DEPARTMENT OF THE INTERIOR
JOHN BARTON PAYNE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

WATER-SUPPLY PAPER 472

SURFACE WATER SUPPLY OF THE UNITED STATES

1918

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

NATHAN C. GROVER, Chief Hydraulic Engineer
GUY C. STEVENS and C. G. PAULSEN
District Engineers

WASHINGTON
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SURFACE WATER SUPPLY OF SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO DRAINAGE BASINS, 1918.

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, 1918.

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 1888 in connection with special studies relating to irrigation in the arid west. Since the fiscal year ending June 30, 1895, successive sundry civil 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, 1895–1919.

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
1919	148,244.10

In the execution of the work many private and State organizations have cooperated, either by furnishing data or by assisting in collecting data. Acknowledgments 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 4,510 points in the United States and also at many points in Alaska and the Hawaiian Islands. In July, 1918, 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 in 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 channel 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 gaging station is that point on the gage—the gage height—to which the surface of the river falls when the discharge is reduced to zero.

EXPLANATION OF DATA.

The data presented in this report cover the year beginning October 1, 1917, and ending September 30, 1918. 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 means of discharge are 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 stage-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 RECORDS.

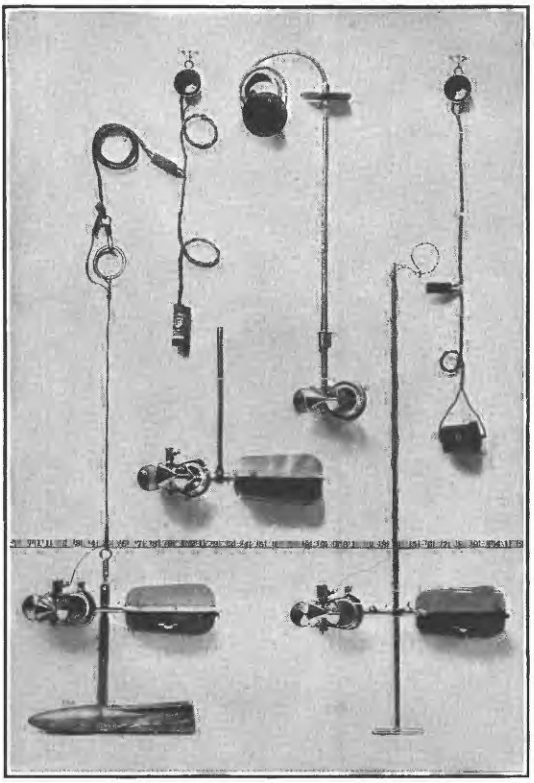
The accuracy of stream-flow data depends primarily (1) on the permanence of the stage-discharge relation and (2) on the accuracy of observation of stage, measurements of flow, and interpretation of records.

A paragraph in the description of the station 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 height 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 records 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.



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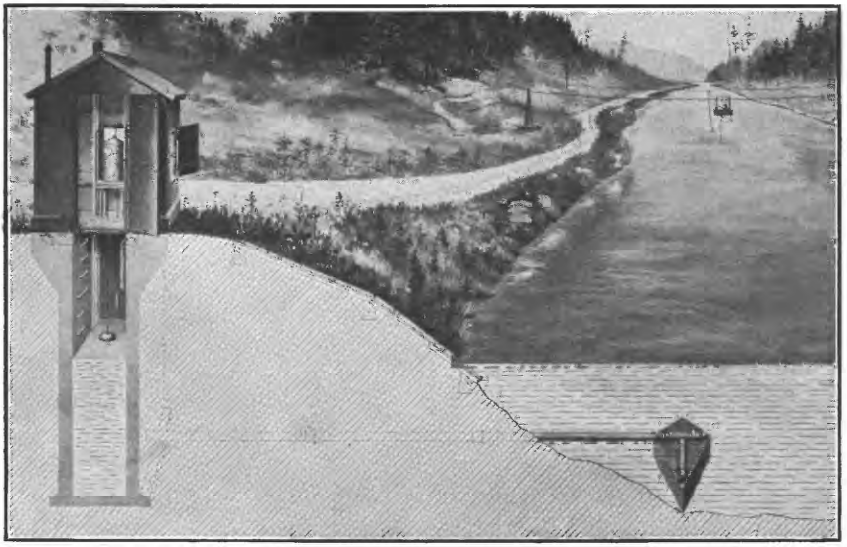
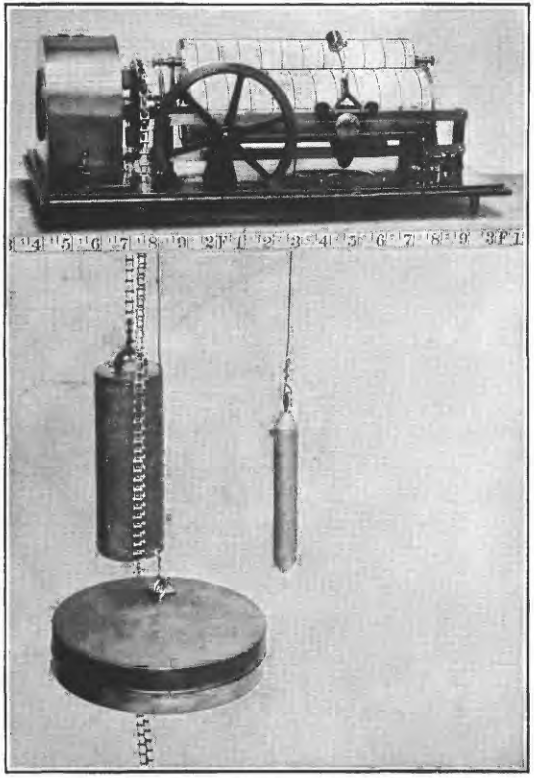


B. TYPICAL GAGING STATION.



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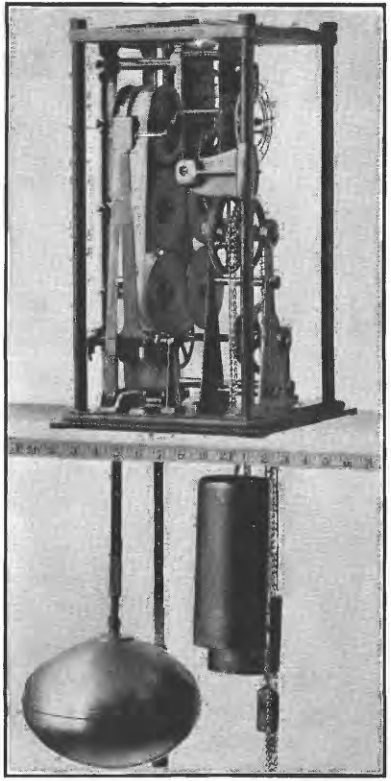
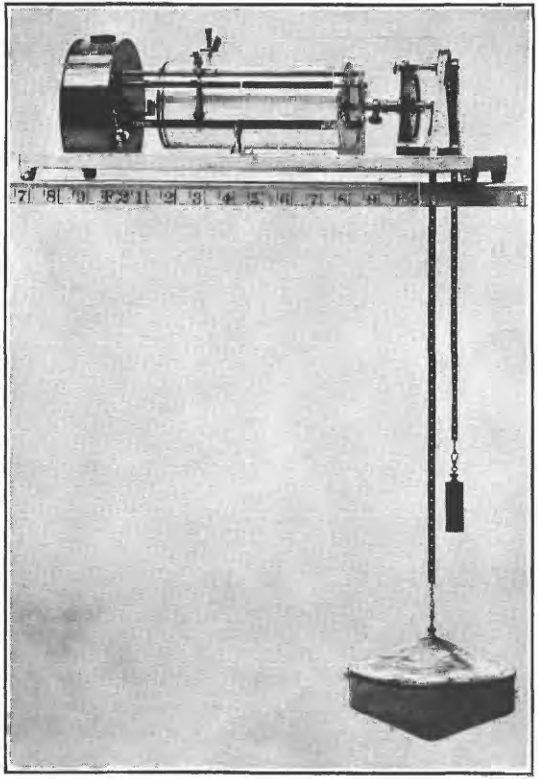


B. GURLEY PRINTING.



C. FRIEZ.

WATER-STAGE RECORDERS.

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 but unknown sources of error.

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, United States Weather Bureau, Tallassee Power Co., Central Georgia Power Co., Columbus Power Co., Georgia Railway & Power Co., Alabama Power Co., Juliette Milling Co., and Rhodhiss Manufacturing Co.

DIVISION OF WORK.

Data for the 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 B. L. Hopkins, A. G. Fiedler, B. J. Peterson, and J. W. Moulton.

The data for all drainage basins south of Roanoke River were collected and prepared for publication under the direction of C. G. Paulsen, district engineer, assisted by B. J. Peterson, A. H. Condron, L. J. Hall, 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, 1918.

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, or by wading.

CHANNEL AND CONTROL.—Bed under bridge in composed of rock overlain with a tbick 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, 17.0 feet March 14 (discharge, 54,700 second-feet); minimum stage, 1.9 feet several days in October (discharge, 340 second-feet).

1895–1918: Maximum stage recorded, 31 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, 1898 (discharge, 260 second-feet).

ICE.—Stage-discharge relation affected by ice during the severe winter of 1917–18.

ACCURACY.—Stage-discharge assumed permanent during the year; affected by ice December 11 to February 10. Rating curve fairly well defined below 4,000 second-feet, and poorly defined above. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table, except for period of ice effect. Records fair for open water and poor for winter.

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

The following discharge measurement was made by B. L. Hopkins and A. G. Fiedler:

May 29, 1918: Gage height, 4.48 feet; discharge, 3,240 second-feet.

Daily discharge, in second-feet, of James River at Buchanan, Va., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	340	975	390	2,000	3,880	2,560	4,560	2,560	5,040	1,080	975
2	340	975	390	2,000	3 470	2,220	3,670	2,330	5,540	975	880
3	340	880	390	1,400	3,270	1,920	3,080	2,220	2,930	880	795
4	340	795	390	1,200	3,080	1,780	2,900	2,220	2,560	795	715
5	340	715	390	1,200	2,900	1,650	2,720	2,070	1,920	715	975
6	340	640	390	1,000	6,320	1,650	2,390	2,070	1,520	640	2,390
7	340	570	390	1,000	7,100	1,520	2,220	1,920	1,400	640	2,220
8	340	505	390	1,000	9,900	1,520	2,070	1,780	1,290	975	2,390
9	340	505	390	3,000	7,100	3,080	1,920	1,400	1,180	795	1,920
10	340	505	390	6,000	5,040	14,700	1,920	1,400	1,180	795	2,070
11	340	505	.....	16,100	4,100	15,000	1,780	1,290	1,180	715	1,650
12	340	505	.....	16,500	3,470	12,400	2,070	1,290	975	795	1,400
13	340	505	.....	16,100	2,900	10,200	1,920	1,080	880	795	1,180
14	340	445	.....	18,700	54,700	7,640	2,070	1,080	880	715	975
15	340	445	.....	18,300	19,500	6,060	1,780	975	795	715	880
16	340	445	.....	18,000	9,040	5,290	1,780	975	715	640	880
17	340	445	.....	13,000	6,060	4,800	1,650	1,650	715	640	795
18	340	445	.....	6,320	4,560	4,560	1,650	2,330	975	640	1,180
19	340	445	.....	3,670	4,100	4,100	1,650	3,880	1,520	1,080	2,070
20	390	445	.....	4,560	3,670	6,580	1,520	2,560	1,780	975	1,920
21	390	445	.....	6,060	6,580	14,700	1,520	2,070	1,400	880	1,780
22	390	390	.....	7,100	13 300	26,600	1,400	1,650	1,180	795	1,650
23	340	390	.....	6,580	9,900	13,000	1,400	1,650	1,080	795	1,520
24	340	390	.....	5,540	7,100	9,320	3,270	1,520	975	715	1,400
25	340	390	.....	5,040	5,800	6,840	4,560	1,520	880	715	1,180
26	340	390	.....	7,100	4,560	6,060	4,100	5,540	795	640	1,080
27	390	390	.....	10,500	4,100	6,580	3,880	14,000	715	640	975
28	390	390	.....	5,040	3,670	8,760	3,670	10,200	640	880	880
29	390	390	.....	.....	3,080	6,580	3,470	7,640	640	1,080	795
30	1,080	390	.....	.....	2,900	5,040	4,560	5,540	570	880	715
31	975	.....	.....	.....	2,720	.....	2,560	.....	1,180	795	.....

NOTE.—Discharge estimated, because of ice, from weather records and comparison with records at other stations as follows: Dec. 11–20, 350 second-feet; Dec. 21–31, 500 second-feet; Jan. 1–15, 350 second-feet; Jan. 16–31, 1,200 second-feet; Feb. 1–10, as in table.

Monthly discharge of James River at Buchanan, Va., for the year ending Sept. 30, 1918.

[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	1,080	340	394	0.191	0.22
November	975	390	522	.253	.28
December	.....	.....	416	.202	.23
January	.....	.....	789	.383	.44
February	18,700	1,000	7,280	3.53	3.68
March	54,700	2,720	7,350	3.57	4.12
April	26,600	1,520	7,090	3.44	3.84
May	4,560	1,400	2,570	1.25	1.44
June	14,000	975	2,950	1.43	1.60
July	5,540	570	1,450	.704	.81
August	1,080	640	800	.388	.45
September	2,390	715	1,340	.650	.73
The year	54,700	340	2,710	1.32	17.84

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, 1918.

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 17.0 feet at 9.30 a. m. April 22 (discharge, 52,800 second-feet); minimum stage, 0.75 foot at 9.30 a. m. October 3 (discharge, 910 second-feet).

1899–1918: Maximum stage recorded, 26.7 feet at 6 p. m. December 30, 1901 (discharge about 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.—Stage-discharge relation affected by ice during the winter of 1917–18.

ACCURACY.—Stage-discharge relation practically permanent during year; affected by ice December 12 to February 10. 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, except during period of ice effect. Records good for open water periods and fair for winter period.

The following discharge measurement was made by B. J. Peterson and A. G. Fiedler: June 24, 1918: Gage height, 2.10 feet; discharge, 3,350 second-feet.

Daily discharge, in second-feet, of James River at Cartersville, Va., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,150	5,460	1,630	1,310	4,600	13,100	7,870	16,400	6,390	13,100	3,440	2,790
2	1,150	5,240	1,550	1,310	5,020	10,000	8,650	14,600	5,920	10,500	2,630	3,400
3	1,020	3,790	1,470	1,310	5,240	9,460	8,130	13,100	5,240	9,510	2,580	2,540
4	1,230	3,400	1,230	1,310	5,580	7,870	7,610	9,190	4,600	8,360	2,510	3,440
5	1,150	3,020	1,310	1,310	5,920	8,390	5,240	8,390	3,790	4,770	2,300	2,790
6	1,470	2,470	1,390	1,310	6,150	8,390	5,240	7,360	4,190	4,010	2,060	2,560
7	1,390	2,300	1,390	1,310	6,630	8,920	4,810	6,870	3,790	3,750	2,270	4,230
8	1,150	2,130	1,470	1,310	7,630	12,800	4,190	6,390	3,400	3,420	1,860	4,270
9	1,050	2,040	1,630	1,310	8,130	14,300	4,810	5,920	3,400	2,630	1,930	3,500
10	1,150	1,880	1,710	1,310	10,000	12,500	30,700	5,460	3,590	2,510	1,660	3,610
11	1,470	1,960	1,470	1,310	13,400	9,730	44,100	5,460	3,400	2,330	2,440	3,590
12	1,470	1,790	1,470	1,310	33,700	8,920	35,200	5,690	3,210	2,100	3,440	3,360
13	1,310	1,630	1,470	1,310	37,400	10,800	30,700	5,690	2,650	2,270	2,980	3,040
14	1,310	1,470	1,550	1,470	39,000	19,600	27,500	6,630	2,300	2,490	3,440	2,630
15	1,470	1,630	1,310	1,790	39,700	48,600	20,000	7,110	2,040	2,160	2,610	2,330
16	1,310	1,630	1,310	2,650	34,000	32,200	20,000	6,870	1,880	1,760	1,980	2,100
17	1,050	1,630	1,310	6,390	30,700	25,400	21,600	6,390	1,550	1,710	1,660	1,860
18	1,230	1,630	1,310	5,920	26,400	13,700	19,600	5,920	1,630	2,580	1,880	1,940
19	1,150	1,630	1,470	5,240	23,700	10,800	16,100	5,690	1,960	3,210	2,300	2,560
20	2,300	1,390	1,790	4,600	17,100	8,650	15,200	5,020	2,130	2,380	2,580	3,400
21	2,130	1,230	1,960	4,190	14,000	9,460	38,600	4,600	2,300	3,690	2,270	7,140
22	1,790	1,630	1,960	3,790	13,700	20,600	50,700	4,810	5,460	3,120	2,670	7,900
23	1,630	1,630	1,960	3,400	12,800	23,700	44,900	5,020	3,790	2,790	2,790	5,510
24	2,130	1,470	1,960	3,210	12,500	21,300	29,300	5,460	3,210	2,610	2,370	4,270
25	2,650	1,470	1,960	3,020	10,800	17,700	20,600	8,390	2,470	2,160	2,270	3,830
26	1,960	1,470	1,960	3,020	9,460	14,900	18,000	7,110	6,390	1,990	1,980	3,170
27	1,790	1,310	1,880	3,210	9,730	12,500	14,900	5,240	9,190	2,060	1,490	2,690
28	2,130	1,230	1,790	3,590	14,000	10,800	15,800	4,810	22,000	2,160	1,600	2,470
29	2,300	1,390	1,710	3,790	.....	9,460	15,500	5,920	11,700	2,440	1,600	2,270
30	3,990	1,470	1,630	3,990	.....	8,390	14,300	8,920	10,000	2,400	1,930	2,030
31	11,100	.....	1,470	4,390	.....	8,130	.....	7,360	.....	2,870	2,380	.....

