	26,300	32,200	37,100	25,800	7,930	37,600	.....	15,500	3,920	13,000
10	3,250	3,040	18,900	30,800	25,400	22,400	7,930	35,600	.....	15,100	3,920	9,190
11	4,740	3,040	13,300	26,300	19,600	19,300	7,630	31,700	.....	14,000	3,920	6,750
12	5,370	3,140	9,520	21,600	17,000	16,600	7,330	29,000	.....	10,200	4,500	5,630
13	4,620	4,150	8,240	20,000	15,100	14,800	7,330	22,400	.....	9,580	4,740	4,860
14	4,380	4,500	9,190	19,600	14,000	13,700	7,040	17,000	.....	8,870	4,620	4,500
15	4,040	4,150	10,200	19,600	16,000	13,000	7,180	13,700	.....	8,550	5,370	4,380
16	4,740	4,150	10,200	18,900	19,000	12,200	7,630	13,000	.....	7,930	5,900	4,040
17	8,240	5,500	9,520	19,600	21,000	11,600	7,630	11,900	.....	7,930	5,630	4,380
18	15,500	6,040	8,550	21,200	23,000	11,600	7,040	10,200	.....	8,240	5,500	4,620
19	15,900	5,900	7,630	23,700	22,000	11,200	6,750	8,870	.....	7,630	5,500	4,500
20	11,600	5,630	6,900	25,800	17,000	11,600	6,600	7,930	.....	6,900	7,630	4,150
21	7,630	4,740	6,600	26,300	15,500	12,600	6,460	7,330	.....	6,180	7,630	3,920
22	5,630	4,150	6,600	24,500	13,700	12,600	6,320	7,040	.....	5,500	10,500	3,800
23	4,740	3,800	6,900	21,200	13,000	11,900	6,180	6,600	.....	5,110	9,520	3,690
24	4,260	3,690	7,630	22,000	15,900	11,200	6,180	6,460	.....	4,860	8,550	3,690
25	4,040	3,580	10,200	20,400	19,300	10,500	6,040	6,180	.....	4,860	7,180	3,920
26	3,800	3,470	21,600	22,800	22,800	10,200	5,900	6,180	.....	4,860	5,900	4,380
27	3,580	3,470	34,100	27,200	25,800	9,520	5,900	6,460	.....	4,620	5,240	4,150
28	3,470	3,470	41,300	28,100	23,700	9,520	5,630	7,330	.....	4,380	5,110	3,690
29	3,360	4,040	46,100	25,000	.....	9,520	5,630	8,870	.....	4,150	4,740	3,470
30	3,250	5,240	53,000	20,400	.....	9,190	5,630	9,190	.....	4,040	5,110	3,580
31	3,250	.....	50,100	18,500	.....	10,200	.....	7,930	.....	3,920	4,980	.....
1915–16.												
1	4,620	6,460	8,550	63,400	23,700	15,100	9,850	6,180	13,300	6,040	.....	.....
2	12,200	6,040	7,930	59,400	48,400	15,900	9,190	6,180	13,000	5,900	.....	.....
3	16,200	5,760	7,180	58,200	57,600	19,300	10,500	6,180	9,800	6,180	.....	.....
4	14,000	5,500	6,600	57,100	55,300	22,000	10,900	5,900	8,240	5,900	.....	.....
5	13,000	5,370	6,180	54,200	51,800	22,000	9,850	5,900	7,040	6,600	.....	.....
6	14,000	5,240	6,040	42,800	48,400	20,400	9,190	5,760	6,600	6,900	.....	.....
7	17,400	5,110	5,900	25,000	41,800	18,100	10,500	5,630	7,630	46,900	.....	.....
8	19,300	4,860	5,760	17,000	31,700	19,300	15,100	5,630	10,200	91,300	.....	.....
9	16,600	4,860	5,500	15,500	22,400	20,800	14,800	5,370	8,870	.....	.....	.....
10	13,000	4,620	5,370	14,400	19,300	20,400	13,300	5,370	7,930	.....	.....	.....
11	9,520	4,620	5,370	13,700	19,300	18,100	12,200	5,110	7,330	.....	.....	.....
12	7,180	4,620	6,040	13,300	18,900	15,100	11,200	5,110	6,180	.....	.....	.....
13	5,900	4,620	6,180	17,000	18,100	13,300	10,200	4,860	7,040	.....	.....	.....
14	5,500	4,980	6,460	23,700	16,200	12,200	9,520	4,860	12,600	.....	.....	.....
15	10,200	5,900	6,900	24,100	15,100	11,600	8,550	4,620	12,200	.....	.....	.....
16	11,200	7,930	7,180	24,100	14,400	10,900	8,550	5,110	11,600	.....	.....	.....
17	15,500	8,240	9,950	23,200	13,700	10,500	8,870	4,980	10,900	.....	.....	.....
18	16,200	9,850	27,200	21,200	13,000	10,200	8,240	4,740	10,200	.....	.....	.....
19	13,700	12,200	41,300	18,100	11,900	9,520	8,240	4,620	12,200	.....	.....	.....
20	18,500	13,700	47,800	15,900	11,600	9,190	7,930	4,500	11,900	90,100	.....	.....
21	26,300	13,000	48,900	14,400	10,900	9,190	7,930	4,380	9,520	83,700	.....	.....
22	31,700	10,900	47,200	17,400	10,500	8,870	8,240	5,110	7,630	68,700	.....	.....
23	32,600	9,190	45,600	30,400	10,200	8,550	7,930	7,630	7,630	.....	.....	.....
24	25,400	8,240	38,700	36,600	11,200	8,240	7,930	12,600	6,320	.....	.....	.....
25	18,900	7,330	26,300	37,600	10,900	8,240	7,630	19,300	6,320	.....	.....	.....
26	14,800	7,180	16,500	30,800	11,200	13,300	7,330	22,800	6,180	.....	.....	.....
27	11,600	7,630	14,000	25,000	13,700	14,800	6,900	19,600	6,900	.....	.....	4,860
28	9,520	7,930	20,000	21,600	14,000	13,300	6,750	14,000	6,600	.....	.....	4,860
29	8,240	8,240	50,700	18,100	16,200	11,900	6,460	10,900	6,460	.....	.....	.....
30	7,330	8,550	66,900	15,100	.....	10,900	6,460	10,500	6,320	.....	.....	.....
31	6,900	.....	66,900	14,400	.....	10,500	.....	10,900	.....	.....	.....	.....

Daily discharge, in second-feet, of Coosa River at Childersburg, Ala., for the years ending Sept. 30, 1915–1917—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916–17.												
1	6,750	4,700	6,200	23,200	19,600	47,200	72,100	10,200	6,750	7,630	7,330	4,740
2	7,930	5,110	6,000	21,200	30,800	30,800	71,600	9,850	6,750	6,750	6,320	6,040
3	6,200	6,460	5,900	18,500	38,100	47,800	69,200	9,850	6,750	5,900	9,850	6,600
4	6,040	6,460	5,630	16,200	40,200	82,600	71,600	10,200	6,750	5,630	10,500	8,870
5	5,240	5,630	5,110	14,800	37,600	94,800	93,000	10,200	6,750	5,370	9,850	9,190
6	4,980	5,110	4,740	17,000	30,800	88,400	89,500	11,600	6,750	5,370	17,500	7,930
7	4,860	4,860	4,620	18,500	21,200	79,100	73,900	13,000	6,750	5,240	32,200	6,460
8	.....	.....	4,620	17,000	16,200	75,000	69,200	12,600	6,750	5,240	22,800	5,630
9	.....	.....	5,240	15,100	14,400	72,000	65,800	10,900	7,330	6,180	29,400	5,110
10	.....	.....	5,900	13,700	13,700	70,000	59,400	9,850	10,500	7,630	23,700	5,500
11	.....	.....	5,900	11,600	13,000	68,100	49,500	9,190	14,000	6,600	24,500	5,110
12	.....	.....	7,630	9,850	12,200	66,900	37,600	8,870	15,900	5,370	22,400	4,740
13	.....	.....	8,870	9,190	11,600	64,600	28,600	8,550	14,800	5,110	15,900	4,500
14	.....	.....	7,040	13,300	10,900	57,100	24,500	8,240	11,200	5,240	11,200	4,380
15	.....	.....	5,900	19,600	12,200	35,600	22,000	7,930	8,550	4,980	9,520	4,040
16	.....	.....	4,980	32,200	14,400	21,600	20,000	7,630	7,630	4,860	10,200	3,920
17	.....	.....	4,980	39,200	14,800	19,600	18,900	7,630	7,330	5,900	10,500	3,920
18	.....	.....	4,860	40,200	17,400	22,400	17,400	7,330	7,330	6,750	10,500	3,920
19	.....	.....	4,980	41,800	28,200	23,200	15,900	7,330	8,870	5,500	10,200	4,040
20	.....	.....	5,500	38,700	64,000	23,700	15,100	7,330	7,180	7,330	9,190	3,920
21	.....	.....	6,040	32,600	79,700	30,800	14,400	7,330	7,180	14,400	7,630	3,920
22	5,370	.....	6,600	36,100	76,800	46,100	13,700	7,040	10,500	17,400	6,750	3,920
23	6,750	.....	6,750	41,300	69,800	43,900	13,000	6,900	9,190	13,000	6,180	3,800
24	6,600	.....	6,320	42,300	71,000	75,000	12,600	6,750	9,520	10,900	5,630	3,580
25	5,900	.....	6,180	42,300	69,200	89,000	12,200	6,750	8,240	10,900	5,240	3,470
26	5,240	.....	6,320	36,600	64,600	84,900	11,900	6,750	7,330	12,200	5,110	3,470
27	4,980	.....	6,180	30,400	60,500	91,900	11,600	6,750	6,460	10,500	4,860	4,380
28	4,860	.....	7,630	24,100	56,500	84,300	11,200	6,750	6,040	10,200	4,860	9,850
29	4,700	.....	13,700	19,600	.....	76,200	10,900	6,750	6,180	9,190	4,620	10,900
30	4,700	.....	20,000	18,100	.....	73,900	10,500	6,750	6,900	8,870	4,500	15,100
31	4,600	.....	24,100	16,200	.....	72,700	.....	6,750	.....	8,240	4,620	.....

NOTE.—Water-stage recorder not operating satisfactorily Dec. 4 and 5, 1914, Feb. 15–20, June 6 to July 3, and Dec. 26–28, 1915, June 3, July 23 to Sept. 26, Sept. 29, 30, Oct. 8–21, 29–31, Nov. 1 and Nov. 8 to Dec. 2-1916, and Mar. 8–10, 1917; discharge estimated by comparison with records of flow on Coosa River at River, side except June 6–30, 1915, July 23 to Sept. 26, Sept. 29, 30, and Nov. 8–30, 1916, for which no determinations were made.

Discharge Oct. 8–21, 1916, estimated from records of flow at Riverside, as 3,800 second-feet. No determinations of discharge for period of high water July 9–19, 1916, owing to lack of data for extending rating curve.

Monthly discharge of Coosa River at Childersburg, Ala., for the years ending Sept. 30, 1915–1917.

