

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 303

SURFACE WATER SUPPLY OF THE
UNITED STATES

1911

PART III. THE OHIO RIVER BASIN

PREPARED UNDER THE DIRECTION OF M. O. LEIGHTON

BY

A. H. HORTON, M. R. HALL, AND H. J. JACKSON



WASHINGTON
GOVERNMENT PRINTING OFFICE
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SURFACE WATER SUPPLY OF THE OHIO RIVER BASIN, 1911.

By A. H. HORTON, M. R. HALL, and H. J. JACKSON.

AUTHORIZATION OF WORK.

This volume is Part III of a series of 12 reports presenting results of measurements of flow made on certain streams in the United States during the calendar year 1911. The reports are listed below.

Papers on surface water supply of the United States, 1911.

Part. ^a	No.	Title.
I	301	North Atlantic coast.
II	302	South Atlantic coast and eastern Gulf of Mexico.
III	303	Ohio River basin.
IV	304	St. Lawrence River basin.
V	305	Upper Mississippi River and Hudson Bay basins.
VI	306	Missouri River basin.
VII	307	Lower Mississippi River basin.
VIII	308	Western Gulf of Mexico.
IX	309	Colorado River basin.
X	310	Great Basin.
XI	311	Pacific coast in California.
XII	312	North Pacific coast.

^a For the purpose of uniformity in the presentation of reports, a general plan has been agreed upon by the United States Reclamation Service, the United States Forest Service, the United States Weather Bureau, and the United States Geological Survey, according to which the area of the United States has been divided into 12 parts, whose boundaries coincide with natural drainage lines indicated by the parts of the report.

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

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 of water supply for irrigation. 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 year ending June 30—

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 1913, inclusive.....	150, 000

In the execution of the work many private and State organizations have cooperated. Acknowledgments for such cooperation is made on page 13 and also in connection with the description of each station affected by the cooperative work.

PUBLICATIONS.

Measurements of stream flow have been made at more than 2,000 points in the United States and also at many points in small areas in Seward Peninsula and the Yukon-Tanana region, Alaska, and in the Hawaiian Islands. During 1911 gaging stations were maintained by the Survey and the cooperating organizations at about 1,500 points in the United States, and many discharge measurements were 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 the regular surface water supply papers from time to time. A complete list of the gaging stations maintained by the Survey to and including 1910 and a list of the papers relating to the water supply of the country has been published as Water-Supply Paper 280. An index to the reports containing stream-flow measurements prior to 1904 has been published as Water-Supply Paper 119.

For each calendar year there has been prepared a report embodying the stream-flow data collected during that year, which has been published either as a part of the annual report of the Director, as a bulletin, or as a water-supply paper, as shown by the following table:

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

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

Report.	Character of data.	Year.
10th A, pt. 2.....	Descriptive information only.....	
11th A, pt. 2.....	Monthly discharge.....	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.
WS 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.
WS 15.....	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.....	1897.
WS 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.
WS 27.....	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.....	1898.
WS 28.....	Measurements, ratings, and gage heights, Arkansas River and western United States.....	1898.

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

Report.	Character of data.	Year.
20th A, pt. 4.....	Monthly discharge (also for many earlier years).....	1898.
WS 35 to 39.....	Descriptions, measurements, gage heights, and ratings.....	1899.
21st A, pt. 4.....	Monthly discharge.....	1899.
WS 47 to 52.....	Descriptions, measurements, gage heights, and ratings.....	1900.
22d A, pt. 4.....	Monthly discharge.....	1900.
WS 65, 66.....	Descriptions, measurements, gage heights, and ratings.....	1901.
WS 75.....	Monthly discharge.....	1901.
WS 82 to 85.....	Complete data.....	1902.
WS 97 to 100.....	do.....	1903.
WS 124 to 135.....	do.....	1904.
WS 165 to 178.....	do.....	1905.
WS 201 to 214.....	Complete data, except descriptions.....	1906.
WS 241 to 252.....	Complete data.....	1907-8.
WS 261 to 272.....	do.....	1909.
WS 281 to 292.....	do.....	1910.
WS 301 to 312.....	do.....	1911.

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

The table which follows gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1911. The data for any particular station will 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 1911, are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, and 301, which contain records for the New England streams from 1903 to 1911.

Number of water-supply papers containing results of stream measurements, 1899-1911.