NOTE.—Daily discharge Dec. 12 to Feb. 10 estimated because of ice from observer's notes, weather records, and comparison with records at other stations.

Monthly discharge of James River at Cartersville, Va., for the year ending Sept. 30, 1918.

[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	11,100	1,020	1,920	0.308	0.36
November	5,460	1,230	2,080	.334	.37
December	1,930	1,230	1,600	.257	.30
January	6,390	1,310	2,730	.438	.50
February	39,700	4,600	16,300	2.62	2.73
March	48,600	7,870	14,600	2.34	2.70
April	50,700	4,190	20,000	3.21	3.58
May	16,400	4,600	7,150	1.15	1.33
June	22,000	1,550	4,790	.769	.86
July	13,100	1,710	3,670	.589	.68
August	3,440	1,490	2,320	.372	.43
September	7,900	1,860	3,370	.541	.60
The year	50,700	1,020	6,620	1.06	14.44

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, 1918.

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 by wading.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.5 feet 8 a. m. June 26 (discharge not determined); minimum stage, 0.49 foot December 29–31 (affected by ice); minimum open-water stage, 0.55 foot November 18.

1896–1918: 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.

ICE.—Stage-discharge relation seriously affected by ice during the winter of 1917–18.

ACCURACY.—Current-meter measurements indicate that stage-discharge relation changed during the year; affected by ice from about December 9 to February 1. Gage read to tenths or half-tenths once daily. Daily discharge not ascertained owing to lack of current-meter measurements to define change in stage-discharge relation.

COOPERATION.—Gage-height record 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, 1918.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 28	Hopkins and Fiedler	1.96	607
28	....do	1.96	603

Daily gage height, in feet, of Roanoke River at Roanoke, Va., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.62	0.95	0.72	.....	1.25	.....	2.70	1.40	3.40	3.90	2.00
2	.62	.82	.72	.....	1.25	1.35	2.40	1.30	2.30	2.40	1.70
3	.60	.69	.67	1.35	1.20	1.25	2.15	1.25	1.80	1.95	1.50
4	.59	.65	.67	1.35	1.15	1.25	2.00	1.30	1.60	1.70	1.35
5	.57	.65	.67	1.35	1.25	1.15	1.85	1.20	1.48	1.45	1.30
6	.57	.57	.67	1.35	1.40	1.05	1.75	1.12	1.40	1.35	1.35
7	.58	.67	.67	.95	1.85	1.15	1.65	1.15	1.30	1.30	1.30
8	.60	.67	.67	1.05	2.15	1.15	1.65	1.13	1.28	1.35	1.40
9	.61	.62	.97	1.15	1.90	1.85	1.60	1.10	1.28	1.20	2.45
10	.62	.60	.97	3.30	1.80	2.80	1.55	1.08	1.25	1.15	1.80
11	.70	.67	.97	3.45	1.70	3.40	1.55	1.02	1.20	1.10	1.60
12	.62	.62	.77	3.40	1.60	3.20	1.45	1.00	1.10	1.08	1.50
13	.57	.62	.57	4.05	1.75	2.95	1.45	1.00	1.30	1.05	1.40
14	.62	.62	.57	3.15	2.05	2.65	1.55	.97	1.22	1.20	1.30
15	.61	.62	.57	2.85	1.85	2.85	1.50	.95	1.10	1.05	1.24
16	.60	.62	.77	2.95	1.65	2.55	1.45	.92	1.00	1.30	1.18
17	.58	.62	.72	2.30	1.50	2.25	1.45	1.25	1.13	1.15	1.11
18	.59	.55	.72	1.95	1.45	2.05	1.37	1.50	1.50	1.15	2.50
19	.58	.62	.67	1.75	1.35	1.85	1.55	4.20	2.35	2.80	2.05
20	.65	.62	.57	1.75	1.30	1.85	1.65	2.05	1.85	2.00	1.60
21	.60	.62	.52	1.90	2.10	4.20	2.05	1.50	1.55	1.50	1.90
22	.59	.62	.52	1.70	2.75	4.00	4.40	1.42	1 40	1.35	1.75
23	.58	.62	.52	1.70	2.25	2.85	2.25	1.30	1.30	1.25	1.65
24	.63	.62	.51	1.55	2.35	2.45	1.95	1.18	1.25	1.15	1.45
25	.74	.62	.51	1.45	2.45	2.15	1.70	1.10	1.15	1.10	1.38
26	.67	.62	.51	1.40	2.15	1.95	1.60	7.50	1.85	1.05	1.32
27	.67	.62	.50	1.40	1.95	2.55	1.55	2.95	1.35	1.30	1.28
28	.67	.62	.50	1.35	1.80	2.45	2.30	2.30	1.30	2.35	1.22
29	.69	.62	.49	.....	1.60	2.25	1.75	1.90	1.70	1.65	1.16
30	.97	.72	.49	.....	.....	2.05	1.80	2.05	1.40	1.40	1.12
31	1.07	.....	.49	.....	.....	.....	1.52	.....	1.50	1.30	.....

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, and 2½ miles above mouth of Deep Creek.

DRAINAGE AREA.—8,350 square miles.

RECORDS AVAILABLE.—December 7, 1911, to September 30, 1918.

GAGE.—Chain gage attached to outside of guard timber on downstream side of second span from right end of deck railroad bridge; 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; point of 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, 10.7 feet in the morning of April 23 (discharge, 72,300 second-feet); minimum stage. 1.0 foot October 6 (discharge, 900 second-feet).

1911–1918: 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).

ICE.—Ice formed to considerable thickness at this station during the winter of 1917–18 and the stage-discharge relation was seriously affected.

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

ACCURACY.—Stage-discharge relation practically permanent; affected by ice from December 12 to January 29. Rating curve well defined below 33,300 second-feet, and fairly well defined to 180,000 second-feet. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good for open water periods and fair for periods of ice effect.

The following discharge measurement was made by B. J. Peterson and A. G. Fiedler: June 21, 1918: Gage height, 2.36 feet; discharge, 4,980 second-feet.

Daily discharge, in second-feet, of Roanoke River at Old Gaston, N. C., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,160	11,900	4,430	900	28,200	6,240	6,240	11,400	3,740	5,140	8,210	3,740
2	2,160	9,060	4,080	900	21,400	5,500	4,780	17,200	5,500	4,430	7,010	5,780
3	1,620	5,870	3.740	900	15,300	4,430	4,430	13,000	5,140	3,410	7,800	2,770
4	2,160	3,740	6,620	900	13,000	4,430	5,140	11,400	3,740	2,160	7,400	3,410
5	1,130	3,410	5,870	900	11,400	5,500	6,240	10,400	3,410	3,090	5,140	2,770
6	900	3,090	3,410	900	10,900	7,010	5,870	9,060	4,080	2,770	3,410	2,160
7	1,880	2,770	3,090	1,130	9,500	7,010	5,500	7,010	3,740	4,430	2,770	2,460
8	1,370	2,160	3,410	1,620	11,400	7,400	6,240	6,620	4,430	3,740	2,160	9,060
9	2,160	1,880	1,620	1,620	32,400	10,400	7,010	5,500	3,410	3,410	2,460	5,870
10	2,460	1,620	1,620	1,880	19,900	9,960	34,200	4,780	2,770	2,770	2,160	4,780
11	3,090	3,410	1,370	2,460	14,700	9,500	49,300	7,010	3,090	2,160	1,620	5,500
12	2,770	2,770	1,250	2,770	14,700	8,210	47,300	6,240	2,460	2,460	1,370	4,780
13	3,090	2,160	1,370	18,500	14,200	7,010	36,000	8,630	3,090	3,090	3,740	4,430
14	3,410	1,880	900	19,900	11,400	6,240	22,800	16,600	4,430	6,240	5,500	4,080
15	2,460	1,620	900	26,600	11,900	5,870	17,200	24,300	3,410	3,740	3,740	3,410
16	2,160	1,370	900	18,500	10,900	5,500	8,630	14,700	3,090	3,410	3,410	2,160
17	1,620	1,370	900	13,600	9,500	5,140	7,400	10,400	2,770	2,460	3,090	2,770
18	2,160	2,460	900	10,900	8,630	6,240	7,010	9,060	2,160	2,770	3,410	2,160
19	1,620	2,160	2,160	8,630	8,210	5,500	6,240	8,210	1,880	3,090	4,780	1,620
20	2,770	2,160	3,090	8,210	7,400	5,140	5,870	3,740	2,160	6,240	9,500	1,370
21	3,090	3,090	3,090	7,400	7,010	4,780	22,800	5,500	4,780	11,400	8,630	5,140
22	2,770	2,460	3,090	4,430	7,400	4,430	60,800	5,140	3,410	9,060	7,400	9,960
23	2,460	2,160	1,620	4,430	7,800	7,010	72,300	4,780	4,080	7,400	5,870	7,010
24	3,410	2,460	1,370	4,080	7,010	9,060	70,800	5,140	3,740	4,430	3,740	5,500
25	3,090	2,160	1,370	4,780	5,140	7,400	29,000	9,500	3,090	3,090	3,410	4,780
26	2,460	2,770	1,130	4,430	6,620	9,960	13,000	11,900	4,430	3,410	2,460	3,740
27	2,160	3,090	1,130	4,780	6,240	9,060	15,900	9,960	11,400	3,740	2,160	3,410
28	1,370	3,090	900	9,960	7,010	9,060	22,800	10,900	13,000	3,740	3,410	3,740
29	1,620	3,410	900	18,500	.....	8,210	17,200	8,210	11,900	3,090	4,780	3,410
30	4,780	3,740	900	37,800	.....	7,010	13,600	7,010	11,400	3,410	4,430	2,770
31	8,210	.....	900	38,800	.....	6,620	.....	4,430	.....	6,620	6,240	.....

NOTE.—Discharge estimated, because of ice, as in table for Dec. 12-13, 18-28, 30-31, and Jan. 1-29, from observer's notes, weather records, and comparison with records at other stations.

Monthly discharge of Roanoke River at Old Gaston, N. C., for the year ending Sept. 30, 1918.

[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	8,210	900	2,530	0.303	0.35
November	11,900	1,370	3,180	.381	.43
December	6,620	900	2,190	.262	.30
January	38,800	900	9,070	1.09	1.26
February	32,400	5,140	12,100	1.45	1.51
March	10,400	4,430	6,930	.830	.96
April	72,300	4,430	21,100	2.53	2.82
May	24,300	3,740	9,280	1.11	1.28
June	13,000	1,880	4,660	.558	.62
July	11,400	2,160	4,210	.504	.58
August	9,500	1,370	4,560	.546	.63
September	9,960	1,370	4,150	.497	.55
The year	72,300	900	6,940	.831	11.29

PEEDEE RIVER BASIN.

YADKIN RIVER AT DONNAHA, N. C.

LOCATION.—At toll bridge in Donnaha, Forsyth County, on road between Donnaha and East Bend, a quarter of a mile west of Donnaha railroad station, 6 miles downstream from 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, 1918.

GAGE.—Vertical gage in four sections on left bank, 150 feet downstream from left end of toll bridge; read twice daily to tenths by J. F. Goolsby. Section of gage below 10 feet was carried away by ice in February, 1918. Gage heights below 10 feet, after gage went out, obtained by measuring down from 12.5-foot mark on gage.

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 date.

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, 10.4 feet at 8 a. m. April 29 (discharge not determined); minimum stage recorded, 5.0 feet at 4 p. m. January 6 and 8 a. m. and 5 p. m. January 7 and 8 (discharge not determined).

1913–1918: 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.

DIVERSIONS.—None.

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, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.2	5.1	5.2	5.3	5.6	5.4	5.3	6.2	5.4	5.4	6.5	5.9
2	5.2	5.1	5.2	5.3	5.6	5.4	5.3	5.7	5.4	5.3	6.4	5.8
3	5.2	5.1	5.1	5.2	5.8	5.4	5.3	5.4	5.4	5.3	5.8	5.6
4	5.1	5.1	5.2	5.2	5.8	5.4	5.3	5.4	5.4	5.3	5.6	5.5
5	5.2	5.1	5.2	5.1	5.8	5.8	5.4	5.4	5.3	5.3	5.5	5.4
6	5.2	5.1	5.1	5.0	5.6	5.8	5.4	5.4	5.3	5.4	5.4	5.5
7	5.2	5.1	5.1	5.0	5.8	5.6	5.4	5.4	5.3	5.4	5.4	5.5
8	5.2	5.1	5.1	5.0	5.8	5.5	5.4	5.4	5.3	5.4	5.4	5.6
9	5.1	5.1	5.2	5.2	5.6	5.8	5.3	5.4	5.3	5.4	5.4	5.5
10	5.2	5.1	5.2	5.2	5.8	6.2	5.3	5.4	5.3	5.4	6.1	5.6
11	5.2	5.2	5.4	5.6	6.0	6.0	5.3	5.4	5.3	5.3	7.0	6.0
12	5.2	5.8	5.4	9.0	5.7	5.8	5.3	5.4	5.2	5.3	7.2	5.8
13	5.2	8.5	5.5	9.6	5.6	5.8	5.4	5.4	5.2	5.3	8.0	5.6
14	6.2	7.8	5.4	8.7	5.6	5.6	5.4	5.6	5.2	5.3	6.8	6.6
15	6.5	6.2	5.4	7.9	5.8	5.4	5.4	6.2	5.2	5.3	6.1	6.4
16	5.8	5.6	5.6	7.4	5.6	5.4	5.4	5.6	6.0	5.3	5.6	6.0
17	5.4	5.5	5.6	6.8	5.6	5.4	5.4	5.5	6.9	5.3	5.6	5.8
18	5.4	5.4	5.5	6.6	5.6	5.4	5.4	5.4	9.5	5.3	5.4	5.6
19	5.3	5.4	5.4	6.4	5.5	5.4	5.3	5.4	8.0	5.3	5.4	5.6
20	5.3	5.3	5.4	6.4	5.6	5.4	5.3	5.4	6.6	5.3	5.4	5.6
21	5.3	5.2	5.4	6.2	5.5	5.4	5.3	5.4	5.8	5.3	5.4	5.6
22	5.2	5.2	5.4	6.0	5.5	5.3	5.4	5.4	5.8	5.3	5.3	5.6
23	5.2	5.2	5.5	5.8	5.4	5.3	5.4	5.4	5.6	5.4	5.4	5.5
24	5.2	5.2	5.6	5.6	5.4	5.3	5.5	5.4	5.5	6.2	5.6	5.5
25	5.2	5.2	5.6	5.8	5.4	5.4	6.0	5.4	5.4	8.8	5.5	5.4
26	5.2	5.2	5.6	5.6	5.4	5.4	6.6	5.4	5.4	7.5	5.5	5.4
27	5.2	5.2	5.6	5.6	5.4	5.4	5.8	5.4	5.4	6.2	5.5	5.4
28	5.2	5.2	5.6	5.6	5.4	5.4	6.9	5.4	5.4	6.9	5.6	5.4
29	5.2	5.2	5.6	5.4	.....	5.4	10.0	5.4	5.4	6.4	5.6	5.4
30	5.2	5.2	5.6	5.6	.....	5.4	8.1	5.4	5.3	7.6	6.0	5 4
31	5.1	.....	5.4	5.7	.....	5.4	.....	5.4	.....	6.9	6.2	.....

NOTE.—Gage heights after February, 1918, when gage below 10 feet was carried out by ice, obtained by measuring down from 12.5-foot mark; may be somewhat in error.

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, 1918.

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; bed rather rough. Control is a rock ledge about 500 feet below bridge extending entirely across river.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.55 feet at 7 a. m. April 22 (discharge, 24,300 second-feet); minimum stage recorded, 1.75 feet at 7 a. m. Dec. 13 (discharge, 1,250 second-feet).

1895–1909; 1911–1918: 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.

DIVERSIONS.—None.

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.