[Drainage area, 8,390 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1914–15.					
October	15,900	2,840	5,090	0.607	0.70
November	6,040	2,940	3,880	.462	.52
December	53,000	5,900	17,800	2.12	2.44
January	45,600	14,400	24,000	2.86	3.30
February	61,100	13,000	29,500	3.52	3.66
March	29,900	9,190	15,400	1.84	2.12
April	10,500	5,630	7,450	.888	.99
May	37,600	5,110	12,900	1.54	1.78
June 1–5	6,750	6,180	6,460	.77	.14
July	20,800	3,920	8,950	1.07	1.23
August	10,500	3,800	5,370	.640	.74
September	20,800	3,470	6,450	.769	.86

Monthly discharge of Coosa River at Childersburg, Ala., for the years ending Sept. 30, 1915–1917—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1915–16.					
October	32,600	4,620	14,400	1.72	1.98
November	13,700	4,620	7,299	.869	.97
December	66,900	5,370	21,600	2.57	2.96
January	63,400	13,300	27,800	3.31	3.82
February	57,600	10,200	22,800	2.72	2.93
March	22,000	8,240	13,900	1.66	1.91
April	15,100	6,460	9,340	1.11	1.24
May	22,800	4,380	7,880	.940	1.05
June	13,300	6,180	8,820	1.05	1.17
1916–17.					
October	7,930	.....	4,800	.572	.66
November 1–7	6,460	4,700	5,480	.653	.17
December	24,100	4,620	7,240	.863	.99
January	42,300	9,190	24,900	2.97	3.42
February	79,700	10,900	36,000	4.29	4.47
March	94,800	19,600	60,000	7.15	8.24
April	93,000	10,500	36,900	4.40	4.91
May	13,000	6,750	8,500	1.01	1.16
June	15,900	6,010	8,410	1.00	1.12
July	17,400	4,860	7,880	.939	1.08
August	32,200	4,500	11,700	1.40	1.61
September	15,100	3,470	5,700	.679	.76

ETOWAH RIVER NEAR ROME, GA.

LOCATION.—At Freemans Ferry, a railroad stop on Nashville, Chattanooga & St. Louis Railway branch line from Kingston to Rome, Ga., 1 mile downstream from mouth of Dikes Creek and 5 miles upstream from Rome, Floyd County, where Etowah and Oostanaula rivers unite to form Coosa River.

DRAINAGE AREA.—1,800 square miles.

RECORDS AVAILABLE.—August 17, 1904, to September 30, 1917.

GAGE.—Vertical staff in three sections on left bank, 250 feet downstream from ferry. Read by R. M. Pattillo.

DISCHARGE MEASUREMENTS.—Made from boat held in place by ferry cable. Measurements cannot be made at high water.

CHANNEL AND CONTROL.—Bed composed of rock, boulders and gravel; practically permanent. Banks subject to overflow at extremely high stages. A shoal immediately below gage forms control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 23.5 feet at 6 p. m. March 4 and 7 a. m. March 5 (discharge obtained from extension of rating curve, 39,100 second-feet); minimum stage recorded, 1.75 feet at 7 a. m. and 6 p. m. September 22–23 (discharge, 848 second-feet).

1904–1917: Maximum stage recorded, 27.0 feet at 12 p. m. July 11, 1916 (discharge, 45,400 second-feet; prior to 1909 high water rating was not defined and estimates based on an extension of the rating cruve are considerably too large as shown by later measurements); minimum stage, 1.2 feet October 10 and 24, 1904 (discharge, 360 second-feet).

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—The operation of a few sawmills upstream apparently has no effect on flow.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 4,000 second-feet and extended tangent beyond that point. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good below 4,000 second-feet; determinations above that point subject to error because of impossibility of obtaining flood discharge measurements.

No discharge measurements were made during the year.

Daily discharge, in second-feet, of Etowah River near Rome, Ga., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,920	2,340	1,920	2,200	9,760	4,720	8,680	3,130	4,360	1,790	1,360	5,800
2	1,480	2,060	1,790	2,060	15,900	5,980	6,160	2,960	2,960	1,660	1,300	5,080
3	1,300	1,920	1,480	2,060	6,880	10,300	5,080	2,800	2,960	1,540	4,180	4,180
4	1,300	1,790	1,300	1,920	4,540	33,700	5,620	3,470	2,800	1,540	2,640	3,640
5	1,250	1,790	1,200	4,000	4,000	38,900	20,000	4,360	2,640	1,420	1,920	3,470
6	1,200	1,660	1,140	3,640	3,640	29,600	22,900	4,000	2,640	2,490	1,600	3,300
7	1,140	1,480	1,090	3,470	3,300	21,600	14,300	4,000	2,640	2,340	2,960	3,300
8	1,090	1,300	1,360	3,300	3,130	19,700	8,680	3,820	2,640	2,340	8,500	3,130
9	1,040	1,040	3,130	2,960	3,130	15,900	7,060	3,820	2,640	2,060	17,000	2,960
10	1,040	895	6,700	2,490	2,960	7,960	6,700	3,640	3,640	2,060	7,960	2,640
11	1,040	1,920	4,360	2,200	2,800	5,620	6,340	3,470	3,640	1,920	3,130	2,200
12	990	1,790	2,800	2,060	2,640	4,900	5,800	3,300	3,300	1,790	1,920	1,790
13	990	1,660	2,060	2,200	2,640	4,720	5,440	2,960	3,130	1,790	1,600	1,420
14	942	1,660	1,790	3,300	2,490	4,720	5,080	2,800	2,960	2,960	1,540	1,140
15	942	1,600	1,790	7,960	2,340	4,720	4,900	2,640	2,800	2,490	1,480	1,090
16	895	1,540	1,660	12,100	2,340	4,540	4,720	2,640	2,640	1,790	1,480	1,040
17	895	1,480	1,660	9,760	3,300	4,720	4,540	2,640	2,490	1,250	1,420	990
18	895	1,420	1,480	6,160	3,300	5,080	4,360	2,490	2,340	1,040	1,420	942
19	2,340	1,420	1,790	4,720	14,400	4,360	4,360	2,340	3,300	12,100	1,360	942
20	2,060	1,360	2,200	4,360	31,700	4,000	4,360	2,340	3,130	7,600	1,300	895
21	1,790	1,300	2,060	4,000	30,100	7,600	4,180	2,340	2,960	4,540	1,300	895
22	1,660	1,300	2,060	7,780	13,900	11,600	4,000	2,200	2,800	2,960	1,300	848
23	1,480	1,250	1,920	8,500	9,760	9,760	4,000	2,640	2,800	2,340	1,250	848
24	1,300	1,250	1,920	7,060	26,300	28,800	4,000	2,340	2,640	2,340	1,200	1,660
25	1,200	1,200	1,790	6,160	21,300	33,700	4,000	2,340	2,490	2,200	1,200	4,360
26	1,090	1,200	1,790	4,720	12,300	26,700	3,820	2,640	2,340	2,060	1,200	3,640
27	1,040	1,140	1,660	3,640	6,150	29,600	3,640	3,130	2,060	2,340	1,140	2,490
28	990	1,660	5,800	3,300	4,720	29,200	3,470	4,900	2,340	2,200	1,090	11,200
29	990	2,200	9,760	3,130	.....	22,000	3,300	4,360	2,060	1,920	1,090	15,200
30	942	2,060	4,360	2,960	.....	16,600	3,300	2,960	1,920	1,600	1,040	6,340
31	2,960	.....	2,340	2,640	.....	12,100	.....	2,340	.....	1,420	990	.....

Monthly discharge of Etowah River near Rome, Ga., for the year ending Sept. 30, 1917.

[Drainage area, 1,800 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,960	895	1,300	0.722	0.83
November	2,340	895	1,560	.867	.97
December	9,760	1,090	2,520	1.40	1.61
January	12,100	1,920	4,410	2.45	2.82
February	31,700	2,340	8,920	4.96	5.16
March	38,900	4,000	14,900	8.28	9.55
April	22,900	3,300	6,430	3.57	3.98
May	4,900	2,200	3,090	1.72	1.98
June	4,360	1,920	2,800	1.56	1.74
July	12,100	1,040	2,580	1.43	1.65
August	17,000	990	2,540	1.41	1.63
September	15,200	848	3,250	1.81	2.02
The year	38,900	848	4,500	2.50	33.94

TALLAPOOSA RIVER AT STURDEVANT, ALA.

LOCATION.—At bridge of Central of Georgia Railway one-fourth mile west of Sturdevant, Tallapoosa County, and 5 miles below mouth of Hillabee Creek.

DRAINAGE AREA.—2,460 square miles (2,500 square miles used in computing table of monthly means published in Water Supply Papers 322 and 352 for years 1912 and 1913).

RECORDS AVAILABLE.—July 19, 1900, to September 30, 1917.

GAGE.—Vertical staff on right bank, about 2,000 feet upstream from bridge; installed August 20, 1906; read by A. L. Stowe. Original staff, a gage attached to pier of railroad bridge, was read until July 10, 1905, when the present gage was substituted for the chain gage because it was impossible to obtain an observer for the chain gage. From August 21, 1906, to September 30, 1915, readings on the present staff gage were reduced to datum of original gage by means of comparative readings; since October 1, 1915, gage heights have been obtained from readings on the present staff gage without reference to datum of old gage, which has been removed.

DISCHARGE MEASUREMENTS.—Made from a plank walk resting on lower members of deck of railroad bridge.

CHANNEL AND CONTROL.—Bed rough and rocky; permanent. At extreme high stage water overflows banks. Control is a series of rock ledges and shoals below gage; permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 22.3 feet at 6.30 a. m. August 7 (discharge, 57,600 second-feet); minimum stage recorded, 0.7 foot at 5 p. m. October 17 (discharge, 860 second-feet).

1900–1917: Maximum stage recorded, 22.5 feet at 5 p. m. December 29, 1915 (discharge, 58,200 second-feet); minimum stage, −0.2 foot (old datum) October 25–29, 1904 (discharge, 250 second-feet).

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—Practically none.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 500 and 20,000 second-feet; extended above that point. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

No discharge measurements were made at this station during the year, but measurements made in 1918 indicate that there has been no change in stage-discharge relation.

Daily discharge, in second-feet, of Tallapoosa River at Sturdevant, Ala., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,400	1,080	2,400	3,060	6,180	4,770	6,640	3,210	2,650	2,280	1,490	2,170
2	1,670	1,110	2,060	3,530	9,840	7,840	7,360	3,210	3,210	2,280	1,670	2,280
3	1,290	1,140	1,760	3,060	7,360	18,000	7,840	3,210	2,920	2,060	1,490	11,400
4	1,180	1,110	1,580	3,860	5,150	44,100	32,700	4,580	2,400	2,650	2,780	12,500
5	1,110	1,080	1,490	4,960	4,210	41,100	30,600	4,030	2,170	4,580	2,780	5,150
6	1,080	1,040	1,410	4,030	3,530	27,000	27,300	4,030	1,960	3,530	21,900	2,170
7	1,040	1,040	1,370	3,060	3,210	21,900	20,400	4,030	1,490	2,170	51,600	1,860
8	1,040	1,040	1,410	2,520	3,060	11,400	16,200	3,530	2,060	1,960	21,900	1,760
9	1,010	1,080	2,170	2,280	3,060	7,840	13,600	3,210	2,400	1,860	14,200	1,670
10	1,010	1,080	2,280	2,060	2,920	6,640	10,100	3,060	4,030	1,670	13,300	4,390
11	980	1,140	2,170	1,860	2,780	5,960	8,080	2,920	3,370	1,760	8,080	3,690
12	980	1,180	1,960	3,060	2,780	5,350	7,120	2,780	2,780	1,580	3,690	2,170
13	980	1,250	1,760	7,360	2,650	5,150	6,880	2,780	2,520	1,410	4,030	2,060
14	950	1,220	1,580	15,900	2,520	4,960	8,080	2,650	1,860	1,760	3,370	1,860
15	950	1,290	1,490	15,300	2,780	4,390	6,400	2,520	2,400	1,330	2,650	1,490
16	890	1,250	1,490	4,960	3,210	4,390	5,150	2,520	1,670	1,490	2,280	1,290
17	860	1,220	1,490	6,640	3,060	4,580	4,960	2,400	1,580	1,490	3,370	1,250
18	1,180	1,180	1,490	7,600	4,770	4,960	4,770	2,400	1,960	4,960	3,860	1,140
19	4,390	1,140	1,670	5,960	7,840	4,580	4,770	2,280	1,860	4,030	2,520	1,040
20	2,520	1,140	1,580	5,150	17,700	4,210	4,580	2,280	1,490	4,580	3,690	1,080
21	1,860	1,140	2,060	4,770	20,100	7,360	4,770	2,170	1,490	4,580	2,170	1,040
22	1,490	1,140	1,860	6,880	14,700	20,700	4,580	3,370	2,060	5,960	1,960	980
23	1,290	1,670	1,670	7,840	10,400	13,600	4,210	2,780	1,960	3,690	2,920	980
24	1,220	2,400	1,580	10,100	13,000	17,100	4,030	2,400	1,580	2,920	2,060	1,180
25	1,180	2,280	1,490	8,800	13,300	25,500	3,860	2,280	1,490	4,390	1,670	1,670
26	1,140	1,580	1,410	5,150	11,700	21,300	3,860	2,280	1,580	2,780	1,490	7,360
27	1,140	1,490	1,410	5,150	6,180	30,900	3,690	2,170	1,760	3,690	1,410	6,180
28	1,110	1,760	3,530	4,390	4,030	27,600	3,530	3,530	1,490	2,400	1,370	18,600
29	1,140	2,780	10,900	4,770	.....	19,800	3,530	2,780	1,960	2,400	1,410	20,700
30	1,110	2,780	7,360	7,120	.....	12,800	3,370	2,650	2,920	2,280	1,330	16,200
31	1,110	.....	4,580	4,770	.....	8,320	.....	2,400	.....	1,760	1,860	.....