Discharge measurements of Yadkin River near Salisbury, N. C., during the year ending Sept. 30, 1918.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 28	L. J. Hall	2.46	3,030
May 26	C. G. Paulsen	3.27	5,240

Daily discharge, in second-feet, of Yadkin River near Salisbury, N. C., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,290	3,790	2,290	1,630	10,000	2,660	2,410	5,050	2,170	2,060	6,100	3,210
2	1,840	2,800	2,060	1,630	7,220	2,540	2,290	4,720	2,170	2,170	8,000	2,930
3	1,730	2,170	2,170	1,840	6,100	2,660	2,290	4,090	2,170	2,410	3,790	1,940
4	1,630	2,170	1,940	1,940	6,100	2,660	2,290	3,500	1,940	1,730	2,660	1,730
5	1,840	2,290	1,940	2,060	5,390	2,800	2,290	3,360	2,170	1,730	2,410	1,630
6	1,730	2,060	2,060	2,060	4,400	2,800	2,290	3,070	2,170	1,530	2,060	1,730
7	1,840	2,060	1,940	2,660	4,090	2,800	2,060	2,930	2,170	1,530	1,940	2,800
8	2,060	2,060	2,060	2,660	4,400	2,540	2,540	2,800	2,540	1,730	1,730	3,500
9	1,630	2,060	2,290	2,800	4,090	2,540	6,460	3,790	2,170	1,940	1,940	3,790
10	2,170	2,060	2,290	2,540	4,720	2,800	10,000	3,500	2,060	2,290	2,660	3,210
11	2,660	1,840	1,630	2,290	4,400	3,070	6,100	3,070	2,170	2,060	2,170	2,660
12	2,170	2,170	1,840	12,000	4,400	2,660	4,720	2,800	1,940	1,730	3,070	2,170
13	1,840	1,840	1,630	14,700	3,790	2,540	3,500	3,070	1,730	1,630	2,410	1,940
14	1,840	2,170	1,730	8,800	4,090	2,540	3,360	5,740	1,730	1,530	2,060	1,730
15	2,060	2,170	1,940	7,220	3,500	2,540	3,210	5,390	1,730	1,630	1,730	1,630
16	1,730	2,060	1,840	9,200	3,210	2,290	2,930	3,790	1,530	1,530	4,400	1,730
17	1,840	1,840	2,170	7,220	3,790	2,290	3,360	3,210	2,170	1,530	2,660	1,630
18	1,840	1,840	2,170	4,720	3,790	2,800	3,070	3,210	4,400	1,940	6,840	1,730
19	1,840	2,060	2,410	4,090	3,210	2,540	3,360	2,540	3,500	4,400	14,700	2,170
20	2,170	2,660	2,410	3,210	3,500	2,540	10,400	2,800	2,800	3,500	8,800	3,790
21	4,400	1,940	2,290	2,930	4,090	3,360	20,500	3,360	2,540	1,940	4,090	5,390
22	2,800	1,940	2,410	2,540	3,500	5,050	22,000	3,210	2,410	1,940	2,540	4,400
23	2,060	1,840	2,800	2,800	3,070	4,400	10,000	3,360	2,410	1,730	2,170	2,660
24	1,940	1,840	2,540	2,930	3,070	3,790	6,460	3,070	2,660	4,400	1,940	2,060
25	1,840	1,840	2,290	2,800	3,210	4,090	4,720	3,360	2,170	3,360	1,730	1,940
26	2,060	1,940	2,290	3,360	2,800	3,790	5,050	6,100	2,170	3,070	2,170	1,730
27	1,840	1,730	2,540	5,740	2,930	3,070	4,090	5,050	2,930	3,500	2,170	2,800
28	1,940	1,840	2,290	10,800	2,800	2,660	4,400	3,070	2,410	3,070	2,410	3,070
29	2,060	2,290	2,540	14,700	.....	2,660	4,090	2,660	1,940	4,090	3,500	2,170
30	2,660	1,940	1,630	18,000	.....	2,540	4,090	2,660	1,730	4,720	2,660	2,060
31	5,740	.....	1,340	16,000	.....	2,290	.....	2,410	.....	5,050	2,060	.....

Monthly discharge of Yadkin River near Salisbury, N. C., for the year ending Sept. 30, 1918.

[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	5,740	1,630	2,200	0.647	0.75
November	3,790	1,730	2,110	.621	.69
December	2,800	1,340	2,120	.624	.72
January	18,000	1,630	5,740	1.69	1.95
February	10,000	2,800	4,270	1.26	1.31
March	5,050	2,290	2,910	.856	.99
April	22,000	2,060	5,480	1.61	1.80
May	6,100	2,410	3,570	1.05	1.21
June	4,400	1,530	2,290	.674	.75
July	5,050	1,530	2,500	.735	.85
August	14,700	1,730	3,530	1.04	1.20
September	5,390	1,630	2,530	.744	.83
The year	22,000	1,340	3,270	.962	13.05

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, 1917, to September 30, 1918.

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 year, 5.8 feet at 8.30 a. m. January 29 (discharge, 10,100 second-feet); minimum stage recorded, 1.3 feet at 9.30 a. m. December 30 (discharge, 600 second-feet).

1917–1918: Maximum stage recorded, 8.58 feet at 7 a. m. September 1, 1917 (discharge, 18,800 second-feet); minimum stage, that of January 29, 1918.

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

REGULATION.—Slight fluctuations 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, 1918.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 9	Babb and Hollar	5.32	8,540
May 27	C. G. Paulsen	2.59	2,130
Sept. 14	C. C. Babb	1.64	891

Daily discharge, in second-feet, of Catawba River at Rhodhiss, N. C., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,160	1,160	900	858	4,830	1,330	1,210	2,110	1,330	4,590	2,110	950
2	1,050	1,050	815	1,050	3,880	1,610	1,270	1,690	1,270	2,290	1,770	858
3	950	1,050	900	1,050	3,660	1,330	1,210	1,610	1,210	1,540	1,210	815
4	950	1,020	900	1,000	3,440	1,210	1,160	1,330	1,160	1,330	1,160	815
5	950	1,000	900	1,000	2,470	1,270	1,160	1,270	1,330	1,330	1,000	950
6	1,000	1,050	900	1,050	2,470	1,210	1,100	1,400	1,210	1,100	950	1,000
7	858	1,000	858	1,540	2,110	1,210	1,000	1,330	1,460	1,100	1,000	1,000
8	900	950	705	1,330	2,020	1,270	4,350	1,460	1,400	1,100	1,210	1,160
9	900	950	705	1,160	2,110	1,210	7,980	1,770	1,280	1,270	1,620	1,610
10	900	950	705	1,050	2,110	1,400	3,880	1,610	1,160	1,000	2,020	1,210
11	900	858	705	1,100	2,290	1,270	2,840	1,270	1,210	950	2,020	1,050
12	1,050	950	858	6,360	2,020	1,210	2,290	1,210	1,100	950	2,020	815
13	858	1,100	930	2,470	1,860	1,160	1,860	1,270	1,210	950	1,050	900
14	778	1,210	1,000	2,110	1,770	1,210	1,860	2,840	1,100	858	900	815
15	900	1,000	1,000	2,290	1,610	1,160	1,770	2,110	1,050	950	900	815
16	900	1,000	778	2,110	1,940	1,100	1,540	1,610	975	815	900	815
17	900	1,000	1,000	1,860	2,110	1,100	1,610	1,540	900	900	1,380	815
18	950	950	1,000	1,690	1,860	1,210	1,540	1,460	1,690	900	1,860	1,770
19	1,460	1,000	1,050	1,400	1,770	1,160	1,610	1,540	1,270	1,000	3,230	1,400
20	4,350	950	1,000	1,610	2,110	1,210	2,290	1,690	1,460	950	1,770	1,770
21	1,770	900	1,100	1,330	2,290	1,610	4,590	2,290	1,400	975	1,270	1,270
22	1,460	950	1,000	1,330	2,110	1,270	3,660	2,290	2,840	1,000	1,050	1,140
23	1,210	950	950	1,270	1,860	1,210	2,650	2,290	2,120	1,000	1,000	1,000
24	1,000	950	900	1,400	1,770	2,110	2,290	2,110	1,400	1,460	900	1,000
25	1,000	858	950	1,330	1,610	1,860	2,020	2,020	1,460	1,460	925	858
26	950	900	1,160	1,540	1,540	1,540	1,940	1,940	1,400	1,460	950	858
27	950	858	1,270	1,460	1,470	1,400	1,860	2,110	1,160	1,330	1,100	1,460
28	900	815	1,100	6,620	1,400	1,270	1,690	1,940	1,160	1,720	1,160	1,100
29	1,000	900	1,000	9,160	.....	1,270	1,610	1,610	1,160	2,110	1,100	858
30	2,290	950	600	9,160	.....	1,210	1,610	1,460	2,880	2,470	1,050	858
31	1,270	.....	900	7,700	.....	1,210	.....	1,460	.....	2,470	1,050	.....

NOTE.—Discharge interpolated for the following days: Nov. 4; Dec. 8, 13; Feb. 26, 27; June 2, 9, 16, 23, 30; July 7, 21, 28; Aug. 9, 11, 17, 25; Sept. 1, 15, and 22. Accuracy of records for the following days affected to some extent by regulation above gage: Oct. 1-20; Nov. 19-30; Dec. 1-31; Jan. 1-11.

Monthly discharge of Catawba River at Rhodhiss, N. C., for the year ending Sept. 30, 1918.

[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.	
October	4,350	778	1,180	1.00	1.15
November	1,210	815	974	.825	.92
December	1,270	600	921	.781	.90
January	9,160	858	2,460	2.08	2.40
February	4,830	1,400	2,230	1.89	1.97
March	2,110	1,100	1,320	1.12	1.29
April	7,980	1,000	2,250	1.91	2.13
May	2,840	1,210	1,730	1.47	1.70
June	2,880	900	1,390	1.18	1.32
July	4,590	815	1,400	1.19	1.37
August	3,230	900	1,340	1.14	1.31
September	1,770	815	1,060	.898	1.00
The year	9,160	600	1,520	1.29	17.46

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, 1917, to January 28, 1918; September 25–30, 1918.

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 same datum. Gage read by employees of Georgia Railway & Power Co.

DISCHARGE MEASUREMENTS.—Made from cable at gage.

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, 4.44 feet January 28 (discharge, 2,690 second-feet); minimum mean daily stage recorded, 0.78 foot September 26 and 30 (discharge, 313 second-feet).

1917–1918: Maximum mean daily stage recorded January 1, 1917, to January 28, 1918, and September 25–30, 1918, 12.2 feet March 24, 1917 (discharge, about 12,000 second-feet); minimum mean daily stage recorded, 0.78 foot September 26 and 30, 1918 (discharge, 313 second-feet).

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

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 280 and 2,000 second-feet. Operation of recording gage satisfactory except for the period January 29 to September 24 for which there is no record owing to the gage well having been partly filled with sand. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting gage-height graph. Records 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, 1918.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 11	Nelson and Wills[a]	0.98	383
May 9	Paulsen and Condron	1.57	642
Aug. 23	C. G. Paulsen	.80	321

[a] Employees of Georgia Railway & Power Co.

Daily discharge, in second-feet, of Chattooga River near Tallulah Falls, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Sept.	Day.	Oct.	Nov.	Dec.	Jan.	Sept.
1	438	510	386	358	.....	16	376	422	406	840	.....
2	410	479	386	358	.....	17	376	414	414	705	.....
3	394	470	386	351	.....	18	376	414	422	605	.....
4	390	466	390	347	.....	19	1,660	414	418	551	.....
5	390	462	390	347	.....	20	1,120	418	406	551	.....
.....	383	450	390	361	.....	21	755	410	406	502	.....
.....	383	446	390	458	.....	22	630	398	406	515	.....
8	379	442	383	383	.....	23	569	394	402	488	.....
9	410	438	394	354	.....	24	520	383	394	488	.....
10	430	430	383	347	.....	25	510	383	386	502	317
11	390	438	383	556	.....	26	497	383	383	533	313
12	383	438	410	1,400	.....	27	497	383	376	705	379
13	376	458	406	705	.....	28	497	383	368	2,690	344
14	376	506	462	454	.....	29	528	386	361	.....	317
15	376	442	430	1,020	.....	30	680	386	361	.....	313
						31	578	.....	361	.....	.....

NOTE.—No gage-height record Jan. 29 to Sept. 24.

Monthly discharge of Chattooga River near Tallulah Falls, Ga., for the year ending Sept. 30, 1918.

[Drainage area, 256 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,660	376	519	2.03	2.34
November	510	383	428	1.67	1.86
December	462	361	395	1.54	1.78
January 1–28	2,690	347	624	2.44	2.54
September 25–30	379	313	330	1.29	0.29

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, 1918.

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

DISCHARGE MEASUREMENTS.—Made from cable and car about 200 feet upstream for low and medium stages. 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 daily stage recorded during year, 4.21 feet January 28 (discharge, 3,020 second-feet); minimum daily stage recorded, 0.68 foot August 18 (discharge, 70 second-feet).

1916–1918: 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 18, 1918.

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

ACCURACY.—Stage-discharge relation permanent. 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, 1918.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 12	Wills [a] and Nelson [a]	1.04	174
May 9	Paulsen and Condron	1.44	365
Aug. 24	C. G. Paulsen	.88	119

[a] Employees of Georgia Railway & Power Co.

Daily discharge, in second-feet, of Tallulah River near Seed, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	250	286	192	192	825	400	316	495	250	346	183	112
2	225	274	183	183	745	388	322	430	240	235	230	109
3	215	250	175	187	705	376	298	406	240	210	187	127
4	200	240	192	179	595	394	316	382	304	196	162	121
5	200	230	179	183	528	382	292	364	262	192	155	205
6	192	225	175	322	495	418	274	352	316	183	144	144
7	179	220	171	328	495	430	462	340	280	171	138	388
8	179	210	230	256	462	382	1,080	462	245	171	134	200
9	262	205	179	210	462	364	668	388	250	162	134	235
10	200	200	175	205	462	495	528	630	240	158	138	166
11	187	200	175	240	418	382	462	430	268	151	196	144
12	175	210	200	668	418	364	462	406	240	148	138	134
13	171	210	196	382	406	370	406	400	280	148	127	131
14	166	286	220	382	394	358	388	400	230	141	121	118
15	166	225	200	668	400	340	370	364	205	141	115	118
16	162	210	200	406	560	322	400	346	200	141	124	115
17	158	205	210	340	630	334	394	340	200	138	171	112
18	166	200	205	304	495	316	495	334	280	192	70	245
19	1,220	196	215	280	668	316	412	364	240	220	158	148
20	495	200	205	280	430	495	406	358	210	187	138	322
21	352	205	200	250	668	412	462	322	352	220	151	196
22	298	192	200	286	560	370	400	352	316	210	118	155
23	268	183	192	250	495	352	370	376	235	205	112	141
24	240	183	183	256	495	376	364	370	215	179	115	131
25	230	179	183	262	462	352	358	340	205	245	121	124
26	220	179	215	280	462	328	462	322	256	215	121	124
27	215	179	200	668	418	322	382	304	225	230	112	148
28	210	179	187	3,020	412	316	376	286	215	192	121	131
29	220	210	187	1,600	.....	304	394	280	215	205	134	144
30	495	200	138	1,600	.....	298	560	262	286	210	118	151
31	322	.....	162	1,310	.....	292	.....	256	.....	200	115	.....

Monthly discharge of Tallulah River near Seed, Ga., for the year ending Sept. 30, 1918.

[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	1,220	158	266	2.09	2.41
November	286	179	212	1.67	1.86
December	230	138	191	1.50	1.73
January	3,020	179	515	4.06	4.68
February	825	394	520	4.09	4.26
March	495	292	366	2.88	3.32
April	1,080	274	429	3.38	3.77
May	630	256	370	2.91	3.36
June	352	200	250	1.97	2.20
July	346	138	192	1.51	1.74
August	230	70	139	1.09	1.26
September	388	109	161	1.27	1.42
The year	3,020	70	300	2.36	32.01

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, 1918.

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, 4.00 feet at 1.50 p. m. March 7 (discharge, 1,500 second-feet); minimum discharge, somewhat less than 5 second-feet, during periods when sluice gates in dam were closed.

1916–1918: 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.

DIVERSIONS.—None.

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, 1918.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 10	Paulsen and Condron	2.93	883
Aug. 25	C. G. Paulsen	—.21	*a* 4.6

c Sluice gates in Rabun dam closed when this measurement was made.

Daily discharge, in second-feet, of Tallulah River near Lakemont, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	227	405	220	240	330	961	355	460	340	270	40	44
2	419	373	78	285	30	306	580	540	151	250	5	114
3	232	212	404	455	26	76	576	543	565	176	80	133
4	430	102	245	310	91	622	572	172	530	182	37	145
5	420	624	195	100	404	627	590	95	578	375	99	.....
6	132	664	196	37	376	620	238	513	527	207	360	.....
7	84	678	180	204	424	692	112	490	465	175	333	.....
8	415	641	.....	233	415	653	226	560	140	425	363	44
9	385	593	.....	248	55	256	314	565	116	560	409	47
10	490	280	.....	262	33	58	248	487	626	510	136	23
11	500	73	.....	120	568	617	220	208	475	573	43	54
12	485	435	.....	38	623	641	312	110	415	569	140	136
13	165	490	282	79	670	650	106	504	450	213	155	118
14	87	405	310	300	580	680	24	508	416	116	136	117
15	450	495	188	338	660	670	264	468	173	500	82	64
16	400	522	82	457	130	322	486	270	134	525	91	165
17	505	243	295	374	28	100	518	350	420	490	67	176
18	487	79	283	145	310	615	490	170	445	485	30	238
19	293	480	172	62	405	586	459	85	490	412	37	172
20	180	405	220	41	450	665	251	510	430	188	39	86
21	60	470	280	32	459	716	24	385	317	65	34	5
22	197	460	150	31	455	672	318	390	118	305	8	5
23	180	390	.....	290	141	228	278	447	110	370	18	5
24	264	180	.....	450	24	57	225	311	290	285	19	58
25	359	84	.....	330	445	475	420	182	425	260	7	134
26	322	416	.....	35	645	630	104	122	445	240	128	146
27	210	420	.....	28	792	600	151	395	424	6	135	110
28	90	490	.....	25	866	750	19	405	400	6	192	98
29	455	355	.....	148	.....	710	390	440	131	6	60	82
30	315	465	90	159	.....	275	425	490	103	50	139	142
31	350	.....	200	193	.....	139	.....	500	.....	290	74	.....

NOTE.—Gage-height record incomplete Dec. 31, Jan. 1, 24, 25 and June 1; discharge estimated for part o day. No gage-height record Dec. 8–12, 23–29, and Sept. 5–7.

Monthly discharge, in second-feet, of Tallulah River, near Lakemont, Ga., for the year ending Sept. 30, 1918.

Month.	Maximum.	Minimum.	Mean.	Month.	Maximum.	Minimum.	Mean.
October	505	60	309	April	590	19	310
November	678	73	398	May	565	85	377
January	457	25	195	June	626	103	355
February	866	24	373	July	573	6	293
March	961	57	505	August	409	5	113

TIGER CREEK AT LAKEMONT, GA.

LOCATION.—100 feet from old Mathis post office, 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, 1918.

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, 3.01 feet January 28 (discharge, 518 second-feet); minimum mean daily stage, 1.19 feet September 26 (discharge, 31 second-feet).

1916–1918: 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 September 26, 1918.

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

DIVERSIONS.—None.

REGULATION.—Phillips' mill, which is infrequently operated, can cause considerable variation in stage. The gage is read only when mill is not running. As the pond above dam has practically no storage the gage heights are an accurate indication of natural flow.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice. Rating curve well defined below 600 second-feet; above this point it is an extension. Gage read to half-tenths four times daily—at 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, 1918.

[Made by C. G. Paulsen.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 10	1.67	108
Aug. 25	1.16	28.0

Daily discharge, in second-feet, of Tiger Creek at Lakemont, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	50	47	41	48	105	66	55	73	55	46	41	33
2	46	43	39	39	107	66	57	68	54	43	51	32
3	43	42	39	39	100	65	57	63	52	42	43	37
4	42	42	38	43	83	71	55	58	61	42	40	35
5	41	42	37	39	71	66	55	58	55	40	38	47
6	40	41	37	57	71	63	54	58	57	38	36	41
7	40	41	38	45	73	68	98	55	55	37	34	42
8	40	40	42	43	71	63	95	66	52	37	33	41
9	51	39	41	43	69	65	105	91	52	37	33	41
10	43	38	46	43	71	66	87	100	51	36	33	38
11	42	37	43	109	65	61	81	73	48	34	37	34
12	40	40	48	89	66	58	71	68	57	34	34	33
13	40	87	46	65	65	58	68	69	52	34	33	33
14	40	61	43	60	68	57	63	65	50	34	33	32
15	39	51	42	89	69	55	63	61	48	34	33	32
16	39	48	41	69	105	55	68	58	47	34	33	32
17	39	43	42	60	100	58	65	58	47	34	73	34
18	43	42	43	52	85	55	79	57	47	35	39	46
19	162	42	43	54	122	54	68	75	47	39	46	45
20	63	45	41	52	127	60	73	68	47	36	38	48
21	55	43	41	51	105	65	73	60	63	48	34	42
22	54	42	41	50	89	63	68	98	50	42	33	34
23	52	42	40	50	81	60	65	73	47	43	33	34
24	50	42	42	52	75	63	61	135	46	45	37	32
25	48	42	40	54	71	60	60	79	43	41	35	32
26	48	41	43	54	71	57	69	69	50	47	34	31
27	48	39	43	98	68	55	63	65	45	63	34	33
28	48	37	41	518	68	55	63	61	42	46	39	32
29	48	41	41	186	.....	54	61	58	42	42	37	37
30	52	41	39	259	.....	54	83	57	47	43	35	36
31	47	.....	41	137	.....	52	.....	57	.....	42	34	.....

Monthly discharge of Tiger Creek at Lakemont, Ga., for the year ending Sept. 30, 1918.

[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	162	39	49.5	1.71	1.97
November	87	37	44.0	1.52	1.70
December	48	37	41.4	1.43	1.65
January	518	39	85.4	2.94	3.39
February	127	65	82.9	2.86	2.98
March	71	52	60.3	2.08	2.40
April	105	54	69.4	2.39	2.67
May	135	55	69.5	2.40	2.77
June	63	42	50.3	1.73	1.93
July	63	34	40.3	1.39	1.60
August	73	33	37.6	1.30	1.50
September	48	31	36.6	1.26	1.41
The year	518	31	55.4	1.91	25.97

[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 from Post Route map of Georgia).

RECORDS AVAILABLE.—June 3, 1916, to September 30, 1918.

GAGE.—Stevens continuous water-stage recorder on left bank of river, referenced 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, 14.16 feet at 9 p. m. December 30 (discharge, 15,300 second-feet); minimum stage, from water-stage recorder, 3.06 feet at 2 a. m. June 17 (discharge, 430 second-feet).

1916–1918: 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, that of June 17, 1918.

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.

DIVERSIONS.—None.

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 Juliette mills, 1 mile upstream and the hydroelectric plant on Towaliga River at High Falls, about 15 miles away.

ACCURACY.—Stage-discharge relation probably permanent, but some trouble was caused during the year by obstructions in intake pipe to gage well. Rating curve fairly well defined between 600 and 45,000 second-feet. Operation of water-stage recorder satisfactory. Slight errors in gage-height graph, due to lag in stage, caused by obstruction in intake pipe, are compensating, because there is considerable diurnal fluctuation. Discharge determined by use of discharge integrator. Records good.

Discharge measurements of Ocmulgee River at Juliette, Ga., during the year ending September 30, 1918.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 23	C. G. Paulsen	4.80	1,540	June 5	A. H. Condron	4.00	914
Apr. 12	do	4.68	1,680	Aug. 7	do	4.48	1,200
May 27	A. H. Condron	4.08	1,130				

Daily discharge, in second-feet, of Ocmulgee River at Juliette, Ga., for the year ending September 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	7,130	1,450	1,320	1,390	9,140	2,170	1,540	2,550	1,520	1,290	1,380	980
2	3,610	1,510	940	1,420	7,100	2,000	1,970	2,270	1,000	1,230	3,150	870
3	2,440	1,370	1,100	1,460	5,900	1,290	1,920	1,990	1,250	1,200	2,480	1,440
4	2,430	970	1,410	1,490	5,530	1,690	1,870	1,740	1,550	1,030	1,620	1,950
5	2,000	1,150	1,400	1,380	3,930	2,120	1,860	1,110	1,440	920	1,470	1,860
6	1,620	1,520	1,500	940	2,880	2,180	1,700	1,500	1,440	1,080	1,510	1,860
7	1,100	1,510	1,440	1,040	2,850	2,350	1,150	1,890	1,540	700	1,440	1,600
8	1,300	1,550	1,460	1,370	2,750	2,280	2,180	1,890	1,520	780	1,430	1,010
9	1,550	1,580	1,130	1,330	2,580	2,050	1,990	1,810	840	1,340	1,460	1,110
10	1,540	1,440	1,100	1,250	1,670	1,170	2,000	1,880	1,000	1,220	1,440	1,670
11	1,470	970	1,440	1,280	2,090	1,640	2,000	1,650	1,460	1,120	950	1,640
12	1,490	1,170	1,490	.....	2,490	2,140	1,930	1,100	1,360	1,120	1,060	1,560
13	1,410	1,340	1,390	.....	2,610	2,200	1,730	1,390	1,350	1,070	1,380	1,480
14	1,020	1,330	1,360	.....	2,480	2,170	1,200	1,740	1,310	680	1,390	1,500
15	1,120	1,320	1,400	.....	2,500	2,180	1,500	1,740	1,210	800	1,360	860
16	1,510	1,340	1,070	.....	2,290	1,970	1,860	1,810	730	1,170	1,380	1,010
17	1,500	1,290	1,170	.....	1,680	1,240	1,890	1,790	860	1,140	1,270	1,450
18	1,540	1,000	1,610	.....	2,370	1,670	1,860	1,530	1,240	1,250	855	1,320
19	1,560	1,150	1,480	.....	2,700	2,200	1,920	1,040	1,220	1,320	985	1,240
20	1,400	1,800	1,420	1,260	2,640	2,380	1,750	1,370	1,230	1,300	1,330	1,210
21	931	1,500	1,520	1,650	2,630	2,300	1,400	1,740	1,180	840	1,330	1,000
22	1,220	1,390	1,400	2,170	2,550	2,200	1,530	1,780	1,090	880	1,350	710
23	1,540	1,410	920	2,270	2,320	1,990	1,850	1,830	700	1,280	1,350	700
24	1,520	1,360	680	2,160	1,600	1,270	1,870	1,950	840	1,290	1,300	920
25	1,510	970	828	2,520	2,160	1,690	1,860	1,610	1,180	1,330	830	880
26	1,680	1,140	920	2,370	2,620	2,230	2,040	1,060	1,180	1,700	750	910
27	1,480	1,430	1,230	1,280	2,450	2,250	1,900	1,310	1,200	1,000	1,230	900
28	975	1,420	1,300	2,070	2,260	2,250	1,510	1,690	1,190	870	1,310	870
29	1,200	1,360	1,260	7,620	.....	2,320	1,930	1,650	1,220	930	2,700	730
30	1,650	1,320	890	12,400	.....	2,080	2,400	1,660	1,050	1,380	1,440	740
31	1,480	.....	940	12,800	.....	1,250	.....	1,640	.....	1,620	1,290	.....

NOTE.—Discharge, Jan. 12–19, estimated, by comparison with records for Ocmulgee River at Jackson, as 1,570 second-feet.

Monthly discharge, in second-feet, of Ocmulgee River at Juliette, Ga., for the year ending September 30, 1918.

Month.	Maximum.	Minimum.	Mean.	Month.	Maximum.	Minimum.	Mean.
October	7,130	931	1,740	May	2,550	1,040	1,670
November	1,800	970	1,340	June	1,550	700	1,200
December	1,610	680	1,240	July	1,700	680	1,130
January	12,800	940	2,500	August	3,150	750	1,430
February	9,140	1,600	3,100	September	1,950	700	1,200
March	2,380	1,170	1,970				
April	2,400	1,150	1,800	The year.	12,800	680	1,680

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, 1918.

GAGE.—Standard chain gage attached to bridge; read by F. M. Chambers to December, 1917, and by N. T. Oakes from January to September, 1918.

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, 14.1 feet at 4 p. m. January 31 (discharge, 8,260 second-feet); minimum stage, 0.2 foot in forenoon of July 15 (discharge, 141 second-feet).

1903–1918: 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 discharges 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, 0.2 foot in forenoon of July 15, 1918 (discharge, 141 second-feet).

ICE.—None.

DIVERSIONS.—None.

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

ACCURACY.—Stage-discharge relation practically permanent during the year. Rating curve well defined between 225 and 6,000 second-feet. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Oconee River near Greensboro, Ga., during the year ending Sept. 30, 1918.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 11	C. G. Paulsen	3.79	1,280
June 15	A. H. Condron	1.36	425

Daily discharge, in second-feet, of Oconee River near Greensboro, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,330	890	520	432	7,500	925	582	1,150	352	1,110	1,920	1,110
2	1,280	520	490	314	3,470	890	750	1,110	404	890	3,590	550
3	715	614	490	490	2,550	855	750	960	352	680	4,480	460
4	680	490	490	550	2,020	925	614	820	550	520	5,130	432
5	550	490	490	582	1,720	1,280	582	750	490	314	6,180	750
6	520	490	550	490	1,640	995	715	715	404	378	2,550	1,920
7	460	490	550	614	1,500	960	550	785	1,540	378	995	1,150
8	490	550	550	820	1,460	960	1,150	785	960	460	890	890
9	614	490	490	715	1,280	890	2,120	1,110	520	1,920	820	647
10	680	490	520	614	1,190	890	1,820	2,440	647	460	820	550
11	520	490	490	614	1,230	890	1,230	1,070	820	432	582	550
12	614	432	520	4,220	1,150	890	1,110	855	614	432	785	520
13	550	614	520	4,740	1,190	820	960	820	582	326	995	432
14	404	750	460	4,870	1,190	820	890	1,070	490	228	680	432
15	404	680	490	4,220	1,190	820	890	1,030	490	252	680	352
16	378	680	490	4,220	1,030	820	855	855	404	276	582	288
17	432	550	550	4,220	1,150	750	820	750	550	314	432	404
18	432	550	490	1,920	1,280	890	960	750	750	314	378	404
19	490	490	490	1,460	1,230	890	995	550	614	614	352	404
20	750	750	550	1,110	1,360	820	890	855	490	2,550	520	432
21	750	647	550	1,110	1,320	995	890	785	582	2,080	404	680
22	614	614	582	1,190	1,230	1,110	960	715	550	1,280	432	614
23	520	550	550	2,120	1,070	960	890	715	378	960	432	520
24	550	550	432	2,220	1,030	1,720	785	680	680	1,720	432	550
25	460	550	614	1,920	1,030	1,190	750	647	460	2,660	378	550
26	460	404	614	1,820	1,030	890	890	404	1,820	1,540	352	520
27	582	432	750	1,680	960	820	1,030	582	1,360	1,320	326	432
28	490	490	582	1,590	925	820	1,030	680	890	925	520	490
29	550	490	614	4,610	.....	785	1,030	614	550	1,680	680	264
30	820	550	432	5,840	.....	750	1,110	432	614	2,280	890	288
31	1,320	.....	404	7,700	.....	550	.....	378	.....	3,830	995	.....

Monthly discharge of Oconee River near Greensboro, Ga., for the year ending Sept. 30, 1918.

[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	2,330	378	658	0.598	0.69
November	890	404	559	.508	.57
December	750	404	526	.478	.55
January	7,700	314	2,230	2.03	2.34
February	7,500	925	1,600	1.45	1.52
March	1,720	550	922	.838	.97
April	2,120	550	953	.866	.97
May	2,440	378	834	.758	.87
June	1,820	352	664	.604	.67
July	3,830	228	1,070	.973	1.12
August	6,180	326	1,260	1.15	1.33
September	1,920	264	586	.533	.59
The year	7,700	228	987	.897	12.18

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, 1918.

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 feet, at same site. High-water section, 10 to 20 feet, attached to tree 75 feet upstream from inclined section. Read by H. A. Taylor and B. L. Butts.

DISCHARGE MEASUREMENTS.—Made from ferryboat.

CHANNEL AND CONTROL.—Sand 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, 4.3 feet at 7 a. m. July 15 and 5 p. m. July 16 (discharge, 400 second-feet).

1906–1918: Maximum stage recorded May 23, 1906, to December 31, 1908, and October 6, 1909, to September 30, 1918, about 24.6 feet March 17, 1913 (discharge determined from extension of rating curve, about 49,700 second-feet); minimum stage recorded, July 15 and 16, 1918.

ICE.—None.

DIVERSIONS.—None.

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

ACCURACY.—Stage-discharge relation permanent during the year. Rating curve very well defined below 2,000 second-feet, fairly well defined between 2,000 and 5,500 second-feet, and extended above 5,500 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage-height to rating table. Records good up to 5,500 second-feet; above that point subject to error.

Discharge measurements of Oconee River at Fraleys Ferry, near Milledgeville, Ga., during the year ending Sept. 30, 1918.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 15	C. G. Paulsen	5.73	1,700
June 6	A. H. Condron	5.10	1,030
Aug. 8	.....do	5.57	1,480

Daily discharge, in second-feet, of Oconee River at Fraleys Ferry, near Milledgeville, Ga., for the year ending Sept. 30, 1918.

Day.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	1,540	1,270	.....	2,210	1,540	3,160	710	1,320	4,030	2,360
2	.....	1,430	1,320	.....	2,210	2,060	2,680	792	1,790	3,670	1,790
3	.....	1,430	1,320	.....	2,210	1,790	2,210	710	1,430	9,240	1,270
4	1,540	1,430	1,380	7,970	2,060	1,790	1,790	632	972	5,940	880
5	1,120	1,430	1,430	5,940	2,060	1,660	1,540	880	835	5,940	835
6	1,120	1,320	1,540	4,410	2,060	1,540	1,540	1,120	632	5,740	2,060
7	1,120	1,430	1,790	3,500	2,060	1,540	1,540	3,330	710	1,540	2,360
8	1,020	1,920	1,790	3,000	2,060	1,540	1,540	3,160	710	1,540	2,360
9	1,020	1,790	1,920	2,680	2,060	3,000	1,790	1,790	4,030	1,270	1,120
10	1,540	1,540	1,790	2,680	2,060	2,680	3,330	1,170	4,030	1,270	1,270
11	2,840	1,540	2,060	2,520	2,060	2,060	3,000	1,540	1,270	1,540	1,070
12	2,360	1,430	7,140	2,680	2,060	2,680	1,790	1,540	925	1,380	835
13	3,670	1,380	7,140	3,160	1,790	2,210	1,540	1,660	710	1,380	792
14	3,330	1,430	7,140	3,670	1,790	2,060	1,790	1,430	670	1,380	710
15	3,160	1,320	7,760	3,330	1,790	1,790	2,360	1,070	460	972	670
16	3,000	1,320	7,140	3,000	1,660	1,790	2,060	880	430	1,120	525
17	2,840	1,430	6,140	3,000	1,790	1,540	1,540	1,380	632	1,790	632
18	2,680	1,430	4,030	3,000	2,060	1,540	1,540	2,360	835	880	710
19	2,520	1,430	3,330	3,000	2,060	2,060	1,320	1,540	1,790	670	670
20	3,160	1,430	3,000	3,000	2,060	2,360	1,380	1,170	3,000	1,170	835
21	2,060	1,430	2,680	3,160	2,060	3,160	1,430	1,020	4,600	972	880
22	1,540	1,430	4,030	3,000	2,210	2,360	1,380	925	3,000	670	972
23	1,540	1,430	4,410	3,000	2,210	2,060	1,220	880	1,920	670	880
24	1,320	1,430	4,030	2,840	1,790	1,660	1,270	710	3,000	595	792
25	1,220	1,430	3,670	2,680	2,680	1,660	1,220	632	4,030	670	792
26	1,220	1,790	3,330	2,520	2,360	2,060	1,170	1,120	4,980	670	750
27	1,220	2,210	3,160	2,520	1,540	2,360	972	2,840	3,000	595	792
28	1,320	2,060	3,160	2,360	1,540	2,680	925	2,060	2,360	632	835
29	1,320	1,540	.....	.....	1,540	2,210	925	1,380	1,790	1,070	792
30	1,540	1,380	.....	.....	1,660	2,680	880	1,540	1,430	1,790	632
31	.....	1,270	.....	.....	1,430	.....	880	.....	4,220	1,660	.....