Monthly discharge of Tallapoosa River at Sturdevant, Ala., for the year ending Sept. 30, 1917.

[Drainage area, 2,460 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	4,390	860	1,330	0.541	0.62
November	2,780	1,040	1,390	.565	.63
December	10,900	1,370	2,340	.951	1.10
January	15,900	1,860	5,680	2.31	2.66
February	20,100	2,520	6,860	2.79	2.90
March	44,100	4,210	14,300	5.81	6.70
April	32,700	3,370	9,100	3.70	4.13
May	4,580	2,170	2,920	1.19	1.37
June	4,030	1,490	2,170	.882	.98
July	5,960	1,330	2,780	1.13	1.30
August	51,600	1,330	6,140	2.50	2.88
September	20,700	980	4,580	1.86	2.08
The year	51,600	860	4,960	2.02	27.35

MISCELLANEOUS MEASUREMENTS.

Miscellaneous discharge measurements in south Atlantic and eastern Gulf of Mexico drainage basins during the year ending Sept. 30, 1917.

Streams draining into the south Atlantic.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Oct. 8	Tallulah River	Tugaloo River	Former gaging station at Mathis, Ga.	0.44	119
Nov. 5	do	do	do	.91	217
Mar. 24	do	do	Georgia Railway & Power Co.'s dam at Tallulah Falls, Ga.	8.64	4,460
25	do	do	do	5.11	*a* 1,490
25	do	do	do	5.11	*a* 1,490
Apr. 4	do	do	do	2.41	*a* 150
4	do	do	do	2.47	*a* 165
5	do	do	do	4.60	*a* 1,270
6	do	do	do	1.56	*a* 11
July 23	Ohoopee Creek	Ohoopee River	Bridge on Norristown-Soperton Road, three-fourths mile from Norristown, Ga.		241
25	Tobesofkee Creek	Ocmulgee River	Highway bridge 8 miles west of Macon, Ga.		44
Feb. 27	Silver Spring River	Ocklawaha River	2½ miles below head of spring at Carmichael's boat landing near Silver Spring, Fla.		674
27	Silver Spring	Silver Spring River	Head of main spring forming Silver Spring River at Silver Spring, Fla.		342

Streams draining into eastern Gulf of Mexico.

Oct. 20	Chattahoochee River	Apalachicola River	Pace's Ferry bridge, 1 mile northeast of Vinings, Ga.	6.02	3,930
May 24	North Fork of Peachtree Creek.	Chattahoochee River	Wagon bridge on Doraville Road near Chamblee, Ga.		17.4
June 12	Cartecay River	Coosawattee River	Former gaging station near Cartecay, Ga.	.25	237
Sept. 19	do	do	Just below McHan's mill near Ellijay, Ga.	.92	90
30	do	do	do	.91	92
Feb. 13	Wakulla Spring	Wakulla River	Highway bridge 3 miles downstream from Wakulla Spring and 5 miles from Wakulla, Fla.		326
19	Ichatucknee River	Santa Fe River	Atlantic Coast Line Railway bridge, about 2 miles east of Hildreth, Fla.		342
18	Ichatucknee Spring	Ichatucknee River	300 feet below the spring, near Fort White, Fla.		44.4
19	Poe Spring	Santa Fe River	150 feet below the spring, 3 miles from High Springs, Fla.		86
21	Wekiva Spring	Gulf Hammock River	One-fourth mile below the spring and 15 miles south of Bronson, Fla.		65
21	Blue Spring Creek	Withlacoochee River	Highway bridge one-half east of Dunellon, Fla.		738
23	Weekiwachee Spring	Weekiwachee River	900 feet below the spring and 12 miles west of Brooksville, Fla.		145
24	Sulphur Spring	Hillsboro River	Head of the spring near Tampa, Fla.		35.5
25	Kissinger Spring	Peace River	Head of the spring 4½ miles southeast of Bartow, Fla.		21.3

a Discharge represents the waste over the dam and does not include the water diverted to the power house of the Georgia Railway & Power Co.

INDEX.

STREAM-GAGING STATIONS

AND

PUBLICATIONS RELATING TO WATER RESOURCES

PART II. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS

112129°—20—WSP 452——5

STREAM-GAGING STATIONS AND PUBLICATIONS RELATING TO WATER RESOURCES.

INTRODUCTION.

Investigation of water resources by the United States Geological Survey has consisted in large part of measurements of the volume of flow of streams and studies of the conditions affecting that flow, but it has comprised also investigation of such closely allied subjects as irrigation, water storage, water powers, ground waters, and quality of waters. Most of the results of these investigations have been published in the series of water-supply papers, but some have appeared in the bulletins, professional papers, monographs, and annual reports.

The results of stream-flow measurements are now published annually in 12 parts, each part covering an area whose boundaries coincide with natural drainage features as indicated below:

PART I. North Atlantic slope basins.
II. South Atlantic slope and eastern Gulf of Mexico basins.
III. Ohio River basin.
IV. St. Lawrence River basin.
V. Upper Mississippi River and Hudson Bay basins.
VI. Missouri River basin.
VII. Lower Mississippi River basin.
VIII. Western Gulf of Mexico basins.
IX. Colorado River basin.
X. Great Basin.
XI. Pacific slope basins in California.
XII. North Pacific slope basins, in three volumes:
A. Pacific slope basins in Washington and upper Columbia River basin.
B. Snake River basin.
C. Lower Columbia River basin and Pacific slope basins in Oregon.

HOW GOVERNMENT REPORTS MAY BE OBTAINED OR CONSULTED.

Water-supply papers and other publications of the United States Geological Survey containing data in regard to the water resources of the United States may be obtained or consulted as indicated below.

1. Copies may be obtained free of charge by applying to the Director of the Geological Survey, Washington, D. C. The edition printed for free distribution is, however, small and is soon exhausted.

2. Copies may be purchased at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C., who will on application furnish lists giving prices.

3. Sets of the reports may be consulted in the libraries of the principal cities in the United States.

4. Complete sets are available for consultation in the local offices of the water-resources branch of the Geological Survey as follows:

Boston, Mass., 2500 Customhouse.
Albany, N. Y., 704 Journal Building.
Atlanta, Ga., Post Office Building.
Madison, Wis., Capitol Building, c/o Railroad Commission of Wisconsin.
Helena, Mont., Montana National Bank Building.
Topeka, Kans., 23 Federal Building.
Austin, Tex., Capitol Building.
Denver, Colo., 403 New Post Office Building.
Salt Lake City, Utah, 313 Federal Building.
Boise, Idaho, 615 Idaho Building.
Tucson, Ariz., University of Arizona.
Portland, Oreg., 606 Post Office Building.
Tacoma, Wash., 406 Federal Building.
San Francisco, Calif., 328 Customhouse.
Los Angeles, Calif., 619 Federal Building.
Honolulu, Hawaii, 14 Capitol Building.

A list of the Geological Survey's publications may be obtained by applying to the Director of the United States Geological Survey, Washington, D. C.

STREAM-FLOW REPORTS.

Stream-flow records have been obtained at more than 4,240 points in the United States, and the data obtained have been published in the reports tabulated below:

Stream-flow data in reports of the United States Geological Survey.

[A=Annual Report; B=Bulletin; W=Water-Supply Paper.]

Report.	Character of data.	Year.
10th A, pt. 2	Descriptive information only	
11th A, pt. 2	Monthly discharge and descriptive information	1884 to Sept., 1890.
12th A, pt. 2	....do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years)	1895.
W 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
W 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas	1897.
W 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
W 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.

Stream-flow data in reports of the United States Geological Survey—Continued.

Report.	Character of data.	Year.
W 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
W 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
W 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
W 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
W 75	Monthly discharge	1901.
W 82 to 85	Complete data	1902.
W 97 to 100	do	1903.
W 124 to 135	do	1904.
W 165 to 178	do	1905.
W 201 to 214	do	1906.
W 241 to 252	do	1907–8.
W 261 to 272	do	1909.
W 281 to 292	do	1910.
W 301 to 312	do	1911.
W 321 to 332	do	1912.
W 351 to 362	do	1913.
W 381 to 394	do	1914.
W 401 to 414	do	1915.
W 431 to 444	do	1916.
W 451 to 464	do	1917.

NOTE—No data regarding stream flow are given in the 15th and 17th annual reports.

The records at most of the stations discussed in these reports extend over a series of years, and miscellaneous measurements at many points other than regular gaging stations have been made each year. An index of the reports containing records obtained prior to 1904 has been published in Water-Supply Paper 119.

The following table gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1917. The data for any particular station will in general be found in the reports covering the years during which the station was maintained. For example, data for Machias River at Whitneyville, Me., 1903 to 1917, are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, 351, 381, 401, 431, and 451, which contain records for the New England streams from 1903 to 1917. Results of miscellaneous measurements are published by drainage basins.

In these papers and in the following lists the stations are arranged in downstream order. The main stem of any river is determined by measuring or estimating its drainage area—that is, the headwater stream having the largest drainage area is considered the continuation of the main stream, and local changes in name and lake surface are disregarded. All stations from the source to the mouth of the main stem of the river are presented first, and the tributaries in regular order from source to mouth follow, the streams in each tributary basin being listed before those of the next basin below.

In exception to this rule the records for Mississippi River are given in four parts, as indicated on page III, and the records for large lakes are presented in order of streams around the rim of the lake.

Numbers of water-supply papers containing results of stream measurements, 1899–1917.