NOTE.—Water overtopped the gage Dec. 29 to Feb. 3; discharge above 9,700 second-feet. No record Oct. 1 to Nov. 3.

Monthly discharge of Oconee River at Fraleys Ferry, near Milledgeville, Ga., for the year year ending Sept. 30, 1918.

[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.	
November 4–30	3,670	1,020	1,940	0.683	0.69
December	2,210	1,270	1,510	.532	.61
January 1–28	7,760	1,270	3,530	1.24	1.29
February 4–28	7,970	2,360	3,300	1.16	1.08
March	2,680	1,430	1,970	.694	.80
April	3,160	1,540	2,070	.729	.81
May	3,330	880	1,670	.588	.68
June	3,330	632	1,400	.493	.55
July	4,980	430	1,980	.697	.80
August	9,240	595	2,010	.708	.82
September	2,360	525	1,060	.373	.42

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, 1917, to January 31, 1918, when station was discontinued.

GAGE.—Vertical staff, enamel-faced, 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, 7.85 feet January 12; minimum mean daily stage, 0.34 foot December 12.

1917–1918: Maximum mean daily stage recorded, 12.93 feet March 24, 1917; minimum mean daily stage recorded, 0.34 foot December 12, 1917.

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.

Discharge measurements of Chattahooche River near Gainesville, Ga., during 1918.

[Made by C. G. Paulsen.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Aug. 26	0.76	396
Oct. 1	.74	364

Daily gage height, in feet, of Chattahoochee River near Gainesville, Ga., for the period Oct. 1, 1917, to Jan. 31, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Day.	Oct.	Nov.	Dec.	Jan.
1	2.25	1.55	0.95	0.80	16	0.75	1.12	2.55	6.45
2	1.62	1.50	.98	2.50	17	.73	1.03	2.35	3.05
3	1.05	1.60	.93	1.70	18	.68	1.07	2.05	2.83
4	1.05	1.10	.95	2.65	19	1.97	.87	1.82	1.45
5	1.05	1.25	.99	3.10	20	2.65	1.00	1.58	1.15
6	1.00	.95	.80	1.25	21	2.15	1.08	1.62	1.35
7	1.28	1.00	.98	1.68	22	1.25	.95	1.14	3.00
8	1.00	.95	.81	1.13	23	.85	.91	1.27	2.45
9	1.00	.92	1.25	.95	24	.88	.85	1.16	1.95
10	1.10	.94	1.10	1.10	25	.98	1.00	.93	2.45
11	1.00	.97	2.00	2.40	26	.90	.98	1.21	1.95
12	.75	.97	.34	7.85	27	1.10	1.25	1.25	1.52
13	.80	1.10	1.83	5.25	28	1.17	.97	1.05	4.15
14	1.05	1.45	3.05	5.30	29	1.05	.92	.96	7.40
15	.85	1.10	2.86	5.75	30	2.10	1.05	1.00	5.50
					31	1.35	.....	1.05	5.65

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, 1918.

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 without change in datum, 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, 10.4 feet at 6 p. m. January 29 (discharge, 10,800 second-feet); minimum stage recorded, 1.15 feet at 7 a. m. August 24 (discharge, 522 second-feet).

1903–1918: 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 stages has not been determined.

ACCURACY.—Stage-discharge relation practically permanent during the year. Rating curve well defined between 700 and 10,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Chattahooche River near Norcross, Ga., during the year ending Sept. 30, 1918.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 28	C. G. Paulsen	3.68	2,450	June 12	A. H. Condron	2.26	1,260
Mar. 9	do	2.81	1,800	July 11	do	1.77	930
Apr. 9	do	6.34	5,440	Sept. 5	do	3.22	2,200
9	do	5.87	4,890	5	do	3.12	2,150
May 18	A. H. Condron	2.48	1,540				

Daily discharge, in second-feet, of Chattahoochee River near Norcross, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,920	1,560	1,230	1,150	4,670	1,830	1,390	2,460	1,080	1,740	1,740	800
2	1,650	1,390	1,230	1,080	3,440	1,740	1,390	2,370	1,080	1,310	3,870	730
3	1,560	1,310	1,150	1,230	3,240	1,740	1,390	2,010	1,010	1,080	4,310	730
4	1,390	1,310	1,230	1,150	2,940	1,740	1,470	1,830	1,080	940	2,100	2,840
5	1,310	1,230	1,390	1,150	2,550	1,740	1,470	1,740	1,150	870	1,650	2,100
6	1,310	1,310	1,310	1,230	2,280	1,740	1,390	1,560	1,310	870	1,150	1,650
7	1,310	1,230	1,230	1,470	2,190	1,740	1,560	1,470	1,920	870	1,230	1,390
8	1,150	1,230	1,230	1,560	2,100	1,560	4,090	1,560	1,740	765	1,080	1,150
9	1,310	1,230	1,230	1,470	2,100	1,650	5,030	1,920	1,310	870	870	1,230
10	1,310	1,230	1,230	1,310	1,920	1,740	2,740	1,650	1,150	800	905	1,080
11	1,310	1,230	1,230	2,460	1,920	1,650	2,100	1,390	1,150	765	1,920	905
12	1,310	1,230	1,830	9,060	1,830	1,560	2,010	1,470	1,150	730	1,010	870
13	1,230	1,310	2,010	5,150	1,830	1,560	1,830	1,470	1,150	730	975	870
14	1,230	1,310	1,830	2,460	1,740	1,560	1,740	1,830	1,310	730	975	800
15	1,080	1,390	1,920	5,270	2,100	1,390	1,470	1,560	1,080	670	975	765
16	1,150	1,310	2,010	4,790	2,640	1,390	1,650	1,390	1,010	730	800	730
17	1,150	1,230	1,650	2,640	3,650	1,560	1,830	1,310	940	730	800	670
18	1,150	1,310	1,740	2,190	3,440	1,560	1,830	1,310	1,010	800	800	765
19	1,390	1,150	1,560	1,920	2,640	1,390	1,830	1,310	1,310	1,230	765	800
20	1,920	1,230	1,560	1,830	2,840	1,470	1,830	1,470	1,230	2,190	765	1,310
21	1,830	1,230	1,310	1,740	2,940	1,740	1,740	1,390	1,390	1,740	730	1,390
22	1,560	1,230	1,230	2,280	2,640	1,740	1,740	1,560	1,390	1,150	730	1,230
23	1,470	1,230	1,310	2,100	2,370	1,560	1,650	1,390	1,390	1,390	730	1,080
24	1,390	1,230	1,230	2,100	2,190	1,650	1,650	1,470	1,150	1,310	730	1,010
25	1,230	1,150	1,310	2,010	2,100	1,560	1,470	1,470	1,080	1,390	730	905
26	1,230	1,080	1,390	2,280	2,010	1,560	1,830	1,230	1,920	2,370	905	800
27	1,230	1,010	1,230	2,100	1,920	1,470	2,370	1,310	1,470	2,460	870	800
28	1,230	1,230	1,310	3,440	1,920	1,390	1,920	1,310	1,150	1,830	975	835
29	1,390	1,230	1,310	10,000	.....	1,390	2,010	1,230	1,080	1,560	940	800
30	1,740	1,230	1,230	8,020	.....	1,390	2,100	1,150	1,740	1,560	800	800
31	1,470	.....	1,150	7,760	.....	1,470	.....	1,080	.....	2,100	800	.....

Monthly discharge of Chattahoochee River near Norcross, Ga., for the year ending Sept. 30, 1918.

[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	1,920	1,080	1,380	1.18	1.36
November	1,560	1,010	1,250	1.07	1.19
December	2,010	1,150	1,410	1.21	1.40
January	10,000	1,080	3,050	2.61	3.01
February	4,670	1,740	2,510	2.15	2.24
March	1,830	1,390	1,590	1.36	1.57
April	5,030	1,390	1,950	1.67	1.86
May	2,460	1,080	1,540	1.32	1.52
June	1,920	940	1,260	1.08	1.20
July	2,460	670	1,230	1.05	1.21
August	4,310	730	1,210	1.03	1.19
September	2,840	670	1,060	0.906	1.01
The year	10,000	670	1,620	1.38	18.76

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, 1918.

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 mean daily stage, 16.3 feet January 12 (discharge, 34,800 second-feet); minimum mean daily stage, 2.2 feet July 16 (discharge, 1,300 second-feet).

1896–1918: Maximum stage recorded (old gage), 25.0 feet December 30, 1901 (discharge, 88,600 second-feet); minimum stage (old gage), 0.8 foot September 18–21, 1896 (discharge, 780 second-feet).

ICE.—None.

DIVERSIONS.—None.

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 permanent during the year. Rating curve 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.

Discharge measurements of Chattahoochee River at West Point, Ga., during the year ending Sept. 30, 1918.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 19	C. G. Paulsen	3.54	3,110	Aug. 1	A. H. Condron	3.95	3,970
Apr. 26	Paulsen and Cox	5.65	8,140	Sept. 26	do	2.68	1,770
June 19	A. H. Condron	3.42	2,870				

Daily discharge, in second-feet, of Chattahoochee River at West Point, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	13,200	3,630	2,510	2,350	20,500	4,060	3,030	13,500	2,350	7,000	3,840	2,680
2	7,750	2,680	2,680	2,200	14,800	4,060	3,030	9,750	2,200	4,770	9,500	2,850
3	5,010	2,850	2,510	2,350	11,800	3,840	3,030	7,750	2,060	3,420	18,800	2,060
4	4,060	2,850	2,350	2,350	9,750	3,840	3,030	6,000	2,060	2,850	16,000	2,060
5	3,840	2,510	2,350	2,200	8,500	3,630	2,850	5,010	2,060	2,350	9,000	4,530
6	3,420	2,350	2,510	2,680	7,250	3,630	3,030	4,530	2,060	2,060	4,770	6,250
7	3,220	2,510	2,680	3,220	6,250	3,840	3,840	4,060	2,510	1,930	3,220	3,840
8	3,030	2,510	2,510	3,220	6,000	3,630	12,200	3,840	3,220	1,800	2,680	2,850
9	2,850	2,510	2,850	3,220	5,250	3,630	20,200	3,840	4,060	2,060	2,350	2,680
10	2,680	2,510	2,350	3,220	5,250	3,630	17,000	5,010	4,060	2,060	2,200	1,930
11	2,850	2,510	2,350	3,420	5,010	3,420	12,200	5,010	5,010	1,800	4,060	1,930
12	2,850	2,350	2,510	34,800	4,530	3,420	7,750	3,840	3,630	1,680	3,030	1,930
13	2,850	2,680	2,680	26,800	4,770	3,420	5,500	3,840	2,850	1,470	3,420	1,800
14	2,850	2,850	2,350	18,500	5,010	3,630	5,010	7,750	2,680	1,470	1,930	1,680
15	2,680	2,680	2,350	14,000	5,750	3,420	4,530	6,500	2,510	1,380	1,930	1,680
16	2,510	2,680	2,510	14,500	5,750	3,220	4,060	4,530	2,350	1,300	1,800	1,570
17	2,510	2,510	2,510	12,000	6,000	3,030	3,840	3,840	2,200	1,470	1,800	1,470
18	2,680	2,680	2,350	8,750	6,500	3,030	4,290	3,420	2,350	1,470	1,930	1,470
19	2,680	2,350	2,350	6,500	7,000	3,030	4,530	3,420	2,850	1,680	1,800	1,470
20	3,630	2,680	2,510	5,250	7,000	3,420	4,060	3,030	2,060	2,510	1,800	1,800
21	3,420	3,220	2,510	5,500	5,500	3,630	4,290	3,030	2,350	2,850	1,680	2,680
22	3,030	3,420	2,510	9,500	6,000	3,420	4,290	3,220	2,350	3,840	1,570	2,850
23	3,220	2,850	2,510	12,200	5,750	3,420	3,840	3,220	2,510	3,220	1,570	2,350
24	2,680	2,510	2,510	7,750	5,010	3,420	3,630	3,420	2,350	2,850	1,380	2,060
25	2,680	2,510	2,510	6,750	5,010	3,420	3,420	3,840	2,200	4,060	1,470	1,800
26	2,680	2,350	2,680	5,750	4,530	3,220	7,250	3,030	2,350	4,530	1,380	1,680
27	2,680	2,350	2,680	5,250	4,290	3,220	12,200	2,850	2,850	3,630	1,570	1,680
28	2,680	2,350	2,680	6,250	4,060	3,030	8,500	2,510	3,030	10,200	1,380	1,570
29	2,510	2,510	2,680	17,200	.....	3,030	9,750	2,510	2,850	6,500	2,200	1,800
30	2,680	2,510	2,510	22,000	.....	2,850	13,200	2,510	5,250	4,770	2,060	1,800
31	3,630	.....	2,510	26,800	.....	2,850	.....	2,350	.....	4,060	2,510	.....

Monthly discharge of Chattahoochee River at West Point, Ga., for the year ending Sept. 30, 1918.

[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	13,200	2,510	3,520	1.07	1.23
November	3,630	2,350	2,650	.803	.90
December	2,850	2,350	2,520	.764	.88
January	34,800	2,200	9,560	2.90	3.34
February	20,500	4,060	6,890	2.09	2.18
March	4,060	2,850	3,430	1.04	1.20
April	20,200	2,850	6,580	1.99	2.22
May	13,500	2,350	4,550	1.38	1.59
June	5,250	2,060	2,770	.839	.94
July	10,200	1,300	3,130	.948	1.09
August	18,800	1,380	3,700	1.12	1.29
September	6,250	1,470	2,290	.694	.77
The year	34,800	1,300	4,290	1.30	17.63

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, 1917, to August 31, 1918, when station was discontinued.

GAGE.—Vertical staff in tail race of Georgia Railway & Power Co.'s power plant; read to hundredths 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, 3.25 feet January 29 and 30; minimum mean daily stage recorded, zero, May 7.

1917 and 1918: Maximum mean daily stage recorded, 5.2 feet March 4, 1917; minimum mean daily stage recorded, zero, May 7, 1918.

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.

The following discharge measurement was made by C. G. Paulsen:

October 1, 1918: Gage height, 1.02 feet; discharge, 197 second-feet.