Year.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
												North Pacific slope basins.		
	North Atlantic slope basins (St. John River to York River).	South Atlantic slope and eastern Gulf of Mexico basins (James River to the Mississippi).	Ohio River basin.	St. Lawrence River basin.	Hudson Bay and upper Mississippi River basins.	Missouri River basin.	Lower Mississippi River basin.	Western Gulf of Mexico basins.	Colorado River basin.	Great Basin.	Pacific slope basins in California.	Pacific slope basins in Washington and upper Columbia River basin.	Snake River basin.	Lower Columbia River basin and Pacific slope basins in Oregon.
1899 [a]	35	[b] 35, 36	36	36	36	[c] 36, 37	37	37	[d] 37, 38	38, [e] 39	38, [f] 39	38	38	38
1900 [g]	47; [h] 48	48	48, [i] 49	49	49	49, [j] 50	50	50	50	51	51	51	51	51
1901	65, 75	65, 75	65, 75	65, 75	[k] 65, 66, 75	66, 75	[k] 65, 66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75
1902	82	[b] 82, 83	83	[l] 82, 83	[k] 83, 85	84	[k] 83, 84	84	85	85	85	85	85	85
1903	97	[b] 97, 98	98	97	[k] 98, 99, [m] 100	99	[k] 98, 99	99	100	100	100	100	100	100
1904	[n] 124, [o] 125, [p] 126	[p] 126, 127	128	129	[k] 128, 130	130, [q] 131	[k] 128, 131	132	133	133, [r] 134	134	135	135	135
1905	[n] 165, [o] 166, [p] 167	[p] 167, 168	169	170	171	172	[k] 179, 173	174	175, [s] 177	176, [r] 177	177	178	178	[t] 177, 178
1906	[n] 201, [o] 202, [p] 203	[p] 203, 204	205	206	207	208	[k] 205, 209	210	211	212, [r] 213	213	214	214	214
1907–8	241	242	243	244	245	246	247	248	249	250, [r] 251	251	252	252	252
1909	261	262	263	264	265	266	267	268	269	270, [r] 271	271	272	272	272
1910	281	282	283	284	285	286	287	288	289	290	291	292	292	292
1911	301	302	303	304	305	306	307	308	309	310	311	312	312	312
1912	321	322	323	324	325	326	327	328	329	330	331	332–A	332–B	332–C
1913	351	352	353	354	355	356	357	358	359	360	361	362–A	362–B	362–C
1914	381	382	383	384	385	386	387	388	389	390	391	392	393	394
1915	401	402	403	404	405	406	407	408	409	410	411	412	413	414
1916	431	432	433	434	435	436	437	438	439	440	441	442	443	444
1917	451	452	453	454	455	456	457	458	459	460	461	462	463	464

[a] Rating tables and index to Water-Supply Papers 35-39 contained in Water Supply Paper 39. Tables of monthly discharge for 1899 in Twenty-first Annual Report, Part IV.
[b] James River only.
[c] Gallatin River.
[d] Green and Gunnison rivers and Grand River above junction with Gunnison.
[e] Mohave River only.
[f] Kings and Kern rivers and south Pacific slope basins.
[g] Rating tables and index to Water-Supply Papers 47-52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52. Tables of monthly discharge for 1900 in Twenty-second Annual Report, Part IV.
[h] Wissahickon and Schuylkill rivers to James River.
[i] Scioto River.
[j] Loup and Platte rivers near Columbus, Nebr., and all tributaries below junction with Platte.
[k] Tributaries of Mississippi from east.
[l] Lake Ontario and tributaries to St. Lawrence River proper.
[m] Hudson Bay only.
[n] New England Rivers only.
[o] Hudson River to Delaware River, inclusive.
[p] Susquehanna River to Yadkin River, inclusive.
[q] Platte and Kansas rivers.
[r] Great Basin in California except Truckee and Carson river basins.
[s] Below junction with Gila.
[t] Rogue, Umpqua, and Siletz rivers only.

PRINCIPAL STREAMS.

The south Atlantic slope and eastern Gulf of Mexico drainage basins include streams flowing into the Atlantic Ocean and Gulf of Mexico from York River Va., to Pearl River, Miss., inclusive. The principal streams in this division are James, Roanoke, Cape Fear, Yadkin, Santee, Savannah, Altamaha, Apalachicola, Chotawhatchee, Mobile, and Pearl. The streams drain wholly or in part the States of Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Virginia.

In addition to the annotated list of publications relating specifically to the section, these pages contain a similar list of reports that are of general interest in many sections and cover a wide range of hydrologic subjects, and also brief references to reports published by State and other organizations. (See p. XVII.)

GAGING STATIONS.

NOTE.—Dash after a date indicates that station was being maintained September 30, 1917; period after a date indicates discontinuance. Tributaries are indicated by indention.

JAMES RIVER BASIN.

Jackson River (head of James) at Covington, Va., 1907–8.
James River at Buchanan, Va., 1895–
James River at Holcomb Rock, Va., 1900–1915.
James River at Cartersville, Va., 1899–
    Cowpasture River near Clifton Forge, Va., 1907–8.
    North River near Glasgow, Va., 1895–1905.
    Appomattox River at Mattoax, Va., 1900–1905.

ROANOKE RIVER BASIN.

Roanoke River at Roanoke, Va., 1896–
Roanoke River at Randolph, Va., 1900–1906.
Roanoke River above Dan River, at Clarksville, Va., 1895–1898.
Roanoke River at Old Gaston, N. C., 1911–
Roanoke River near Weldon, N. C., 1912.
Roanoke River at Neal, N. C., 1896–1903.
    Tinker Creek at Roanoke, Va., 1907–8.
    Back Creek near Roanoke, Va., 1907–8.
    Dan River at Madison, N. C., 1903–1908.
    Dan River at South Boston, Va., 1900–1907.
    Dan River at Clarksville, Va., 1895–1898.
        Banister River at Houston, Va., 1904–5.

TAR RIVER BASIN.

Tar River near Tarboro, N. C., 1896–1900.

NEUSE RIVER BASIN.

Neuse River near Selma, N. C., 1896–1900.

CAPE FEAR RIVER BASIN.

Haw River (head of Cape Fear River) near Moncure, N. C., 1898–9.
Cape Fear River near Fayetteville, N. C., 1889–1903.
Deep River near Cumnock, N. C., 1900–1902.
Deep River near Moncure, N. C., 1898–9.
Rockfish Creek near Brunt, N. C., 1902–3.

YADKIN (OR PEEDEE) RIVER BASIN.

Yadkin River (head of Peedee River) at North Wilkesboro, N. C., 1903–1909.
Yadkin River at Siloam, N. C., 1900–1901.
Yadkin River at Donnaha, N. C., 1913–
Yadkin River near Salisbury, N. C., 1895–1909; 1911–
Yadkin River near Norwood, N. C., 1896–1899.
Yadkin River near Peedee, N. C., 1906–1912.
Peedee River at Cheraw, S. C., 1909–1912.

SANTEE RIVER BASIN.

Catawba River (head of Santee River) at Old Fort, N. C., 1907.
Catawba River near Morganton, N. C., 1900; 1903–1909.
Catawba River at Rhodhiss, N. C., 1917–
Catawba River at Catawba, N. C., 1896–1902.
Catawba River near Rock Hill, S. C., 1895–1903.
Catawba River near Catawba, S. C., 1903–1905.
Wateree River (lower part of Catawba) near Camden, S. C., 1903–1910.
Mill Creek at Old Port, N. C., 1907.
Linville River at Fonta Flora, N. C., 1907–8.
Linville River near Bridgewater, N. C., 1900.
John River at Collettsville, N. C., 1907.
John River near Morganton, N. C., 1900–1901.
Broad River (of the Carolinas), head of Congaree River, at Uree, N. C., 1907–1909.
Broad River (of the Carolinas) at Dellinger, S. C., 1900–1901.
Broad River (of the Carolinas) near Gaffney, S. C., 1896–1899.
Broad River (of the Carolinas) at Alston, S. C., 1896–1907.
Green River near Saluda, N. C., 1907–1909.
Second Broad River near Logans Store, N. C., 1907–8.
Saluda River near Waterloo, S. C., 1896–1905.
Saluda River near Ninety Six, S. C., 1905.

EDISTO RIVER BASIN.

Four Hole Creek near Ridgeville, S. C., 1914–1917.

SAVANNAH RIVER BASIN.

Chattooga River (head of Savannah River) near Clayton, Ga., 1907–8.
Chattooga River near Tallulah Falls, Ga., 1917–
Tugaloo River (continuation of Chattooga River (near Toccoa, Ga., 1907–8.
Tugaloo River near Madison, S. C., 1898–1901; 1903–1910.
Savannah River near Calhoun Falls, S. C., 1896–1903.
Savannah River at Woodlawn, S. C., 1905–1910.
Savannah River at Augusta, Ga., 1899–1906.
Stekoa Creek near Clayton, Ga., 1907–8.
Tallulah River near Seed, Ga., 1916–
Tallulah River near Lakemont, Ga., 1916–
Tallulah River at Mathis, Ga., 1912–1916.
Tallulah River at Tallulah Falls, Ga., 1900–1901; 1904–1912.
Tiger Creek at Lakemont, Ga., 1916–

Savannah River tributaries—Continued.
Chauga River near Madison, S. C., 1907.
Seneca River near Clemson College, S. C., 1903–1905.
Broad River (of Georgia) near Carlton, Ga., 1897–1913.

OGEECHEE RIVER BASIN.

Ogeechee River near Millen, Ga., 1903.
Williamsons Swamp Creek near Davisboro, Ga., 1903–4
Canoochee River near Groveland, Ga., 1903–1907.

ALTAMAHA RIVER BASIN.

South River (head of Ocmulgee River, which is head of Altamaha River) near Lithonia, Ga., 1903–4.
Ocmulgee River near Jackson, Ga., 1906–1915.
Ocmulgee River near Floville, Ga., 1901–1905.
Ocmulgee River at Juliette, Ga., 1916–
Ocmulgee River at Macon, Ga., 1893–1913.
Yellow River at Almon, Ga., 1897; 1899–1901.
Alcovy River near Covington, Ga., 1901–1904.
Alcovy River near Stewart, Ga., 1905–6.
Towaliga River near Juliette, Ga., 1899–1901.
Oconee River at Barnett Shoals, near Watkinsville, Ga., 1902.
Oconee River near Greensboro, Ga., 1903–
Oconee River at Carey, Ga., 1896–1898.
Oconee River at Fraleys Ferry, near Milledgeville, Ga., 1906–1908; 1909–
Oconee River at Milledgeville, Ga., 1903–1905.
Oconee River at Dublin, Ga., 1894–1913.
Middle Oconee River near Athens, Ga., 1901–2.
Apalachee River near Buckhead, Ga., 1901–1908.
Ohoopee River near Reidsville, Ga., 1903–1907.

ST. JOHNS RIVER BASIN.

Silver Spring near Silver Springs, Fla., 1906–7.

FLORIDA EVERGLADES DRAINAGE CANALS.

North New River canal near Fort Lauderdale, Fla., 1913.
North New River canal near Rita, Fla., 1913.
South New River canal near Zona, Fla., 1913.
South New River canal near Rita, Fla., 1913.
Miami canal near Miami, Fla., 1913.

SUWANNEE RIVER BASIN.

Suwannee River near White Springs, Fla., 1906–1908.

APALACHICOLA RIVER BASIN.

Chattahoochee River (head of Apalachicola River) near Ariel, Ga., 1907–1909.
Chattahoochee River near Leaf, Ga., 1907.
Chattahoochee River near Gainsville, Ga., 1901–1903; 1917–
Chattahoochee River near Buford, Ga., 1901.
Chattahoochee River near Norcross, Ga., 1903–
Chattahoochee River at Oakdale, Ga., 1895–1904.
Chattahoochee River at West Point, Ga., 1896–1910; 1912–

REPORTS ON WATER RESOURCES OF THE SOUTH ATLANTIC AND EASTERN GULF STATES.

WATER-SUPPLY PAPERS.

Water-supply papers are distributed free by the Geological Survey as long as its stock lasts. An asterisk (*) indicates that this stock has been exhausted. Many of the papers marked in this way may, however, be purchased (at price noted) from the SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C. Omission of the price indicates that the report is not obtainable from Government sources. Water-supply papers are of octavo size.

*44. Profiles of rivers in the United States, by Henry Gannett. 1901. 100 pp., 11 pls. 15c.

Gives elevations and distances along rivers of the United States, and brief descriptions of many of the streams, including Roanoke, Cape Fear, Peedee, Santee, Savannah, Oconee, Apalachicola, Chattahoochee, Coosa, Tallapoosa, and Black Warrior rivers.

*57. Preliminary list of deep borings in the United States, Part I (Alabama-Montana), by N. H. Darton. 1902. 60 pp. 5c.

*61. Preliminary list of deep borings in the United States, Part II (Nebraska-Wyoming), by N. H. Darton. 1902. 67 pp. 5c.

A second, revised edition of Nos. 57 and 61 was published in 1905 as Water-Supply Paper 149 (q. v.)