Daily gage-height, in second-feet, of Chestatee River at New Bridge, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1	1.70	1.55	1.40	1.40	2.65	1.90	2.15	2.15	2.10	1.95	2.15
2	1.60	1.55	1.40	1.45	2.55	1.85	2.15	2.10	2.05	1.85	2.05
3	1.55	1.55	1.40	1.50	2.40	1.80	2.15	2.10	1.75	2.05	2.00
4	1.50	1.50	1.40	1.40	2.30	1.80	2.15	2.10	2.05	1.65	2.00
5	1.50	1.50	1.40	1.40	2.20	1.80	2.10	2.10	2.00	1.80	2.05
6	1.50	1.45	1.40	1.40	2.10	1.80	2.15	2.15	2.10	1.70	2.00
7	1.50	1.45	1.40	1.85	2.10	2.10	2.25	.00	2.00	1.80	1.85
8	1.50	1.40	1.40	1.40	2.00	2.10	2.85	2.10	1.65	1.85	1.90
9	1.45	1.40	1.40	1.40	2.00	2.10	2.50	2.20	1.75	2.00	1.80
10	1.50	1.45	.70	1.40	2.00	2.10	2.20	2.10	1.55	1.90	1.85
11	1.50	1.45	1.40	2.25	1.70	2.05	2.10	2.10	1.80	1.80	1.95
12	1.45	1.50	1.15	2.80	1.70	2.05	2.10	2.10	2.10	1.85	1.85
13	.70	1.50	1.30	1.80	2.00	2.05	2.10	2.10	2.10	1.85	1.90
14	1.40	1.45	.80	2.05	2.05	2.05	1.05	2.10	2.00	1.75	1.85
15	.75	1.10	1.55	2.90	2.40	2.00	1.15	2.10	1.50	1.75	1.90
16	1.45	1.10	1.50	2.45	2.55	1.85	2.20	2.05	2.10	1.85	1.75
17	1.40	1.40	1.40	2.10	2.85	2.00	2.20	2.10	2.40	1.90	1.70
18	.70	.70	1.40	2.10	2.45	2.10	2.20	2.00	1.80	1.90	1.75
19	2.00	1.45	1.45	2.10	2.40	2.10	2.15	2.10	1.60	2.05	1.80
20	1.90	1.15	1.45	1.80	2.55	1.80	2.15	2.15	1.80	2.10	1.65
21	1.65	1.10	1.40	2.00	2.45	2.10	2.20	2.10	1.90	2.00	1.60
22	1.55	1.40	1.50	1.80	2.35	2.05	2.20	2.10	2.10	1.90	1.70
23	1.50	1.15	1.45	1.90	2.20	1.95	2.15	2.10	2.10	2.05	1.80
24	1.50	1.15	1.40	1.80	2.15	2.05	2.10	2.10	1.80	2.25	1.70
25	1.50	1.40	1.60	1.80	2.10	2.05	2.45	2.10	1.80	2.10	1.85
26	1.50	1.40	1.70	1.90	2.10	2.10	2.65	2.10	2.05	2.10	1.65
27	1.40	1.15	1.50	2.00	2.05	2.10	2.30	1.95	2.00	2.10	1.90
28	.70	1.40	1.45	2.80	1.90	2.05	2.20	1.85	2.00	2.20	1.85
29	1.50	1.40	1.45	3.25	.....	2.05	2.10	1.75	1.85	2.25	1.80
30	1.65	1.40	1.45	3.25	.....	2.05	2.10	2.00	2.05	2.20	2.00
31	1.55	.....	1.40	3.15	.....	2.05	.....	2.05	.....	.....	2.00

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, 1918.

GAGE.—Chain gage attached to guard rail on downstream side of Macon & Birmingham Railroad bridge; installed May 24, 1918. Prior to that date gage was a vertical staff in four sections on left bank about 300 feet above present gage. Gages set to same datum. Slope between gages negligible at low and medium stages. Zero of gage, 660 feet above sea level. Gage read by E. T. Riggins.

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, 6.0 feet at 7 a. m. January 31 (discharge, 8,320 second-feet); minimum stage recorded, −0.4 foot at 7 a. m. July 23 (discharge, 127 second-feet).

1900–1918: 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).

ICE.—None.

DIVERSIONS.—None.

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

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined between 200 and 4,000 second-feet and fairly well defined between 4,000 and 24,000 second-feet. Gage read twice daily to tenths up to May 24 and to hundredths after that date. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Flint River near Woodbury, Ga., during the year ending Sept. 30, 1918.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 27	C. G. Paulsen	1.18	1,030	May 24	A. H. Condron	0.65	566
Mar. 26	do	.78	680	July 16	Paulsen and Condron	−.05	232
May 2	Paulsen and Condron	2.95	3,100				

Daily discharge, in second-feet, of Flint River near Woodbury, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	7,530	690	610	610	6,580	1,040	610	3,900	370	950	1,400	770
2	5,000	610	610	610	6,040	950	610	2,850	370	770	2,430	1,310
3	2,170	610	610	610	5,170	860	690	2,050	325	540	3,900	860
4	1,220	610	610	610	4,050	860	690	1,600	325	420	3,150	860
5	860	540	610	610	2,570	860	610	1,220	325	325	2,710	770
6	690	540	690	690	2,300	860	610	1,040	420	325	1,710	950
7	690	540	610	1,040	1,820	860	860	950	540	285	1,040	1,220
8	610	540	690	950	1,600	950	3,000	860	540	285	690	950
9	610	540	770	860	1,400	950	4,050	860	610	420	540	540
10	610	540	690	860	1,310	950	5,340	770	610	325	420	420
11	610	540	690	1,040	1,220	950	3,450	770	1,040	285	540	420
12	540	540	770	5,000	1,220	860	2,300	690	1,400	285	610	370
13	540	540	770	4,200	1,310	860	1,600	690	1,040	285	540	325
14	540	540	770	4,050	1,220	770	1,220	770	770	285	480	325
15	540	540	690	4,680	1,400	770	1,040	1,040	540	250	370	325
16	540	540	690	4,050	1,500	770	950	1,130	420	250	370	285
17	540	540	690	3,000	2,300	770	860	860	420	215	370	285
18	480	540	690	2,050	1,820	690	860	770	370	250	370	285
19	540	540	690	1,600	1,600	690	860	690	370	325	480	250
20	610	690	690	1,400	1,400	690	950	540	420	540	540	370
21	690	860	610	1,220	1,600	690	1,040	540	420	480	480	420
22	610	770	610	1,600	1,400	770	860	540	420	540	370	420
23	610	770	610	2,050	1,220	770	860	540	420	152	325	370
24	540	770	610	2,170	1,220	690	690	540	370	180	285	325
25	540	690	610	2,170	1,220	690	690	610	325	480	420	325
26	540	610	950	2,050	1,130	690	1,820	540	325	770	325	325
27	540	610	1,040	1,710	1,040	690	2,570	480	325	1,600	285	325
28	540	610	860	1,400	1,040	610	3,150	420	370	1,710	285	325
29	540	610	770	4,680	.....	610	3,300	420	370	1,820	420	325
30	860	610	690	6,040	.....	610	3,600	420	480	2,300	690	325
31	770	.....	610	8,320	.....	610	.....	370	.....	1,600	860	.....

Monthly discharge of Flint River near Woodbury, Ga., for the year ending Sept. 30, 1918.

[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	7,530	480	1,040	0.954	1.10
November	860	540	607	.557	.62
December	1,040	610	697	.639	.74
January	8,320	610	2,320	2.13	2.46
February	6,580	1,040	2,060	1.89	1.97
March	1,040	610	787	.722	.83
April	5,340	610	1,660	1.52	1.70
May	3,900	370	951	.872	1.01
June	1,400	325	502	.461	.51
July	2,300	152	621	.570	.66
August	3,900	285	884	.811	.94
September	1,310	250	512	.470	.52
The year	8,320	152	1,050	.963	13.06

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, 1918.

GAGE.—A vertical staff in four sections on left bank at old ferry landing; read by Lonie Williams until March 1, 1918; thereafter by Arthur Preston.

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

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.1 feet at 7 a. m. January 31 (discharge, 13,500 second-feet); minimum stage, 1.23 feet at 7 a. m. July 19 (discharge, 205 second-feet).

1911–1918: 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).

ICE.—None.

DIVERSIONS.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve 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. Low-water records good; determinations above 4,000 second-feet subject to error.

Discharge measurements of Flint River near Culloden, Ga., during the year ending Sept. 30, 1918.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 27	C. G. Paulsen	2.45	976	July 17	Paulsen and Condron	1.37	284
May 3	Paulsen and Condron	4.72	3,440	Aug. 16	A. H. Condron	1.72	487
23	A. H. Condron	2.20	806	25	do	1.30	526

Daily discharge, in second-feet, of Flint River near Culloden, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	9,600	1,040	922	960	9,220	1,470	960	6,750	530	848	1,880	1,240
2	7,130	998	960	960	9,600	1,420	960	4,940	530	1,080	1,990	1,340
3	3,690	960	960	960	11,200	1,380	1,040	3,290	530	848	5,460	1,120
4	2,100	885	960	960	7,510	1,380	1,040	2,540	500	595	3,840	1,420
5	1,420	885	960	960	5,110	1,290	998	2,100	500	530	3,550	1,240
6	1,160	885	960	998	3,840	1,240	885	1,570	595	440	1,990	848
7	1,040	885	960	1,570	3,030	1,420	960	1,380	772	410	1,470	1,380
8	960	885	1,080	1,420	2,540	1,420	3,840	1,290	960	350	1,080	1,380
9	960	885	1,200	1,380	2,320	1,290	4,460	1,200	848	350	810	1,040
10	1,040	885	1,200	1,340	2,210	1,420	5,460	1,160	922	500	665	735
11	960	885	1,120	1,290	2,210	1,420	4,780	1,040	998	500	630	595
12	922	810	1,040	7,700	2,100	1,240	3,030	998	1,380	320	700	530
13	885	885	1,120	6,560	2,320	1,200	2,320	998	1,570	350	848	500
14	885	810	1,120	5,280	2,100	1,200	1,770	1,040	1,200	290	665	470
15	810	885	1,120	6,560	2,100	1,200	1,380	1,160	922	290	595	440
16	810	885	1,200	5,820	2,320	1,080	1,240	1,340	960	215	470	380
17	810	848	1,120	4,460	3,030	1,120	1,200	1,240	562	265	595	410
18	810	810	1,040	2,100	3,030	1,160	1,200	1,080	562	215	440	350
19	810	810	1,040	1,880	2,430	1,080	1,240	998	562	240	440	350
20	848	1,290	1,040	2,210	2,540	1,200	1,340	960	530	1,080	665	320
21	960	1,290	1,040	2,100	3,030	1,240	1,670	848	562	922	735	470
22	960	1,200	1,040	2,100	2,770	1,200	1,770	810	530	810	562	530
23	885	1,080	960	3,030	2,210	1,240	1,200	810	562	810	470	470
24	885	998	960	3,690	1,990	1,160	1,080	810	500	530	380	440
25	810	960	960	2,900	1,990	1,120	1,040	848	440	500	440	470
26	810	885	960	2,650	1,670	1,040	2,900	848	410	922	440	410
27	810	885	1,040	2,430	1,570	1,040	3,420	810	440	998	350	410
28	810	885	1,160	2,320	1,470	960	3,550	810	470	2,650	735	380
29	810	885	1,200	7,510	.....	960	4,460	700	470	1,880	772	470
30	998	885	1,200	7,700	.....	960	5,460	630	530	2,540	665	440
31	1,160	.....	1,120	12,500	.....	960	.....	595	.....	2,430	1,200	.....

Monthly discharge of Flint River near Culloden, Ga., for the year ending Sept. 30, 1918.

[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	9,600	810	1,530	0.765	0.88
November	1,290	810	935	.468	.52
December	1,200	922	1,060	.530	.61
January	12,500	960	3,360	1.68	1.94
February	11,200	1,470	3,480	1.74	1.81
March	1,470	960	1,210	.605	.70
April	5,460	885	2,220	1.11	1.24
May	6,750	595	1,470	.735	.85
June	1,570	410	695	.348	.39
July	2,650	215	797	.398	.46
August	5,460	350	1,150	.575	.66
September	1,420	320	686	.343	.38
The year	12,500	215	1,540	.770	10.44

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, 1918 (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. It was 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 published for 1902 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 both banks, but only under the approaches to the bridge.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 12.3 feet at 7 a. m. February 8 and 9 (discharge not determined); minimum stage recorded, −0.8 foot at 7 a. m. September 21–23 (discharge not determined).

1902–1918: 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 to 12, 1911 (discharge, 1,110 second-feet).

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

DIVERSIONS.—None.

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.

ACCURACY.—Discharge 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 United States Army Engineers during the summer of 1915. Discharge records for 1915 as published in Water Supply Paper 402 were determined from the old rating and should, therefore, be used with caution. Determination of discharge for 1918 is not possible until additional current-meter measurements can be obtained.

Discharge measurements of Flint River at Albany, Ga., during the year ending Sept. 30, 1918.

[Made by A. H. Condron.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 7	0.40	2,420
June 24	.45	2,410

Daily gage height, in feet, of Flint River at Albany, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.4	0.4	0.5	1.6	5.2	3.0	1.1	6.4	−0.3	1.4	3.6	0.8
2	4.6	.3	1.2	1.6	5.5	2.5	1.1	7.3	− .4	1.2	4.6	.8
3	5.6	.3	1.6	1.9	6.4	2.4	1.3	8.2	− .2	1.0	4.6	.8
4	6.1	.3	.8	1.1	8.5	2.4	1.4	8.6	.2	−.6	4.0	1.2
5	6.5	.2	.6	.8	9.5	2.1	1.3	8.8	.4	−.4	4.5	1.6
6	6.9	.1	.6	.9	11.1	2.0	1.4	8.8	.2	−.3	4.9	1.8
7	6.5	.2	.4	.8	12.1	2.0	1.4	8.0	.3	−.1	4.6	1.8
8	4.3	.1	.3	1.5	12.3	2.1	1.5	6.2	.4	−.1	4.6	2.1
9	3.1	.1	.5	2.0	12.3	1.8	1.1	3.8	.8	.4	3.7	1.9
10	.9	.4	.6	1.9	10.7	1.8	1.7	3.0	1.0	.2	3.4	1.8
11	.8	.3	.5	2.0	8.4	1.9	2.9	2.3	.7	.3	2.8	1.7
12	.9	.2	1.4	2.5	5.8	1.6	4.0	2.8	.6	.1	2.2	1.7
13	.7	.0	1.5	2.8	4.4	1.5	5.1	1.5	.6	−.2	1.8	1.2
14	.7	.3	1.1	3.3	4.3	2.0	5.5	1.2	.7	−.3	1.4	.7
15	.4	.0	1.1	4.4	4.3	1.4	5.6	1.4	1.0	−.4	.8	.4
16	.3	.0	1.4	5.0	4.6	1.4	4.3	1.5	.9	−.4	.7	.0
17	.3	.1	1.3	6.0	4.5	1.2	2.3	1.6	.6	−.5	1.0	−.2
18	.4	.0	1.5	6.5	4.5	1.4	1.8	1.6	.3	−.6	2.2	.0
19	.5	−.1	1.4	7.1	4.7	1.6	1.6	2.2	.5	−.5	3.6	−.5
20	.6	.0	.9	7.0	4.9	1.7	1.4	2.6	.1	.0	3.1	−.7
21	.4	.3	.6	7.0	5.6	1.4	2.0	2.3	.1	.2	2.0	−.8
22	.1	.7	.9	6.3	4.9	1.3	2.3	1.2	.1	.2	1.6	−.8
23	.1	.7	.8	5.0	4.5	1.5	2.3	.6	.0	.4	1.7	−.8
24	.2	.9	.5	4.4	4.3	1.4	2.7	.3	−.2	1.6	1.2	−.4
25	.0	1.2	.3	4.3	4.3	2.0	1.8	.2	.0	2.4	.7	−.1
26	.0	1.6	1.0	4.6	3.8	1.8	1.6	.2	.0	2.6	.3	−.2
27	.4	1.2	1.2	4.6	3.3	1.2	2.0	.2	.1	2.0	.1	−.3
28	.1	.7	1.5	4.6	2.9	1.4	3.0	.2	.2	1.8	.2	−.3
29	.0	.2	1.9	4.4	.....	1.5	4.8	.2	.6	1.8	.4	−.3
30	.1	.3	1.8	4.1	.....	1.3	5.3	−.1	1.0	1.9	.4	.0
31	.2	.....	1.9	4.5	.....	1.2	.....	−.1	.....	2.6	.6	.....

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, 1918, when station was discontinued.

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, 1.8 feet at 7.30 a. m. and 4.30 p. m. January 31 (discharge not determined); minimum stage recorded, 0.4 foot at 5.30 a. m. July 26 (discharge not determined).

1914–1918: 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).

ICE.—None.

DIVERSIONS.—None.

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

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

The following discharge measurement was made by C. G. Paulsen:

February 27, 1918: Gage height, 0.80 foot; discharge, 28.5 second-feet.

Daily gage-height, in feet, of Little Potato (Tobler) Creek near Yatesville, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.6	0.7	0.7	0.7	1.0	0.8	0.8	0.9	0.68	0.7	0.8	0.7
2	.6	.7	.7	.7	1.1	.8	.8	.85	.7	.7	1.15	.7
3	.6	.7	.7	.7	1.2	.8	.85	.8	.7	.7	1.2	1.1
4	.6	.7	.7	.7	1.2	.8	.75	.8	.7	.7	.9	1.0
5	.6	.7	.7	.7	1.0	.8	.72	.7	.7	.7	.8	.85
6	.6	.7	.75	.7	.9	.8	.7	.7	.7	.7	.8	.88
7	.6	.7	.8	.7	.95	.8	.8	.7	.7	.7	.8	.65
8	.6	.7	.8	.8	.8	.8	.8	.7	.7	.7	.7	.7
9	.6	.7	.7	.8	.8	.8	.8	.68	.7	.7	.7	.7
10	.6	.7	.7	.8	.8	.8	.8	.72	.72	.7	.75	.7
11	.6	.7	.7	.82	.8	.8	.8	.7	.72	.7	.8	.7
12	.7	.7	.7	1.4	.8	.8	.8	.7	.7	.7	.8	.7
13	.7	.7	.7	.8	.9	.8	.75	.68	.7	.7	.8	.7
14	.7	.7	.7	.8	.8	.8	.8	.6	.7	.7	.8	.7
15	.7	.7	.7	1.0	.8	.8	.8	.75	.7	.7	.75	.7
16	.7	.7	.7	.9	.8	.8	.8	.7	.7	.7	.7	.7
17	.7	.7	.7	.85	.85	.8	.75	.7	.7	.7	.7	.7
18	.7	.7	.75	.8	.85	.8	.78	.7	.7	.72	.7	.7
19	.7	.7	.62	.8	.85	.8	.8	.7	.7	.75	.8	.72
20	.7	.8	.68	.8	.95	.85	.8	.7	.7	.82	.85	.75
21	.7	.8	.65	.8	.95	.8	.8	.7	.7	.9	.8	.72
22	.7	.8	.6	.8	.9	.8	.8	.7	.7	.9	.8	.7
23	.7	.8	.6	.8	.9	.8	.8	.68	.7	.9	.8	.7
24	.7	.8	.6	.8	.8	.8	.8	.65	.7	.9	.75	.7
25	.7	.8	.7	.8	.8	.8	.8	.65	.7	.65	.7	.7
26	.7	.8	.7	.8	.8	.8	1.1	.65	.7	.62	.7	.7
27	.7	.8	.6	.8	.8	.78	.8	.65	.7	.85	.75	.7
28	.75	.7	.6	.8	.8	.8	.9	.65	.7	.82	1.2	.7
29	.75	.7	.6	1.6	.....	.8	.9	.65	.7	1.0	.8	.7
30	.....	.7	.6	1.05	.....	.8	.9	.65	.7	.9	.85	.7
31	.....	.....	.6	1.8	.....	.8	.....	.65	.....	.9	.9	.....