62. Hydrography of the southern Appalachian Mountain region, Part I, by H. A. Pressey. 1902. 95 pp., 25 pls. 15c.

63. Hydrography of the southern Appalachian Mountain region, Part II, by H. A. Pressey. 1902. pp. 96–190, pls. 26–44. 15c.

Nos. 62 and 63 describe in a general way the mountains, rivers, climate, forests, soil, vegetation, and mineral resources of the southern Appalachian Mountains, and then discuss in detail the drainage basins, giving for each an account of the physical features, rainfall, forests, minerals, transportation, discharge measurements, and water powers. Most of the streams described are tributary through Tennessee River to the Ohio, but Part II (No. 63) includes also descriptions of several streams in the south Atlantic and eastern Gulf of Mexico drainage basins.

*67. The motions of underground waters, by C. S. Slichter. 1902. 106 pp., 8 pls. 15c.

Describes artesian well at Savannah, Ga.

96. Destructive floods in the United States in 1903, by E. C. Murphy. 1904. 81 pp., 13 pls. 15c.

Contains an account of flood on tributaries of Broad River (of the Carolinas) in Spartanburg County, S. C.

101. Underground waters of southern Louisiana, by G. D. Harris, with discussions of their uses for water supplies and for rice irrigation, by M. L. Fuller. 1904. 98 pp., 11 pls. 20c.

Describes the geology and ground-water conditions of the area, gives data in regard to artesian wells, and outlines methods of well drilling, pumping, and rice irrigation. Includes 23 analyses of ground water.

102. Contributions to the hydrology of eastern United States, 1903; M. L. Fuller, geologist in charge. 1904. 522 pp. 30c.

Contains brief reports on municipal water supplies, wells, and springs of Georgia, Florida, Alabama, and Mississippi. The reports comprise tabulated well records, giving information as to location, owner, depth, yield, head, etc., supplemented by notes as to elevation above sea, materials penetrated, temperature, use, and quality; many miscellaneous analyses.

*103. A review of the laws forbidding pollution of inland waters in the United States, by E. B. Goodell. 1904. 120 pp. Superseded by 152.

Cites statutory restrictions of water pollution in Alabama, Florida, Georgia, Mississippi, North Carolina, and Virginia.

*107. Water powers of Alabama, with an appendix on stream measurements in Mississippi, by B. M. Hall. 1904. 253 pp., 9 pls. 20c.

Contains gage heights, rating tables, and estimates of monthly discharge at stations on Tallapoosa, Coosa, Alabama, Cahaba, Black Warrior, and Tombigbee rivers and their tributaries, gives estimates and short descriptions of water powers.

110. Contributions to the hydrology of eastern United States, 1904; M. L. Fuller, geologist in charge. 1905. 211 pp., 5 pls. 10c.

Contains reports as follows:

Experiment relating to problems of well contamination at Quitman, Ga., by S. W. McCallie. Scope indicated by title.

Water resources of the Cowee and Pisgah quadrangles, North Carolina, by Hoyt S. Gale. Discusses drainage, springs, and mineral waters of one of the units of the geologic atlas of the United States.

*114. Underground waters of eastern United States; M. L. Fuller, geologist in charge. 1905. 285 pp., 18 pls. 25c.

Contains brief reports relating to south Atlantic and eastern Gulf of Mexico drainage areas as follows:

Virginia, by N. H. Darton and M. L. Fuller.
North Carolina, by M. L. Fuller.
South Carolina, by L. C. Glenn.
Georgia, by S. W. McCallie.
Florida, by M. L. Fuller.
Alabama, by A. E. Smith.
Mississippi, by L. C. Johnson.

Each of these reports describes the geology of the area in its relation to water supplies, notes the principal mineral springs, and gives list of pertinent publications.

115. River surveys and profiles made during 1903, arranged by W. C. Hall and J. C. Hoyt. 1905. 115 pp., 4 pls. 10c.

Contains results of surveys made to determine location of undeveloped power sites. Gives elevations and distances along Catawba, Tallulah, Chattooga, Tugaloo, Savannah, Broad, Ocmulgee, Yellow, South, Alcovy, Towaliga, and Chattahoochee rivers.

145. Contributions to the hydrology of eastern United States, 1905; M. L. Fuller, geologist in charge. 1905. 220 pp., 6 pls. 10c.

Contains "Notes on certain hot springs of the southern United States," by Walter Harvey Weed, including the "Warm springs of Georgia." Describes the location of the springs, the geologic conditions, and the composition of the waters (with analyses); estimates discharge.

*149. Preliminary list of deep borings in the United States, second edition with additions, by N. H. Darton. 1905. 175 pp. 10c.

Gives by States (and within the States by counties) location, depth, diameter, yield, height of water, and other valuable information concerning wells 400 feet or more in depth; includes all wells listed in Water-Supply Papers 57 and 61; mentions also principal publications relating to deep borings.

*152. A review of the laws forbidding pollution of inland waters in the United States (second edition), by E. B. Goodell. 1905. 149 pp. 10c.

Cites statutory restrictions of water pollution in Alabama, Georgia, Florida, Mississippi, North Carolina, and Virginia.

159. Summary of the underground-water resources of Mississippi, by A. F. Crider and L. C. Johnson. 1906. 86 pp., 6 pls. 20c.

Describes geography, topography, and general geology of the State; discusses the source, depth of penetration, rate of percolation, and recovery of ground waters; artesian requisites, and special conditions in the Coastal Plain formations; gives notes on wells by counties, deep-well records, and selected records in detail; treats of sanitary aspect of wells and gives analyses.

*160. Underground-water papers, 1906; M. L. Fuller, geologist in charge. 1906. 104 pp., 1 pl.

Contains brief report entitled "Peculiar mineral waters from crystalline rocks of Georgia," by Myron L. Fuller, discussing origin of certain mineral springs and wells near Austell; gives analyses.

*162. Destructive floods in the United States in 1905, with a discussion of flood discharge and frequency and an index to flood literature, by E. C. Murphy and others. 1906. 105 pp., 4 pls. 15c.

Gives estimates of flood discharge and frequency on Cape Fear, Savannah, Alabama, and Black Warrior rivers.

*197. Water resources of Georgia, by B. M. and M. R. Hall. 1907. 342 pp., 1 pl. 50c.

Describes topographic and geologic features of the State; discusses by drainage basins, stream flow, river surveys, and water powers.

236. The quality of surface waters in the United States: Part I, Analyses of waters east of the one hundredth meridian, by R. B. Dole. 1909. 123 pp. 10c.

Describes collection of samples, methods of examination, preparation of solutions, accuracy of estimates, and expression of analytical results; gives results of analyses of waters of James, Roanoke, Dan, Neuse, Cape Fear, Peedee, Wateree, Saluda, Savannah, Ocmulgee, Oconee, Chattahoochee, Flint, Oostanaula, Alabama, Cahaba, Tombigbee, and Pearl rivers.

*258. Underground water papers, 1910; by M. L. Fuller, F. G. Clapp, G. C. Matson, Samuel Sanford, and H. C. Wolff. 1911. 123 pp., 2 pls. 15c. Contains:

Saline artesian waters of the Atlantic coastal plain, by Samuel Sanford. Discusses briefly the geology of the Coastal Plain, the artesian waters, the occurrence and character of the salt waters, the causes of salinity, and lateral changes in salinity.

*319. Geology and ground waters of Florida, by G. C. Matson and Samuel Sanford. 1913. 445 pp., 17 pls. 60c.

Describes the characteristic upland, lowland, and coastal features of the State—the springs, lakes, caverns, sand dunes, coral reefs, bars, inlets, tidal runways, pine lands, swamps, keys, and ocean currents; discusses in detail the stratigraphic position, lithologic character, thickness, physiographic expression, structure, and areal distribution of the geologic formations; treats of the source, amount, depth, circulation, and recovery of ground waters, the artesian waters, and public water supplies; and gives details concerning source, quality, and development of the water supplies by counties. Discusses briefly the quality of the well waters.

341. Underground waters of the Coastal Plain of Georgia, by L. W. Stephenson and J. O. Veatch, and a discussion of the quality of the waters, by R. B. Dole. 1915. 539 pp., 21 pls. 50c.

Describes the physiographic features of the State, the geologic provinces, the areal distribution, stratigraphic position, and lithologic character of the rocks belonging to the geologic systems; discusses the source and amount of the ground waters, the uses of the springs and shallow and artesian wells, and the distribution of the ground waters in the rocks of the various formations; gives details concerning each county. The chapter on the chemical character of the waters describes standards for classification and the general requisites of waters for miscellaneous industrial uses and for domestic use; treats also of methods of purifying water and of the relation of quality to geographic position, to water-bearing stratum, and to depth.

364. Water analyses from the laboratory of the United States Geological Survey, tabulated by F. W. Clarke, chief chemist. 1914. 40 pp. 5c.

Contains analyses of spring and well waters in Virginia, North Carolina, South Carolina, and Florida, and of water from the Gulf of Mexico.

ANNUAL REPORTS.

Each of the papers contained in the annual reports was also issued in separate form.

Annual reports are distributed free by the Geological Survey as long as its stock lasts. An asterisk (*) indicates that this stock has been exhausted. Many of the papers so marked, however, may be purchased from the SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C.

*Tenth Annual Report of the United States Geological Survey, 1888–89, J. W. Powell, Director. 1890. 2 parts. *Pt. I. Geology, xv, 774 pp., 98 pls. $2.35. Contains:

*General account of the fresh-water morasses of the United States, with a description of the Dismal Swamp district of Virginia and North Carolina, by N. S. Shaler, pp. 235–339, pls. 6–19. Scope indicated by title.

Fourteenth Annual Report of the United States Geological Survey, 1892–93, J. W. Powell, Director. 1893. (Pt. II, 1894.) 2 parts. *Pt. II. Accompanying papers, xx, 597 pp., 73 pls. $2.10. Contains:

*Potable waters of eastern United States, by W. J. McGee, pp. 1–47. Discusses cistern water, stream waters, and ground waters, including mineral springs and artesian wells.

PROFESSIONAL PAPERS.

Professional papers are distributed free by the Geological Survey as long as its stock lasts. An asterisk (*) indicates that this stock has been exhausted. Many of the papers marked with an asterisk may, however, be purchased from the SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C. Professional papers are of quarto size.

*37. The southern Appalachian forests, by H. B. Ayres and W. W. Ashe. 1905. 291 pp., 37 pls. 80c.

Describes the relief, drainage, climate, natural resources, scenery, and water supply of the southern Appalachian forests, the trees, shrubs, and rate of growth; gives details concerning forests by drainage basins, including New, Holston (southern tributaries of South Fork only), Watauga, Nolichucky, French Broad, Pigeon, Little Tennessee, Hiwassee, Tallulah-Chattooga, Toxaway, Saluda and First and Second Broad Rivers, Catawba and Yadkin rivers, describing many of the tributaries of each of the master streams.

*72. Denudation and erosion in the southern Appalachian region and the Monongahela basin, by L. C. Glenn. 1911. 137 pp., 21 pls. 35c.

Describes the topography, geology, drainage, forests, climate, and population, and transportation facilities of the region, the relation of agriculture, lumbering, mining, and power development to erosion and denudation, and the nature, effects, and remedies of erosion; gives details of conditions in Holston, Nolichucky, French Broad, Little Tennessee, and Hiwassee River basins, along Tennessee River proper, and in the basins of the Coosa-Alabama system, Chattahoochee, Savannah, Saluda, Broad, Catawba, Yadkin, New, and Monongahela rivers.

*90. Shorter contributions to general geology, 1914; David White, chief geologist. 1915. 199 pp., 21 pls. 40c.

Issued also in separate chapters. The following paper relates in part to ground water:
(*h*) A deep well at Charleston, S. C., by L. W. Stephenson, with a report on the mineralogy of the water, by Chase Palmer (pp. 69–94).

BULLETINS.

An asterisk (*) indicates that the Geological Survey's stock of the paper is exhausted. Many of the papers so marked may be purchased from the SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C. Bulletins are of octavo size.

*138. Artesian-well prospects in the Atlantic Coastal Plain region, by N. H. Darton. 1896. 232 pp., 19 pls.

Describes the general geologic structure of the Atlantic Coastal Plain region and summarizes the conditions affecting subterranean water in the Coastal Plain; discusses the general geologic relations in New York, southern New Jersey, Delaware, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, and eastern Georgia; gives for each of the States a list of the deep wells and discusses well prospects. The notes on the wells that follow the tabulated lists contain many sections and analyses of the waters.

*264. Record of deep-well drilling for 1904, by M. L. Fuller, E. F. Lines, and A. C. Veatch. 1905. 106 pp. 10c.

Discusses the importance of accurate well records to the driller, to owners of oil, gas, and water wells, and to the geologist; describes the general methods of work; gives tabulated records of wells in Alabama, Florida, Georgia, Mississippi, and North Carolina, and detailed records of wells in Hancock and Jackson counties, Mississippi. These wells were selected because they give definite stratigraphic information.

*298. Record of deep-well drilling for 1905, by M. L. Fuller and Samuel Sanford. 1906. 299 pp. 25c.

Gives an account of progress in the collection of well records and samples; contains tabulated records of wells in Alabama, Florida, Georgia, Mississppi, North Carolina, South Carolina, and Virginia; and detailed records of wells in Madison, Marengo, and Mobile counties, Alabama; Duval, Escambia, Sumter, and Volusia counties, Florida; Chatham, Decatur, Fulton, Pierce, and Tatnall counties, Georgia; Lenoir, New Hanover, and Moore counties, North Carolina; Hancock, Harrison, Jackson, Jones, Marshall, Newton, and Panola counties Mississippi; and Aiken, Barnwell, Charleston, Hampton, Lee, and Orangeburg counties, South Carolina. The wells of which detailed sections are given were selected because they afford valuable stratigraphic information.

GEOLOGIC FOLIOS.

Under the plan adopted for the preparation of a geologic map of the United States the entire area is divided into small quadrangles, bounded by certain meridians and parallels, and these quadrangles, which number several thousand, are separately surveyed and mapped.[1] The unit of survey is also the unit of publication, and the maps and description of each quadrangle are issued in the form of a folio. When all the folios are completed they will constitute the Geologic Atlas of the United States.

A folio is designated by the name of the principal town or of a prominent natural feature within the quadrangle. Each folio includes maps showing the topography, geology, underground structure, and mineral deposits of the area mapped and several pages of descriptive text. The text explains the maps and describes the topographic and geologic features of the country and its mineral products. The topographic map shows roads, railroads, waterways, and, by contour lines, the shapes of the hills and valleys and the height above sea level of all points in the quadrangle. The areal-geology map shows the distribution of the various rocks at the surface. The structural-geology map shows the relations of the rocks to one another underground. The economic-geology map indicates the location of mineral deposits that are commercially valuable. The artesian-water map shows the depth to underground water horizons. Economic-geology and artesian-water maps are included in folios if the conditions in the areas mapped warrant their publication. The folios are of special interest to students of geography and geology and are valuable as guides in the development and utilization of mineral resources.

The folios numbered from 1 to 163, inclusive, are published in only one form (18 by 22 inches), called the library edition. Some of the folios that bear numbers higher than 163 are published also in an octavo edition (6 by 9 inches). Owing to a fire in the Geologic Survey building May 18, 1913, the stock of geologic folios was more or less damaged by fire and water, but many of the folios are usable. The damaged folios are sold at the uniform price of 5 cents each, with no reduetion for wholesale orders. This rate applies to folios in stock from 1 to 184, inclusive (except reprints), also to the library edition of folio 186. The library edition of folios 185, 187, and higher numbers sells for 25 cents a copy, except that some folios which contain an unusually large amount of matter sell at higher prices. The octavo edition of folio 185 and higher numbers sells for 50 cents a copy, except folio 193, which sells for 75 cents a copy. A discount of 40 per cent is allowed on an order for folios, or for folios together with topographic maps amounting to $5 or more at the retail rate.

All the folios contain descriptions of the drainage of the quadrangles. The folios in the following list contain also brief discussions of the ground waters in connection with the economic resources of the areas and more or less information concerning the utilization of the water resources.

*80. Norfolk, Virginia-North Carolina.

Describes the plains, Dismal Swamp, and the tidal marshes; discusses the reclamation of swamp lands and gives an account of the ground waters; gives sections of wells near Norfolk and at Fort Monroe, and analyses of waters from the test borings at Norfolk and the boring at Lambert Point.

90 Cranberry, North Carolina-Tennessee. 5c.

*124. Mount Mitchell, North Carolina-Tennessee.

*147. Pisgah, North Carolina-South Carolina.

*175. Birmingham, Alabama.[2] 5c.

187. Ellijay, Georgia-North Carolina-Tennessee.[3] 25c.

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[1] Index maps showing areas in the South Atlantic States covered by topographic maps and by geologic folios will be mailed on receipt of request addressed to the Director, U. S. Geological Survey, Washington, D. C.

[2] Octavo edition only.

[3] Octavo edition, 50c.

MISCELLANEOUS REPORTS.

Other Federal bureaus and State and other organizations have from time to time published reports relating to the water resources of the various sections of the country. Notable among those pertaining to the South Atlantic States are the reports of the State surveys of North Carolina, Georgia, Florida, and Alabama, and the Tenth Census (vol. 16).

The following reports deserve special mention:

Hydrography of Virginia, by N. C. Grover and R. H. Bolster: Virginia Geol. Survey Bull. 3, 1906.

Underground waters of the Coastal Plain province of Virginia, by Samuel Sanford: Virginia Geol. Survey Bull. 5, 1913.

Survey water supply of Virginia, by G. C. Stevens: Virginia Geol. Survey Bull. 10, 1916.

A preliminary report on the water powers of Georgia, by B. M. Hall: Georgia Geol. Survey Bull. 3–A, 1896.

A preliminary report on the artesian-well system of Georgia, by S. W. McCallie: Georgia Geol. Survey Bull. 7, 1898.

A preliminary report on the underground waters of Georgia, by S. W. McCallie: Georgia Geol. Survey Bull. 15, 1908.

Second report on the water powers of Georgia, by B. M. Hall and M. R. Hall: Georgia Geol. Survey Bull. 16, 1908.

A preliminary report on the mineral springs of Georgia, by S. W. McCallie: Georgia Geol. Survey Bull. 20, 1913.

Reports on condition of water supply at Savannah, Ga. Mayor of Savannah Ann. Rept., 1915.

Contains the following papers submitted by the United States Geological Survey:
Preliminary report on Savannah water supply, by L. W. Stephenson and R. B. Dole. Pp. 1–14.
The water supply of Savannah, Ga., by R. B. Dole. Pp. 15–89.
These papers discuss the yield and head of the artesian wells of Savannah, the consumption of water, the sanitary and chemical quality of the water, and the cost of operation. They give the results of fluorescein tests and several analyses of surface and ground waters. They conclude with recommendations for future developments.

A preliminary report on the underground water supply of central Florida, by E. H. Sellards: Florida Geol. Survey Bull. 1, 1908.

Underground waters of Mississippi; a preliminary report by W. N. Logan and W. R. Perkins: Mississippi Agr. Exper. Sta. Bull. 89, 1905.

Report of the Secretary of Agriculture in relation to the forests, rivers, and mountains of the southern Appalachian region: 57th Congress, 1st sess., S. Doc. 84, 1902.

Underground water resources of Alabama, by E. A. Smith. Montgomery, Ala., 1907.

Preliminary report on part of the water powers of Alabama, by B. M. Hall: Alabama Geol. Survey Bull. 7, 1903.

Papers on the water power in North Carolina, a preliminary report by George F. Swain, J. A. Holmes, and E. W. Myers: North Carolina Geol. Survey Bull. 8, 1899.

The Coastal Plain of North Carolina, by W. B. Clark, B. L. Miller, L. W. Stephenson, B. L. Johnson, and H. N. Parker: North Carolina Geol. and Econ. Survey Rept., vol. 3, 1912.

Many of these reports can be obtained by applying to the several organizations, and most of them can be consulted in the public libraries of the larger cities.

GEOLOGICAL SURVEY HYDROLOGIC REPORTS OF GENERAL INTEREST.

The following list comprises reports not readily classifiable by drainage basins and covering a wide range of hydrologic investigations:

WATER-SUPPLY PAPERS.

*1. Pumping water for irrigation, by H. M. Wilson. 1896. 57 pp., 9 pls.
Describes pumps and motive powers, windmills, water wheels, and various kinds of engines; also storage reservoirs to retain pumped water until needed for irrigation.

*3. Sewage irrigation, by G. W. Rafter. 1897. 100 pp., 4 pls. 10c. (See Water-Supply Paper 22.)
Discusses methods of sewage disposal by intermittent filtration and by irrigation; describes utilization of sewage in Germany, England, and France and sewage purification in the United States.

*8. Windmills for irrigation, by E. C. Murphy. 1897. 49 pp., 8 pls. 10c.
Gives results of experimental tests of windmills during the summer of 1896 in the vicinity of Garden, Kans.: describes instruments and methods and draws conclusions.

*14. New tests of certain pumps and water lifts used in irrigation, by O. P. Hood, 1898. 91 pp., 1 pl.
Discusses efficiency of pumps and water lifts of various types.

*20. Experiments with windmills, by T. O. Perry. 1899. 97 pp., 12 pls. 15c.
Includes tables and descriptions of wind wheels, compares wheels of several types, and discusses results.

*22. Sewage irrigation, Part II, by G. W. Rafter. 1899. 100 pp., 7 pls. 15c.
Gives résumé of Water-Supply Paper No. 3; discusses pollution of certain streams, experiments on purification of factory wastes in Massachusetts, value of commercial fertilizers, and describes American sewage-disposal plants by States; contains bibliography of publications relating to sewage, utilization, and disposal.

*41. The windmill; its efficiency and economic use, Part I, by E. C. Murphy. 1901. 72 pp., 14 pls. 5c.

*42. The windmill; its efficiency and economic use, Part II, by E. C. Murphy. 1901. 75 pp. (73–147), 2 pls. (15–16). 10c.
Nos. 41 and 42 give details of results of experimental tests with windmills of various types.

*43. Conveyance of water in irrigation canals, flumes, and pipes, by Samuel Fortier, 1901. 86 pp., 15 pls. 15c.

*56. Methods of stream measurement. 1901. 51 pp., 12 pls. 15c.
Describes the methods used by the Survey in 1901–2. (See also Nos. 64, 94, and 95.)

*64. Accuracy of stream measurements, by E. C. Murphy. 1902. 99 pp., 4 pls. (See No. 95.) 10c.
Describes methods of measuring velocity of water and of measuring and computing stream flow and compares results obtained with the different instruments and methods; describes also experiments and results at the Cornell University hydraulic laboratory. A second, enlarged edition published as Water-Supply Paper 95.

*67. The motions of underground waters, by C. S. Slichter. 1902. 106 pp., 8 pls. 15c.
Discusses origin, depth, and amount of ground waters; permeability of rocks and porosity of soils; causes, rates, and laws of motions of ground water; surface and deep zones of flow, and recovery of waters by open wells and artesian and deep wells; treats of the shape and position of the water table; gives simple methods of measuring yield of flowing wells.

72. Sewage pollution in the metropolitan area near New York City and its effect on inland water resources, by M. O. Leighton. 1902. 75 pp., 8 pls. 10c.
Defines "normal" and "polluted" waters and discusses the damage resulting from pollution.

*30. The relation of rainfall to run-off, by G. W. Rafter. 1903. 104 pp. 10c.
Treats of measurements of rainfall and laws and measurements of stream flow; gives rainfall run-off, and evaporation formulas; discusses effects of forests on rainfall and run-off.