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 Railway and Louisville & Nashville Railroad, and 12 miles downstream from mouth of Patsaliga Creek.

DRAINAGE AREA.—1,290 square miles.

RECORDS AVAILABLE.—1891 to 1898 (gage heights by United States Weather Bureau and discharge measurements by United States Geological Survey); 1899 to 1904 incomplete records of gage heights; continuous records January 1, 1905, to September 30, 1918.

GAGE.—Chain gage attached to upstream side of wagon bridge; read once daily to tenths, except Sundays, from October 1, 1917, to January 31, 1918, by A. W. Lambert, and from February 1 to September 30, 1918, by C. E. Raley.

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 recorded, 29.1 feet at 8 a. m. October 3 (discharge, 15,100 second-feet); minimum stage recorded, 0.9 foot at 8 a. m. July 15 and 19 (discharge, 208 second-feet).

1904–1918: 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.

DIVERSIONS.—None.

REGULATION.—Flow may at times be affected by logging operations.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve, substantiated by one additional discharge measurement made subsequent to 1918, is fairly well defined between 225 and 7,000 second-feet above which it is extended. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

The following discharge measurement was made by A. H. Condron:

June 22, 1918: Gage height, 1.96 feet; discharge, 366 second-feet.

Daily discharge, in second-feet, of Conecuh River at Beck, Ala., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	14,300	996	955	795	3,630	1,260	585	6,630	395	278	834	1,150
2	14,000	955	955	834	3,240	1,170	720	6,120	395	278	874	1,040
3	15,100	874	955	795	3,970	1,120	1,680	5,380	395	247	720	955
4	15,000	874	955	757	4,700	1,080	1,120	4,030	395	262	758	914
5	12,800	874	996	720	4,870	1,040	1,300	3,940	443	278	795	1,040
6	10,200	834	996	1,010	4,870	955	1,400	3,860	524	262	617	874
7	7,260	795	874	1,300	4,700	996	1,840	4,190	443	270	496	650
8	4,310	757	996	1,260	4,250	955	2,270	3,630	955	278	443	618
9	2,970	684	1,100	1,260	3,860	955	1,780	2,540	914	278	395	585
10	2,540	684	1,210	1,300	3,520	955	1,590	1,890	874	262	373	554
11	2,050	702	1,210	1,300	3,190	955	1,540	1,440	757	220	343	496
12	1,730	720	1,350	1,730	2,750	874	1,440	1,180	617	220	313	524
13	1,540	684	1,300	1,610	2,540	874	1,400	914	524	220	525	496
14	1,420	684	1,170	1,490	2,160	834	1,280	3,130	496	214	373	496
15	1,300	650	1,170	3,350	2,210	795	1,170	2,910	469	208	352	414
16	1,210	684	1,100	3,190	1,890	757	1,040	2,270	496	220	352	332
17	1,120	650	1,040	2,700	1,920	720	955	2,000	524	220	352	352
18	1,120	650	955	2,320	1,940	684	1,080	1,640	496	220	385	352
19	1,040	650	914	2,050	1,890	720	955	1,450	418	208	418	313
20	996	795	834	2,160	1,830	720	955	1,260	395	247	834	332
21	955	720	834	2,270	1,940	720	1,020	1,080	373	332	395	395
22	914	757	795	2,700	1,730	720	1,080	955	352	418	395	354
23	834	720	776	955	1,730	684	1,040	874	342	332	332	313
24	834	795	757	2,160	1,660	684	914	720	332	332	352	313
25	834	776	757	2,000	1,590	684	914	650	295	395	332	295
26	795	757	1,040	1,890	1,540	684	914	602	278	332	313	278
27	795	684	1,040	1,810	1,400	650	834	554	352	469	278	295
28	758	720	996	1,730	1,300	650	1,280	554	332	512	496	332
29	720	1,040	955	1,780	.....	585	1,730	524	295	554	1,040	314
30	2,000	914	914	1,890	.....	617	3,240	469	286	524	955	295
31	1,040	.....	874	3,970	.....	601	.....	443	.....	469	1,260	.....

NOTE.—Daily discharge interpolated for Sundays when gage was not read.

Monthly discharge of Conecuh River at Beck, Ala., for the year ending Sept. 30, 1918.

[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.	
October	15,100	720	3,950	3.06	3.53
November	1,040	650	769	.596	.66
December	1,350	757	993	.770	.89
January	3,970	720	1,780	1.38	1.59
February	4,870	1,300	2,740	2.12	2.21
March	1,260	585	829	.643	.74
April	3,240	585	1,300	1.00	1.12
May	6,630	443	2,190	1.70	1.96
June	955	278	472	.366	.41
July	554	208	308	.239	.28
August	1,260	278	539	.418	.48
September	1,150	278	522	.405	.45
The year	15,100	208	1,360	1.05	14.32

MOBILE RIVER BASIN.

OOSTANAULA RIVER AT RESACA, GA.

LOCATION.—At Western & Atlantic (now Nashville, Chattanooga & St. Louis) Railroad bridge in Resaca, Gordon County, 400 feet upstream from Dixie highway bridge, 1 mile above Camp Creek, and 3 miles below junction of Conasauga and Coosawattee rivers, which form the Oostanaula.

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, 1918.

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

DISCHARGE MEASUREMENTS.—Made from the Dixie highway bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of sand; somewhat shifting. Right bank a high bluff; not subject to overflow; left bank high but is overflowed at very high stages. Though the location of control is not exactly known, the fact that station rating has shown very little change in the past indicates that the control is practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 23.3 feet February 1 (discharge, 19,900 second-feet); minimum stage recorded, 1.3 feet November 26, December 2 and 4 (discharge, 390 second-feet).

1896-1918: 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.

DIVERSIONS.—None.

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

[1] Gage-height records not obtained 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.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined between 450 and 8,000 second-feet, above which curve is extended tangent. Gage read to tenths once daily. Gage heights at low water subject to error because of poor conditions of lower part of gage; therefore records at low stage should be used with caution. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

The following discharge measurement was made by C. G. Paulsen:
April 17, 1918: Gage height, 8.13 feet; discharge, 4,650 second-feet.

Daily discharge, in second-feet, of Oostanaula River at Resaca, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,760	2,200	452	640	19,900	2,420	820	4,890	820	1,380	2,650	522
2	1,080	2,040	390	600	18,900	1,830	820	4,020	820	1,080	1,440	452
3	1,140	1,760	420	640	16,600	1,760	870	3,270	870	870	1,380	640
4	1,080	1,380	390	600	8,590	1,380	820	2,420	820	600	1,080	2,420
5	870	1,140	2,120	640	4,540	1,080	820	1,690	820	600	772	2,040
6	820	772	1,080	1,690	2,880	1,140	2,120	1,140	870	640	640	1,760
7	870	640	640	1,760	1,690	2,040	1,440	1,080	1,690	600	870	1,380
8	820	560	600	1,080	1,380	1,830	9,070	1,080	3,190	600	772	1,080
9	870	600	640	640	1,760	1,760	12,600	1,760	2,880	640	600	870
10	820	560	600	452	2,120	2,120	11,600	1,140	2,500	560	486	772
11	870	600	640	3,270	2,420	1,900	9,560	1,080	2,040	420	420	726
12	820	522	600	11,500	2,420	1,690	3,190	1,080	1,690	420	420	682
13	920	560	640	10,100	2,500	1,140	2,500	1,760	3,270	452	452	640
14	600	486	600	6,690	2,420	820	1,690	6,690	2,420	420	420	600
15	640	486	640	9,660	2,420	820	1,080	5,780	1,690	420	420	522
16	600	420	600	8,590	2,880	870	4,110	4,980	1,440	452	2,880	522
17	640	452	640	5,160	8,590	820	4,890	3,190	1,080	420	3,190	420
18	560	420	600	3,600	4,890	820	4,890	2,420	1,080	420	2,420	522
19	1,440	452	640	2,500	8,690	870	3,270	1,140	2,500	1,440	1,760	640
20	3,190	560	560	2,040	6,780	870	2,500	2,120	1,140	3,270	1,140	820
21	2,120	452	600	2,120	5,780	1,690	5,330	3,190	1,080	2,800	820	972
22	820	420	560	2,420	4,890	1,690	5,780	2,800	820	2,420	682	870
23	820	452	600	3,270	4,720	1,440	2,500	2,500	640	1,760	640	870
24	600	420	560	2,800	4,450	1,080	1,690	1,690	600	1,080	600	772
25	640	420	600	2,500	4,280	920	1,080	1,380	1,380	1,030	560	600
26	600	390	600	1,690	4,110	870	2,500	1,140	2,500	972	560	560
27	640	420	640	3,680	3,190	820	3,190	1,080	1,690	870	452	420
28	600	452	600	8,500	2,880	820	2,420	1,080	1,080	820	682	522
29	640	452	640	13,600	.....	870	4,980	1,030	870	2,500	870	640
30	1,690	420	600	15,500	.....	870	5,870	870	1,030	2,800	726	600
31	1,140	.....	640	17,600	.....	820	.....	820	.....	2,800	640	.....

Monthly discharge of Oostanaula River at Resaca, Ga., for the year ending Sept. 30, 1918.

[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	3,190	600	991	0.616	0.71
November	2,200	390	697	.433	.48
December	2,120	390	649	.403	.46
January	17,600	452	4,700	2.92	3.37
February	19,900	1,380	5,600	3.48	3.62
March	2,420	820	1,290	.801	.92
April	12,600	820	3,800	2.36	2.63
May	6,690	820	2,270	1.41	1.63
June	3,270	600	1,510	.938	1.05
July	3,270	420	1,150	.714	.82
August	3,190	420	1,010	.627	.72
September	2,420	420	829	.515	.57
The year	19,900	390	2,010	1.25	16.98

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, 1918.

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 the 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 1918 are referred to datum of Gurley gage. Sea-level elevation of zero of staff gage is 421.00 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, 16.1 feet from 4 p. m. January 31 to 1 a. m. February 1 (discharge, 68,700 second-feet); minimum stage, 1.3 feet September 15 (discharge, 2,840 second-feet).

1914–1918: 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. Record good except those above 25,000 second-feet, which should be used with caution.

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

Discharge measurements of Coosa River at Childersburg, Ala., during the year ending Sept. 30, 1918.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-feet.*
Apr. 23	Paulsen and Hoyt	5.38	15,000
July 24	C. G. Paulsen	2.90	6,820

Daily discharge, in second-feet, of Coosa River at Childersburg, Ala., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	21,200	5,370	4,150	3,920	67,500	11,000	5,240	31,700	5,240	8,550	9,190	3,800
2	19,300	5,900	4,150	3,920	65,800	10,000	5,110	31,200	5,110	6,600	7,330	4,260
3	13,000	5,630	4,150	3,690	64,000	9,520	5,110	30,800	4,980	7,040	6,900	4,380
4	8,550	5,240	4,260	3,580	58,800	9,190	5,110	25,400	4,860	7,180	6,460	3,920
5	6,460	4,620	4,150	3,580	53,000	8,550	5,110	18,900	4,740	6,040	6,040	15,500
6	5,370	4,260	4,150	4,040	45,000	7,930	5,110	14,800	4,620	5,110	7,930	17,400
7	4,860	4,150	4,740	4,620	32,200	7,630	6,460	12,600	4,620	4,500	6,750	19,300
8	4,620	4,150	5,630	4,620	20,400	7,500	17,900	11,200	4,980	4,150	5,110	6,750
9	4,380	4,150	5,370	4,860	16,200	7,400	29,900	10,200	5,630	3,920	4,500	5,370
10	4,380	4,150	4,500	5,370	14,800	7,330	40,200	9,520	6,600	3,690	4,380	4,500
11	4,150	3,920	4,380	10,100	14,000	7,330	44,400	8,870	7,630	3,690	5,500	3,920
12	4,040	3,800	4,380	27,200	13,000	7,180	44,400	9,190	6,600	3,650	5,110	3,690
13	3,920	3,800	4,380	34,600	13,000	7,040	38,100	9,850	6,460	3,600	4,260	3,470
14	3,800	3,800	4,380	39,700	12,600	7,040	27,600	15,900	6,040	3,550	4,740	3,360
15	3,920	3,690	4,150	47,200	11,900	6,900	16,600	20,000	5,900	3,500	4,860	2,840
16	3,920	3,690	3,920	47,200	11,200	6,460	12,200	20,000	5,630	3,500	4,150	3,470
17	3,800	3,800	3,920	42,300	13,300	6,460	11,200	16,600	5,240	3,470	3,800	3,250
18	3,690	3,800	3,920	36,600	17,400	6,320	11,600	14,400	4,860	3,470	3,690	3,040
19	4,150	3,800	3,920	27,600	21,200	6,040	12,600	12,200	4,500	3,470	3,690	3,250
20	5,240	4,500	3,920	19,300	23,700	5,900	13,000	9,850	4,380	4,150	3,690	3,250
21	5,760	5,370	3,920	15,100	25,800	6,180	13,000	8,550	4,860	4,980	3,920	3,040
22	6,900	5,110	3,920	21,600	25,400	6,180	12,200	8,240	5,900	6,180	3,800	3,040
23	7,040	4,860	3,920	20,000	22,800	6,180	15,100	7,930	5,630	7,180	3,360	3,140
24	6,180	4,620	4,040	17,400	20,000	6,600	15,900	7,930	5,240	6,750	3,250	3,580
25	5,240	4,380	4,150	15,900	17,400	6,600	14,000	8,240	4,860	6,460	3,250	3,690
26	4,500	4,150	4,150	14,400	15,100	6,320	11,900	7,630	5,240	6,180	3,360	3,690
27	4,260	3,920	4,150	13,000	13,000	6,040	10,200	7,040	4,860	10,200	3,250	3,470
28	4,040	3,800	4,150	14,400	12,000	6,040	13,300	6,750	4,620	12,200	3,140	5,630
29	4,040	4,040	4,040	35,900	.....	5,760	21,200	6,180	6,040	9,520	3,040	6,750
30	4,620	4,260	3,920	53,000	.....	5,500	29,400	5,760	8,550	9,520	3,040	4,980
31	4,860	.....	3,920	66,900	.....	5,240	.....	5,500	.....	10,500	3,140	.....

NOTE.—Water-stage recorder did not operate satisfactorily Feb. 27 to Mar. 2, Mar. 8, 9, July 12–16, and Sept. 15-21; discharge estimated by comparison with records of stage at Riverside except that for July 12–16 which was estimated, and Sept. 15–21 which was determined from daily readings of staff gage reduced to datum of Gurley gage.

Monthly discharge of Coosa River at Childersburg, Ala., for the year ending Sept. 30, 1918.

[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.	
October	21,200	3,690	6,140	0.732	0.84
November	5,900	3,690	4,360	.520	.58
December	5,630	3,920	4,220	.503	.58
January	66,900	3,580	21,300	2.54	2.93
February	67,500	11,200	26,400	3.15	3.28
March	11,000	5,240	7,080	.844	.97
April	44,400	5,110	17,100	2.04	2.28
May	31,700	5,500	13,300	1.59	1.83
June	8,550	4,380	5,480	.653	.73
July	12,200	3,470	5,890	.702	.81
August	9,190	3,040	4,670	.557	.64
September	19,300	2,840	5,320	.634	.71
The year	67,500	2,840	10,000	1.19	16.18

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, 1918.

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 can not 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, 14.8 feet at 7 a. m. April 9 (discharge, obtained from extension or rating curve, 23,400 second-feet); minimum stage recorded, 1.55 feet at 7 a. m. and 6 p. m. September 26–27 (discharge, 668 second-feet).

1904–1918: 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 of discharge based on an extension of the rating curve are considerably too large as shown by later measurements; minimum stage recorded, 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 saw mills 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 above 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.

The following discharge measurement was made by C. G. Paulsen:
March 13, 1918: Gage height, 2.50; discharge, 1,680 second-feet.