87. Irrigation in India (second edition), by H. M. Wilson. 1903. 238 pp., 27 pls. 25c.
First edition was published in Part II of the Twelfth Annual Report.

93. Proceedings of first conference of engineers of the Reclamation Service, with accompanying papers, compiled by F. H. Newell, chief engineer. 1904. 361 pp. 25c. [Requests for this report should be addressed to the U. S. Reclamation Service.]
Contains the following papers of more or less general interest:
Limits of an irrigation project, by D. W. Ross.
Relation of Federal and State laws to irrigation, by Morris Bien.
Electrical transmission of power for pumping, by H. A. Storrs.
Correct design and stability of high masonry dams, by Geo. Y. Wisner.
Irrigation surveys and the use of the plane table, by J. B. Lippincott.
The use of alkaline waters for irrigation, by Thomas H. Means.

*94. Hydrographic manual of the United States Geological Survey, prepared by E. C. Murphy, J. C. Hoyt, and G. B. Hollister. 1904. 76 pp., 3 pls. 10c.
Gives instruction for field and office work relating to measurements of stream flow by current meters. See also No. 95.

*95. Accuracy of stream measurement (second, enlarged edition), by E. C. Murphy. 1904. 169 pp., 6 pls.
Describes methods of measuring and computing stream flow and compares results derived from different instruments and methods. See also No. 94.

*103. A review of the laws forbidding pollution of inland waters in the United States, by E. B. Goodell. 1904. 120 pp. Superseded by No. 152, q. v.
Explains the legal principles under which antipollution statutes become operative, quotes court decisions to show authority for various deductions, and classifies according to scope the statutes enacted in the different States.

110. Contributions to the hydrology of eastern United States, 1904; M. L. Fuller, geologist in charge. 1905. 211 pp., 5 pls. 10c.
Contains the following reports of general interest. The scope of each paper is indicated by its title.
Description of underflow meter used in measuring the velocity and direction of underground water, by Charles S. Slichter.
The California or "stovepipe" method of well construction, by Charles S. Slichter.
Approximate methods of measuring the yield of flowing wells, by Charles S. Slichter.
Corrections necessary in accurate determinations of flow from vertical well casings, from notes furnished by A. N. Talbot.
Experiment relating to problems of well contamination at Quitman, Ga., by S. W. McCallie.

113. The disposal of strawboard and oil-well wastes, by R. L. Sackett and Isaiah Bowman. 1905. 52 pp., 4 pls. 5c.
The first paper discusses the pollution of streams by sewage and by trade wastes, describes the manufacture of strawboard and gives results of various experiments in disposing of the waste. The second paper describes briefly the topography, drainage, and geology of the region about Marion, Ind., and the contamination of rock wells and of streams by waste oil and brine.

*114. Underground waters of eastern United States; M. L. Fuller, geologist in charge. 1905. 285 pp., 18 pls. 25c.
Contains report on "Occurrence of underground waters," by M. L. Fuller, discussing sources, amount, and temperature of waters; permeability and storage capacity of rocks, water-bearing formations; recovery of water by springs, wells, and pumps; essential conditions of artesian flows; and general conditions affecting underground waters in eastern United States.

119. Index to the hydrographic progress reports of the United States Geological Survey, 1888 to 1903, by J. C. Hoyt and B. D. Wood. 1905. 253 pp. 15c.

120. Bibliographic review and index of papers relating to underground waters published by the United States Geological Survey, 1879–1904, by M. L. Fuller. 1905. 128 pp. 10c.

*122. Relation of the law to underground waters, by D. W. Johnson. 1905. 55 pp. 5c.

Defines and classifies underground waters, gives common-law rules relating to their use, and cites States legislative acts affecting them.

140. Field measurements of the rate of movement of underground waters, by C. S. Slitcher. 1905. 122 pp., 15 pls. 15c.

Discusses the capacity of sand to transmit water; describes measurements of underflow in Rio Hondo, San Gabriel, and Mohave River valleys, Cal., and on Long Island, N. Y.; gives results of tests of wells and pumping plants, and describes stovepipe method of well construction.

143. Experiments on steel-concrete pipes on a working scale, by J. H. Quinton. 1905. 61 pp., 4 pls. 5c.

Scope indicated by title.

145. Contributions to the hydrology of eastern United States, 1905; M. L. Fuller, geologist in charge. 1905. 220 pp., 6 pls. 10c.

Contains brief reports of general interest as follows:

Drainage of ponds into drilled wells, by Robert E. Horton. Discusses efficiency, cost, and capacity of drainage wells and gives statistics of such wells in southern Michigan.

Construction of so-called fountain and geyser springs, by Myron L. Fuller.

A convenient gage for determining low artesian heads, by Myron L. Fuller.

146. Proceedings of second conference of engineers of the Reclamation Service, with accompanying papers, compiled by F. H. Newell, Chief Engineer. 1905. 267 pp. 15c. [Inquiries concerning this report should be addressed to the Reclamation Service.]

Contains brief account of the organization of the hydrographic [water resources] branch and the Reclamation Service, reports of conferences and committees, circulars of instruction, and many brief reports on subjects closely related to reclamation, and a bibliography of technical papers by members of the service. Of the papers read at the conference those listed below (scope indicated by title) are of more or less general interest:

Proposed State code of water laws, by Morris Bien.
Power engineering applied to irrigation problems, by O. H. Ensign.
Estimates on tunneling in irrigation projects, by A. L. Fellows.
Collection of stream-gaging data, by N. C. Grover.
Diamond-drill methods, by G. A. Hammond.
Mean-velocity and area curves, by F. W. Hanna.
Importance of general hydrographic data concerning basins of streams gaged, by R. E. Horton.
Effect of aquatic vegetation on stream flow, by R. E. Horton.
Sanitary regulations governing construction camps, by M. O. Leighton.
Necessity of draining irrigated land, by Thos. H. Means.
Alkali soils, by Thos. H. Means.
Cost of stream-gaging work, by E. C. Murphy.
Equipment of a cable gaging station, by E. C. Murphy.
Silting of reservoirs, by W. M. Reed.
Farm-unit classification, by D. W. Ross.
Cost of power for pumping irrigating water, by H. A. Storrs.
Records of flow at current-meter gaging stations during the frozen season, by F. H. Tillinghast.

147. Destructive floods in United States in 1904, by E. C. Murphy and others. 1905. 206 pp., 18 pls. 15c.

Contains a brief account of "A method of computing cross-section area of waterways," including formulas for maximum discharge and areas of cross section.

*150. Weir experiments, coefficients, and formulas, by R. E. Horton. 1906. 189 pp., 38 pls. (See Water-Supply Paper 200.) 15c.

Scope indicated by title.

151. Field assay of water, by M. O. Leighton. 1905. 77 pp., 4 pls.

Discusses methods, instruments, and reagents used in determining turbidity, color, iron, chlorides, and hardness in connection with the studies of the quality of water in various parts of the United States.

*152. A review of the laws forbidding pollution of inland waters in the United States, second edition, by E. B. Goodell. 1905. 149 pp. 10c.

Scope indicated by title.

*155. Fluctuations of the water level in wells, with special reference to Long Island, N. Y., by A. C. Veatch. 1906. 83 pp., 9 pls. 25c.

Includes general discussion of fluctuations due to rainfall and evaporation, barometric changes, temperature changes, changes in rivers, changes in lake level, tidal changes, effects of settlement, irrigation, dams, underground-water development, and to indeterminate causes.

*160. Underground-water papers, 1906; M. L. Fuller, geologist in charge. 1906. 104 pp., 1 pl.

Gives account of work in 1905, lists publications relating to underground waters, and contains the following brief reports of general interest:

Significance of the term "artesian," by Myron L. Fuller.
Representation of wells and springs on maps, by Myron L. Fuller.
Total amount of free water in the earth's crust, by Myron L. Fuller.
Use of fluorescein in the study of underground waters, by R. B. Dole.
Problems of water contamination, by Isaiah Bowman.
Instances of improvement of water in wells, by Myron L. Fuller.

*162. Destructive floods in the United States in 1905, with a discussion of flood discharge and frequency and an index to flood literature, by E. C. Murphy and others. 1906. 105 pp., 4 pls. 15c.

*163. Bibliographic review and index of underground-water literature published in the United States in 1905, by M. L. Fuller, F. G. Clapp, and B. L. Johnson. 1906. 130 pp. 15c.

Scope indicated by title.

*179. Prevention of stream pollution by distillery refuse, based on investigations at Lynchburg, Ohio, by Herman Stabler. 1906. 34 pp., 1 pl. 10c.

Describes grain distillation, treatment of slop, sources, character, and effects of effluents on streams; discusses filtration, precipitation, fermentation, and evaporation methods of disposal of wastes without pollution.

*180. Turbine water-wheel tests and power tables, by R. E. Horton. 1906. 134 pp., 2 pls. 20c.

Scope indicated by title.

*185. Investigations on the purification of Boston sewage, * * * with a history of the sewage-disposal problem, by C.-E. A. Winslow and E. B. Phelps, 1906. 163 pp. 25c.

Discusses composition, disposal, purification, and treatment of sewages and tendencies in sewage-disposal practice in England, Germany, and the United States; describes character of crude sewage at Boston, removal of suspended matter, treatment in septic tanks, and purification in intermittent sand filtration and coarse material; gives bibliography.

*186. Stream pollution by acid-iron wastes, a report based on investigations made at Shelby, Ohio, by Herman Stabler. 1906. 36 pp., 1 pl.

Gives history of pollution by acid-iron wastes at Shelby, Ohio, and resulting litigation; discusses effect of acid-iron liquors on sewage purification processes, recovery of copperas from acid-iron wastes, and other processes for removal of pickling liquor.

*187. Determination of stream flow during the frozen season, by H. K. Barrows and R. E. Horton. 1907. 93 pp., 1 pl. 15c.

Scope indicated by title.

*189. The prevention of stream pollution by strawboard waste, by E. B. Phelps, 1906. 29 pp., 2 pls.

Describes manufacture of strawboard, present and proposed methods of disposal of waste liquors, laboratory investigations of precipitation and sedimentation, and field studies of amounts and character of water used, raw material and finished product, and mechanical filtration.

*194. Pollution of Illinois and Mississippi rivers by Chicago sewage (a digest of the testimony taken in the case of the State of Missouri *v.* the State of Illinois and the Sanitary District of Chicago), by M. O. Leighton. 1907. 369 pp., 2 pls.

Scope indicated by amplification of title.

*200. Weir experiments, coefficients, and formulas (revision of Paper No. 150), by R. E. Horton. 1907. 195 pp., 38 pls. 35c.
Scope indicated by title.

*226. The pollution of streams by sulphite-pulp waste, a study of possible remedies, by E. B. Phelps. 1909. 37 pp., 1 pl. 10c.
Describes manufacture of sulphite pulp, the waste liquors, and the experimental work leading to suggestions as to methods of preventing stream pollution.

*229. The disinfection of sewage and sewage filter effluents, with a chapter on the putrescibility and stability of sewage effluents, by E. B. Phelps. 1909. 91 pp., 1 pl. 15c.
Scope indicated by title.

*234. Papers on the conservation of water resources. 1909. 96 pp., 2 pls. 15c.
Contains the following papers, whose scope is indicated by their titles: Distribution of rainfall, by Henry Gannett; Floods, by M. O. Leighton; Developed water powers, compiled under the direction of W. M. Steuart, with discussion by M. O. Leighton; Undeveloped water powers, by M. O. Leighton; Irrigation, by F. H. Newell; Underground waters, by W. C. Mendenhall; Denudation, by R. B. Dole and Herman Stabler; Control of catchment areas, by H. N. Parker.

*235. The purification of some textile and other factory wastes, by Herman Stabler and G. H. Pratt. 1909. 76 pp. 10c.
Discusses waste waters from wool scouring, bleaching and dyeing cotton yarn, bleaching cotton piece goods, and manufacture of oleomargarine, fertilizer, and glue.