Daily discharge, in second-feet, of Etowah River near Rome, Ga., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4,360	1,360	1,200	1,090	11,200	2,060	1,360	11,200	1,200	2,200	3,300	895
2	3,300	1,250	1,140	1,090	6,880	2,060	1,360	9,040	1,140	1,920	2,960	1,540
3	2,640	1,200	1,140	1,090	4,540	1,920	1,300	7,240	1,090	1,790	5,800	4,900
4	2,340	1,140	1,090	1,090	3,820	1,790	1,300	4,000	1,300	1,790	3,640	5,800
5	2,060	1,140	1,090	1,040	3,640	1,660	1,250	3,640	1,790	1,660	2,490	3,640
6	1,790	1,090	1,090	1,040	3,470	1,660	1,250	3,300	1,300	1,600	2,340	2,060
7	1,480	1,090	1,090	990	3,470	1,600	1,790	3,300	1,200	1,540	2,340	1,300
8	1,250	1,090	1,200	990	3,300	1,600	16,600	3,300	1,200	1,420	2,200	1,090
9	1,040	1,090	1,200	1,540	2,960	1,540	21,300	2,960	1,140	1,300	2,200	990
10	942	1,090	1,090	1,250	2,800	1,540	9,760	2,960	1,090	1,200	2,060	990
11	895	1,090	1,090	2,340	2,640	1,540	4,360	2,960	1,090	1,200	1,920	942
12	848	1,090	1,090	15,200	2,640	1,540	3,300	2,800	990	1,090	1,790	895
13	800	1,040	1,040	9,040	2,490	1,600	2,960	2,340	2,340	990	1,660	895
14	800	1,040	1,040	3,470	2,490	1,600	2,960	3,640	2,060	895	1,480	848
15	755	1,040	1,040	7,240	2,340	1,600	2,800	2,960	1,790	848	1,250	848
16	755	990	1,090	7,240	2,200	1,540	2,800	2,640	1,540	800	1,090	800
17	710	990	1,090	5,440	3,640	1,540	2,640	2,490	1,420	755	2,340	800
18	710	990	1,090	4,180	3,820	1,540	2,640	2,340	2,200	710	3,130	755
19	2,490	990	1,090	3,640	2,960	1,540	2,640	2,200	1,790	2,340	1,600	755
20	2,200	990	1,040	3,640	2,800	1,540	2,960	2,060	1,660	2,200	1,420	2,200
21	1,600	942	990	3,300	2,640	1,540	4,720	1,920	1,600	2,060	1,300	1,540
22	1,420	942	990	3,130	2,490	1,540	2,960	1,790	1,540	2,060	1,200	990
23	1,420	942	1,090	2,640	2,340	1,540	2,640	1,790	1,420	1,920	1,090	800
24	1,360	895	1,140	2,490	2,340	1,480	2,490	1,790	1,360	3,640	990	710
25	1,300	895	1,200	2,340	2,340	1,480	2,340	1,660	1,300	3,640	895	710
26	1,250	895	1,200	2,340	2,340	1,420	6,700	1,660	2,200	2,340	848	668
27	1,200	1,090	1,140	2,340	2,200	1,420	7,420	1,540	1,660	5,440	800	668
28	1,200	1,090	1,090	5,800	2,060	1,420	5,800	1,420	1,420	7,240	942	1,540
29	1,200	1,090	1,090	17,300	.....	1,420	5,440	1,420	1,300	5,440	2,490	1,300
30	1,140	1,200	1,090	16,600	.....	1,360	7,960	1,300	3,130	4,000	1,540	1,200
31	1,090	.....	1,090	18,400	.....	1,360	.....	1,200	.....	3,640	1,040	.....

Monthly discharge of Etowah River near Rome, Ga., for the year ending Sept. 30, 1918.

[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	4,360	710	1,500	0.833	0.96
November	1,360	895	1,060	.589	.66
December	1,200	990	1,100	.611	.70
January	18,400	990	4,820	2.68	3.09
February	11,200	2,060	3,320	1.84	1.92
March	2,060	1,360	1,580	.878	1.01
April	21,300	1,250	4,530	2.52	2.81
May	11,200	1,200	3,060	1.70	1.96
June	3,130	990	1,540	.856	.96
July	7,240	710	2,250	1.25	1.44
August	5,800	800	1,940	1.08	1.24
September	5,800	668	1,440	.800	.89
The year	21,300	668	2,340	1.30	17.64

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, 1918.

GAGE.—Vertical staff on right bank about 2,000 feet upstream from bridge; installed August 20, 1906; read by A. L. Stowe. Original gage, a staff 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 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, 16.4 feet January 12 (discharge, 39,900 second-feet); minimum stage recorded, 0.2 foot July 17 and August 25 (discharge, 585 second-feet).

1900–1918: 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.

Discharge measurements of Tallapoosa River at Sturdevant, Ala., during the year ending Sept. 30, 1918.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 21	C. G. Paulsen	2.51	2,380	June 20	A. H. Condron	1.77	1,670
Apr. 24	Paulsen and Hoyt	2.10	1,960	Sept. 27	do	.72	870

Daily discharge, in second-feet, of Tallapoosa River at Sturdevant, Ala., for the year ending Sept. 30, 1918.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	8,800	2,170	1,860	1,410	12,500	2,920	2,060	12,800	1,290	5,150	4,390	2,280
2	4,770	1,860	1,670	1,370	8,800	2,920	2,060	9,320	1,250	3,210	4,960	1,670
3	3,210	1,670	1,580	1,330	8,080	2,780	2,060	5,550	1,180	2,060	13,600	1,580
4	2,520	1,490	1,580	1,410	6,880	2,780	1,960	4,210	1,140	1,410	7,360	6,180
5	2,280	1,490	1,580	1,370	5,550	2,650	1,960	3,530	1,220	1,220	4,580	4,030
6	2,170	1,490	1,580	1,760	4,960	2,650	2,170	2,780	1,860	1,110	2,780	2,060
7	1,960	1,410	1,580	2,520	4,390	2,650	3,210	2,520	2,400	920	1,960	1,410
8	1,760	1,410	1,760	1,330	4,210	2,650	6,880	2,520	2,520	980	1,580	1,410
9	1,670	1,370	1,760	2,170	4,030	2,520	7,600	2,400	2,920	1,110	1,370	1,330
10	2,170	1,370	1,580	1,960	3,860	2,520	7,840	2,280	3,370	1,290	1,580	1,080
11	2,060	1,370	1,580	14,700	3,530	2,520	6,180	2,170	6,180	860	5,150	980
12	1,580	1,370	1,760	39,300	3,530	2,400	3,860	2,060	4,580	800	2,060	950
13	1,490	1,410	1,860	15,900	3,860	2,400	2,920	2,520	4,390	710	1,330	890
14	1,490	1,490	1,860	10,600	4,390	2,400	2,650	5,750	2,170	655	1,370	830
15	1,410	1,410	1,760	9,320	8,560	2,400	2,400	4,210	1,580	630	1,110	800
16	1,410	1,410	1,760	9,580	5,550	2,280	2,400	3,370	1,410	608	1,010	860
17	1,860	1,410	1,670	7,120	7,120	2,170	2,280	2,520	1,290	608	1,080	800
18	1,410	1,330	1,670	5,150	5,750	2,170	2,520	2,280	2,170	630	950	740
19	1,490	1,370	1,580	3,860	4,210	2,170	2,520	2,060	1,670	710	1,290	655
20	1,580	3,060	1,580	3,530	4,770	2,280	2,280	1,960	1,410	1,490	1,330	710
21	1,490	3,860	1,580	4,580	4,770	2,400	2,170	1,860	1,670	1,410	1,110	2,060
22	1,490	2,650	1,490	11,400	4,210	2,400	2,060	1,960	1,760	1,220	950	2,280
23	1,410	2,060	1,490	11,700	4,030	2,400	2,060	2,060	1,410	1,180	800	2,170
24	1,410	1,860	1,490	7,600	3,690	2,280	1,960	2,170	1,490	1,370	710	1,760
25	1,370	1,580	1,580	5,550	3,530	2,280	1,860	2,400	1,110	4,580	740	1,040
26	1,330	1,490	1,860	4,580	3,370	2,060	2,780	2,280	1,180	4,770	800	860
27	1,330	1,490	1,760	3,860	3,210	2,060	3,060	2,060	1,490	4,770	655	860
28	1,370	1,410	1,670	6,400	3,060	2,060	3,060	1,580	1,330	14,700	950	1,040
29	1,760	2,170	1,580	15,300	.....	1,960	6,400	1,410	1,860	10,900	1,580	2,780
30	4,210	1,960	1,580	15,600	.....	1,960	10,900	1,370	4,770	4,390	1,140	3,060
31	2,780	.....	1,410	17,700	.....	1,960	.....	1,330	.....	3,060	1,370	.....

Monthly discharge of Tallapoosa River at Sturdevant, Ala., for the year ending Sept. 30, 1918.

[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	8,800	1,330	2,160	0.878	1.01
November	3,860	1,330	1,730	.703	.78
December	1,860	1,410	1,650	.671	.77
January	39,300	1,330	7,740	3.15	3.63
February	12,500	3,060	5,160	2.10	2.19
March	2,920	1,960	2,390	.972	1.12
April	10,900	1,860	3,470	1.41	1.57
May	12,800	1,330	3,140	1.28	1.48
June	6,180	1,110	2,140	.870	.97
July	14,700	608	2,530	1.03	1.19
August	13,600	655	2,310	.939	1.08
September	6,180	655	1,640	.667	.74
The year	39,300	608	3,000	1.22	16.53

MISCELLANEOUS MEASUREMENTS.

Miscellaneous discharge measurements in south Atlantic and eastern Gulf of Mexico drainage basins during the year ending September 30, 1918.

Streams draining into south Atlantic Ocean.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
June 19	Roanoke River	Atlantic Ocean	Former gaging station at Southern Railway bridge at Randolph, Va.	a 4.40	1,430
29	Cape Fear River	do	Highway bridge at Fayetteville, N. C.	a 6.20	1,650
29	Lower Little River	Cape Fear River	Highway bridge at Manchester, N. C.		213
July 1	do	do	Lamont's bridge, 4 miles upstream from Manchester, N. C.		188
1	Rockfish Creek	do	Rockfish bridge, half a mile upstream from mouth of Little Rockfish Creek, N.C.		254
1	Little Rockfish Creek	Rockfish Creek	Rockfish bridge, half a mile above mouth.		73
June 29	Beaver Creek	Little Rockfish Creek	Just below Beaver Lake, at bridge on Fayetteville-Carthage road, N. C.		10.2
29	Catawba River	Wateree River	Highway bridge at Bridgewater, N. C.	8.26	333
27	Linville River	Catawba River	One mile above mouth at Bridgewater, N. C.	2.56	125
Sept. 18	Intake canal to John P. King's cotton mill.	Diverts from Savannah River.	At Augusta, Ga.		822
19	Tailrace of the Sutherland cotton mill.	Savannah River	do		158

Streams draining into eastern Gulf of Mexico.

Aug. 27	Big Potato Creek	Flint River	At Nelson's highway bridge, 6 miles west of Thomaston, Ga.		36.2
July 31	Tallapoosa River	Alabama River	Former gaging station at Milstead, Ala.	3.98	4,640
Sept. 8	Etowah River	Coosa River	Former gaging station at Ball Ground, Ga.	2.60	453
7	Chamblee Creek	Etowah River	Half a mile above mouth, near Canton, Ga.		5.8

a United States Weather Bureau gage.

INDEX.

STREAM-GAGING STATIONS

AND

PUBLICATIONS RELATING TO WATER RESOURCES

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

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, care of Railroad Commission of Wisconsin.
Helena, Mont., Montana National Bank Building.
Topeka, Kans., 23 Federal 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.
Austin, Tex., Capitol Building.
Portland, Oreg., 606 Post Office Building.
Tacoma, Wash., 406 Federal Building.
San Francisco, Cal., 328 Customhouse.
Los Angeles, Cal., 619 Federal Building.
Honolulu, Hawaii, 25 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 4,500 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.
W 471 to 484	do	1918.

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 1918. 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 1918, are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, 351, 381, 401, 431, 451, and 471, which contain records for the New England streams from 1903 to 1918. 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.

Number of water-supply papers containing results of stream measurements, 1899–1918.

Year.	I North Atlantic slope basins (St. John River to York River).	II South Atlantic slope and eastern Gulf of Mexico basins (James River to the Mississippi).	III Ohio River basin.	IV St. Lawrence River basin.	V Hudson Bay and upper Mississippi River 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.		
												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, *x*/*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* 169, 173	174	175, *x*/*s* 177	176, *r* 177	177	178	178	*x*/*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
1918	471	472	473	474	475	476	477	478	479	480	481	482	483	484

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, 1918; 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., 1898–99.
Cape Fear River near Fayetteville, N. C., 1889–1903.
Deep River near Cumnock, N. C., 1900–1902.
Deep River near Moncure, N. C., 1898–99.
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 Catawba, S. C., 1903–1905.
Catawba River near Rock Hill, S. C., 1895–1903.
Wateree River (lower part of Catawba) near Camden, S. C., 1903–1910.
Mill Creek at Old Fort, 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., 1884–1906.
Stekoa Creek near Clayton, Ga., 1907–8.
Tallulah River near Seed, Ga., 1916–
Tallulah River near Lakemont, Ga., 1916–

Savannah River at Augusta, Ga., 1899–1906—Continued.
Tallulah River at Mathis, Ga., 1912–1916.
Tallulah River at Tallulah Falls, Ga., 1900–1901; 1904–1912.
Tiger Creek at Lakemont, Ga., 1916–
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 Flovilla, 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; 1917–18.
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–
Chattahoochee River at Columbus, Ga., 1912.
Chattahoochee River at Alaga, Ala., 1908–1912.
Soque River near Demorest, Ga., 1904–1909.
Chestatee River at New Bridge, Ga., 1917–18.
Sweetwater Creek near Austell, Ga., 1904–5; 1913.
Flint River near Molina, Ga., 1897–98.
Flint River near Woodbury, Ga., 1900–
Flint River near Musella, Ga., 1907.
Flint River near Culloden, Ga., 1911–
Flint River near Montezuma, Ga., 1905–1909; 1911–12.
Flint River at Albany, Ga., 1897–
Flint River at Bainbridge, Ga., 1908–1913.
Little Potato (Tobler) Creek near Yatesville, Ga., 1914–1918.
Kinchafoonee Creek near Leesburg, Ga., 1905–1909.
Kinchafoonee Creek near Albany, Ga., 1903.
Muckalee Creek near Albany, Ga., 1903.
Ichawaynochaway Creek at Milford, Ga., 1905–1907.
Chipola River at Altha, Fla., 1912–13.

CHOCTAWHATCHEE RIVER BASIN.

Choctawhatchee River near Newton, Ala., 1906–1908; 1911–12.
Choctawhatchee River near Geneva, Ala., 1904.
Double Bridges Creek at Geneva, Ala., 1904.
Pea River at Pera, Ala, 1904–1913.
Pea River at Elba, Ala. 1906.

ESCAMBIA RIVER BASIN.

Conecuh River at Beck, Ala., 1904–

MOBILE RIVER BASIN.

Cartecay River (head of Mobile River) near Cartecay, Ga., 1904–5; 1907.
Coosawattee River (continuation of Cartecay River) at Carters, Ga., 1896–1908.
Oostanaula River (continuation of Coosawattee River) at Resaca, Ga., 1892–1901; 1905–
Coosa River (continuation of Oostanaula River) at Rome, Ga., 1897–1903.
Coosa River at Lock No. 4, above Riverside, Ala., 1890–1901.
Coosa River at Riverside, Ala., 1896–1916.
Coosa River at Lock No. 5, near Riverside, Ala., 1892–1899.
Coosa River at Childersburg, Ala., 1914–
Coosa River at Lock No. 12, near Clanton, Ala., 1912–1914.
Coosa River at Lock No. 18, near Wetumpka, Ala., 1912–1914.
Coosa River near Wetumpka, Ala., 1896–1898.
Alabama River (continuation of Coosa River) at Montgomery, Ala., 1899–1903.
Alabama River at Selma, Ala., 1899–1913.
Ellijay River at Ellijay, Ga., 1907.
Conasauga River at Beaverdale, Ga., 1907–8.
Etowah River near Ball Ground, Ga., 1907–1915.
Etowah River at Canton, Ga., 1892–1905.
Etowah River near Rome, Ga., 1904–
Etowah River at Rome, Ga., 1903.
Amicalola River near Potts Mountain, Ga., 1907–8; 1910–1913.

PEARL RIVER BASIN.

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 slope 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 wells 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 slope 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. Sumary 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 formation; gives notes on wells by counties, deep well records, and selected records in detail; treats of sanitary aspects 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 water 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. Ayers 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, Mississippi, 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 Tattnall counties, Georgia; Lenoir, New Hanover, and Moore counties, North Carolina; Hancock, Harrison, Jackson, Jones, Marshall, Newton, and Pancla 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 Geological 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 reduction 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 boring at Norfolk and the boring at Lambert Point.

90. Cranberry, North Carolina-Tennessee. 5c.

*124. Mount Mitchell, North Carolina-Tennessee.

[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.

*147. Pisgah, North Carolina-South Carolina.
*175. Birmingham, Alabama.[1] 5c.
187. Ellijay, Georgia-North Carolina-Tennessee.[2] 25c.

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.

Surface 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 development.

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 Cong., 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.

[1] Octavo edition only. [2] Octavo edition, 50c.

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.

*80. 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. Slichter. 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, Calif., 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 polution 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; disdusses 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 estimate, 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 materials; 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 and measurement 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 efficacy 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, Calif., 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.

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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.

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