236. The quality of surface waters in the United States: Part I, Analyses of waters east of the one hundredth meridian, by R. B. Dole. 1909. 123 pp. 10c.
Describes collection of samples, methods of examination, preparation of solutions, accuracy of estimates, and expression of analytical results.

238. The public utility of water powers and their governmental regulation, by René Tavernier and M. O. Leighton. 1910. 161 pp. 15c.
Discusses hydraulic power and irrigation, French, Italian, and Swiss legislation relative to the development of water powers, and laws proposed in the French Parliament; reviews work of bureau of hydraulics and agricultural improvement of the French department of agriculture, and gives résumé of Federal and State water-power legislation in the United States.

*255. Underground waters for farm use, by M. L. Fuller. 1910. 58 pp., 17 pls. 15c.
Discusses rocks as sources of water supply and the relative safety of supplies from different minerals; springs and their protection; open or dug and deep wells, their location, yield, relative cost, protection, and safety; advantages and disadvantages of cisterns and combination wells and cisterns.

*257. Well-drilling methods, by Isaiah Bowman. 1911. 139 pp., 4 pls. 15c.
Discusses amount, distribution, and disposal of rainfall, water-bearing rocks, amount of ground water, artesian conditions, and oil and gas bearing formation; gives history of well drilling in Asia, Europe, and the United States; describes in detail the various methods and the machinery used; discusses loss of tools and geologic difficulties; contamination of well waters and methods of prevention; tests of capacity of depth; and costs of sinking wells.

*258. Underground water-papers, 1910, by M. L. Fuller, F. G. Clapp, G. C. Matson, Samuel Sanford, and H. C. Wolff. 1911. 123 pp., 2 pls. 15c.
Contains the following papers (scope indicated by titles) of general interest:
Drainage by wells, by M. L. Fuller.
Freezing of wells and related phenomena, by M. L. Fuller.
Pollution of underground waters in limestone, by G. C. Matson.
Protection of shallow wells in sandy deposits, by M. L. Fuller.
Magnetic wells, by M. L. Fuller.

274. Some stream waters of the western United States, with chapters on sediment carried by the Rio Grande and the industrial application of water analyses, by Herman Stabler. 1911. 188 pp. 15c.
Describes collection of samples, plan of analytical work, and methods of analyses; discusses soap-consuming power of waters, water softening, boiler waters, and water for irrigation.

*315. The purification of public water supplies, by G. A. Johnson. 1913. 84 pp., 8 pls. 10c.

Discusses ground, lake, and river waters as public supplies, development of waterworks systems in the United States, water consumption, and typhoid fever; describes methods of filtration and sterilization of water, and municipal water softening.

334. The Ohio Valley flood of March-April, 1913 (including comparisons with some earlier floods), by A. H. Horton and H. J. Jackson. 1913. 96 pp., 22 pls. 20c.

Although relating specifically to floods in the Ohio Valley, this report discusses also the causes of floods and the prevention of damage by floods.

337. The effects of ice on stream flow, by William Glenn Hoyt. 1913. 77 pp., 7 pls. 15c.

Discusses methods of measuring the winter flow of streams.

*345. Contributions to the hydrology of the United States, 1914. N. C. Grover, chief hydraulic engineer. 1915. 225 pp., 7 pls. 30c. Contains:

*(e) A method of determining the daily discharge of rivers of variable slope, by M. R. Hall, W. E. Hall, and C. H. Pierce, pp. 53–65. Scope indicated by title.

364. Water analyses from the laboratory of the United States Geological Survey, tabulated by F. W. Clarke, chief chemist. 1914. 40 pp. 5c.

Contains analyses of waters from rivers, lakes, wells, and springs in various parts of the United States, including analyses of the geyser water of Yellowstone National Park, hot springs in Montana, brines from Death Valley, water from the Gulf of Mexico, and mine waters from Tennessee, Michigan, Missouri and Oklahoma, Montana, Colorado and Utah, Nevada and Arizona, and California.

371. Equipment for current-meter gaging stations, by G. J. Lyon. 1915. 64 pp., 37 pls. 20c.

Describes methods of installing automatic and other gages and of constructing gage wells, shelters, and structures for making discharge measurements and artificial controls.

*375. Contributions to the hydrology of the United States, 1915. N. C. Grover, chief hydraulic engineer. 1916. 181 pp., 9 pls. 15c.

Contains three papers presented at the conference of engineers of the water-resources branch in December, 1914, as follows:

*(c) Relation of stream gaging to the science of hydraulics, by C. H. Pierce and R. W. Davenport, pp. 77–84.

(e) A method for correcting river discharge for a changing stage, by B. E. Jones, pp. 117–130.

(f) Conditions requiring the use of automatic gages in obtaining records of stream flow, by C. H. Pierce, pp. 131–139.

*400. Contributions to the hydrology of the United States, 1916. N. C. Grover, chief hydraulic engineer. 1917. 108 pp., 7 pls. Contains:

(a) The people's interest in water-power resources, by G. O. Smith, pp. 1–8.

*(c) The measurement of silt-laden streams, by R. C. Pierce, pp. 39–51.

(d) Accuracy of stream-flow data, by N. C. Grover and J. C. Hoyt, pp. 53–59.

416. The divining rod, a history of water witching, with a bibliography, by A. J. Ellis. 1917. 59 pp. 10c.

A brief paper published "merely to furnish a reply to the numerous inquiries that are continually being received from all parts of the country" as to the efficiency of the divining rod for locating underground water.

425. Contributions to the hydrology of the United States, 1917. N. C. Grover, chief hydraulic engineer. 1918. Contains:

*(c) Hydraulic conversion tables and convenient equivalents, pp. 71–94. 1917.

427. Bibliography and index of the publications of the United States Geological Survey relating to ground water, by O. E. Meinzer. 1918. 169 pp., 1 pl.

Includes publications prepared, in whole or part, by the Geological Survey that treat any phase of the subject of ground water or any subject directly applicable to ground water. Illustrated by map showing reports that cover specific areas more or less thoroughly.

ANNUAL REPORTS.

*Fifth Annual Report of the United States Geological Survey, 1883–84, J. W. Powell, Director. 1885. xxxvi, 469 pp., 58 pls. $2.25. Contains:

*The requisite and qualifying conditions of artesian wells, by T. C. Chamberlin, pp. 125, 173, pl. 21. Scope indicated by title.

*Twelfth Annual Report of the United States Geological Survey, 1890–91, J. W. Powell, Director. 1891. 2 parts. *Pt. II, Irrigation, xviii, 576 pp., 93 pls. $2. Contains:

*Irrigation in India, by H. M. Wilson, pp. 363–561, pls. 107 to 146. (See Water-Supply Paper 87.)

Thirteenth Annual Report of the United States Geological Survey, 1891–92, J. W. Powell, Director. 1892. (Pts. II and III, 1893.) 3 parts. *Pt. III, Irrigation, pp. xi, 486, 77 plates. $1.85. Contains:

*American irrigation engineering, by H. M. Wilson, pp. 101–349, pls. 111 to 146. Discusses economic aspects of irrigation, alkaline drainage, silt, and sedimentation; gives brief history of legislation; describes perennial canals in Idaho-California, Wyoming, and Arizona; discusses water storage at reservoirs of the California and other projects, subsurface sources of supply pumping, and subirrigation.

Fourteenth Annual Report of the United States Geological Survey, 1892–93, J. W. Powell, Director. 1893. (Pt. II, 1894.) 2 parts. *Pt. II, Accompanying papers, pp. xx, 597, 73 pls. $2.10. Contains:

*Natural mineral waters of the United States, by A. C. Peale, pp. 49–88, pls. 3 and 4. Discusses the origin and flow of mineral springs, the source of mineralization, thermal springs, the chemical composition and analysis of spring waters, geographic distribution, and the utilization of mineral waters; gives a list of American mineral spring resorts; contains also some analyses.

Nineteenth Annual Report of the United States Geological Survey, 1897–98, Charles D. Walcott, Director. 1898. (Parts II, III, and V, 1899.) 6 parts in 7 vols. and separate case for maps with Pt. V. *Pt. II, papers chiefly of a theoretic nature, pp. v, 958, 172 plates. $2.65. Contains:

*Principles and conditions of the movements of ground water, by F. H. King, pp. 59–294, pls. 6 to 16. Discusses the amount of water stored in sandstone, in soil and in other rocks, the depth to which ground water penetrates; gravitational, thermal, and capillary movements of ground waters, and the configuration of the ground-water surface; gives the results of experimental investigations on the flow of air and water through a rigid, porous medium and through sands, sandstones, and silts; discusses results obtained by other investigators, and summarizes results of observations; discusses also rate of flow of water through sand and rock, the growth of rivers, rate of filtration through soil, interference of wells, etc.

*Theoretical investigation of the motion of ground waters, by C. S. Slichter, pp. 295–384, pl. 17. Scope indicated by title.

PROFESSIONAL PAPERS.

86. The transportation of débris by running water, by G. K. Gilbert, based on experiments made with the assistance of E. C. Murphy. 1914. 263 pp., 3 pls. 70c.

The results of an investigation which was carried on in a specially equipped laboratory at Berkeley, Cal., and was undertaken for the purpose of learning "the laws which control the movement of bed load and especially to determine how the quantity of load is related to the stream slope and discharge and to the degree of comminution of the débris."

105. Hydraulic-mining débris in the Sierra Nevada, by G. K. Gilbert. 154 pp. 34 pls. 1917. 50c.

Presents the results of an investigation undertaken by the United States Geological Survey in response to a memorial from the California Miners' Association asking that a particular study be made of portions of the Sacramento and San Joaquin valleys affected by detritus from torrential streams. The report deals largely with geologic and physiographic aspects of the subject, traces the physical effects, past and future, of the hydraulic mining of earlier decades, the similar effects which certain other industries induce through stimulation of the erosion of the soil, and the influence of the restriction of the area of inundation by the construction of levees. Suggests cooperation by several interests for the control of the streams now carrying heavy loads of débris.

BULLETINS.

*32. Lists and analyses of the mineral springs of the United States (a preliminary study), by A. C. Peale. 1886. 235 pp.

Defines mineral waters, lists the springs by States, and gives tables of analyses.

*319. Summary of the controlling factors of artesian flows, by Myron L. Fuller. 1908. 44 pp., 7 pls. 10c.

Describes underground reservoirs, the sources of ground waters, the confining agents, the primary and modifying factors of artesian circulation, the essential and modifying factors of artesian flow, and typical artesian systems.

*479. The geochemical interpretation of water analyses, by Chase Palmer. 1911. 31 pp. 5c.

Discusses the expression of chemical analyses, the chemical character of water and the properties of natural water; gives a classification of waters based on property values and reacting values, and discusses the character of the waters of certain rivers as interpreted directly from the results of analyses; discusses also the relation of water properties to geologic formations, silica in river water, and the character of the water of the Mississippi and the Great Lakes and St. Lawrence River as indicated by chemical analyses.

616. The data of geochemistry (third edition), by F. W. Clarke. 1916. 821 pp. 45c.

Earlier editions were published as Bulletins 330 and 491. Contains a discussion of the statement and interpretation of water analyses and a chapter on "Mineral wells and springs" (pp. 179–216). Discusses the definition and classification of mineral waters, changes in the composition of water, deposits of calcareous, ocherous, and siliceous materials made by water, vadose and juvenile waters, and thermal springs in relation to volcanism. Describes the different kinds of ground water and gives typical analyses. Includes a brief bibliography of papers containing water analyses.

INDEX BY AREAS AND SUBJECTS.

[A=Annual Reports; M=Monograph; B=Bulletin; P=Professional Paper; W=Water-Supply Paper; G F=Geologic folio.

[1] Many of the reports contain brief subject bibliographies. See abstracts.

[2] Many analyses of river, spring, and well waters are scattered through publications, as noted in abstracts.

INDEX OF STREAMS.