	1899 ^a	1900 ^b	1901	1902	1903	1904	1905	1906	1907-8	1909	1910	1911
North Atlantic coast (St. John River to York River).....	35	47, ^c 48	65, 75	82	97	<i>d</i> 124, <i>e</i> 125, <i>f</i> 126	<i>d</i> 165, <i>e</i> 166, <i>f</i> 167	<i>e</i> 201, <i>e</i> 202, <i>f</i> 203	241	261	281	301
South Atlantic coast and eastern Gulf of Mexico (James River to the Mississippi).....	<i>g</i> 35, 36	48	65, 75	<i>g</i> 82, 83	<i>g</i> 97, 98	<i>f</i> 126, 127	<i>f</i> 167, 168	<i>f</i> 203, 204	242	262	282	302
Ohio River basin.....	36	48, <i>h</i> 49	65, 75	<i>g</i> 82, 83	<i>g</i> 97, 98	128	169	205	243	263	283	303
St. Lawrence River and Great Lakes.....	36	49	65, 75	<i>i</i> 82, 83	97	129	170	206	244	264	284	304
Hudson Bay and upper Mississippi River.....	36	49	<i>f</i> 65, 66, 75	<i>f</i> 83, 85	<i>h</i> 98, 99, <i>k</i> 100	<i>f</i> 128, 130	171	207	245	265	285	305
Missouri River.....	136, 37	49, <i>m</i> 50	66, 75	84	99	130, <i>n</i> 131	172	208	246	266	286	306
Lower Mississippi River.....	37	50	<i>f</i> 65, 66, 75	<i>f</i> 83, 84	<i>f</i> 98, 99	<i>f</i> 128, 131	<i>f</i> 169, 173	<i>f</i> 205, 209	247	267	287	307
Western Gulf of Mexico.....	37	50	66, 75	<i>f</i> 83, 84	99	132	174	210	248	268	288	308
Colorado River.....	<i>o</i> 37, 38	50	66, 75	85	100	133	175, <i>p</i> 177	211	249	269	289	309
Great Basin.....	38, <i>q</i> 39	51	66, 75	85	100	133, <i>r</i> 134	176, <i>r</i> 177	212, <i>r</i> 213	250, <i>r</i> 251	270, <i>r</i> 271	290	310
Pacific coast in California.....	38, <i>s</i> 39	51	66, 75	85	100	134	177	213	251	271	291	311
North Pacific coast.....	38	51	66, 75	85	100	135	<i>t</i> 177, 178	214	252	272	292	312

^a Rating tables and index to Water-Supply Papers 35-39 continued in Water-Supply Paper 39.^b 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.^c Wisconsin and Schuykill rivers to James River.^d New England rivers only.^e Hudson River to Delaware River, inclusive.^f Susquehanna River to Yadkin River, inclusive.^g James River only.^h Scioto River.ⁱ Lake Ontario and tributaries to St. Lawrence River proper.^j Tributaries of Mississippi from east.^k Hudson Bay only.^l Galatin River.^m Loud and Platte rivers near Columbus, Nebr., and all tributaries below junction with Platte.ⁿ Platte and Kansas rivers.^o Green and Gunnison rivers.^p Below junction with Gila.^q Mohave River only.^r Great Basin in California, excepting Truckee and Carson drainage basins.^s Kings and Kern rivers and south Pacific coast drainage basins.^t Rogue, Umpqua, and Shasta rivers only.

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 which represent a rate of flow, as second-feet, gallons per minute, miner’s inches, and run-off in second-feet per square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches, and acre-feet. The units used in this series of reports are second-feet, second-feet per square mile, run-off in depth in inches, and acre-feet. They may be defined as follows:

“Second-foot” is an abbreviation for cubic foot per second and is the unit for the rate of discharge of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed by the use of the factors given in the accompanying table of equivalents.

“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 the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

An “acre-foot” is equivalent to 43,560 cubic feet, and 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.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

Table for converting discharge in second-feet per square mile into run-off in depth in inches over the area.

Discharge (second-feet per square mile).	Run-off (depth in inches).				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.	0.03719	1.041	1.079	1.116	1.153
2. ....	.07438	2.083	2.157	2.231	2.306
3. ....	.11157	3.124	3.236	3.347	3.459
4. ....	.14876	4.165	4.314	4.463	4.612
5. ....	.18595	5.207	5.393	5.578	5.764
6. ....	.22314	6.248	6.471	6.694	6.917
7. ....	.26033	7.289	7.550	7.810	8.070
8. ....	.29752	8.331	8.628	8.926	9.223
9. ....	.33471	9.372	9.707	10.041	10.376

NOTE.—For partial month multiply the values for 1 day by the number of days.

Table for converting discharge in second-feet into run-off in acre-feet.

Discharge (second- feet).	Run-off (acre-feet).				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	1.983	55.54	57.52	59.50	61.49
2.....	3.967	111.1	115.0	119.0	123.0
3.....	5.950	166.6	172.6	178.5	184.5
4.....	7.934	222.1	230.1	238.0	246.0
5.....	9.917	277.7	287.6	297.5	307.4
6.....	11.90	333.2	345.1	357.0	368.9
7.....	13.88	388.8	402.6	416.5	430.4
8.....	15.87	444.3	460.2	476.0	491.9
9.....	17.85	499.8	517.7	535.5	553.4

NOTE.—For partial month multiply values for 1 day by the number of days.

1 second-foot equals 40 California miner's inches (law of March 23, 1901).

1 second-foot equals 38.4 Colorado miner's inches.

1 second-foot equals 40 Arizona miner's inches.

1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.

1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.

1 second-foot for one year equals 31,536,000 cubic feet.

1 second-foot equals about 1 acre-inch per hour.

1 second-foot for one day equals 86,400 cubic feet.

1,000,000,000 (1 United States billion) cubic feet equals 11,570 second-feet for one day.

1,000,000,000 cubic feet equals 414 second-feet for one 28-day month.

1,000,000,000 cubic feet equals 399 second-feet for one 29-day month.

1,000,000,000 cubic feet equals 386 second-feet for one 30-day month.

1,000,000,000 cubic feet equals 373 second-feet for one 31-day month.

100 California miner's inches equals 18.7 United States gallons per second.

100 California miner's inches for one day equals 4.96 acre-feet.

100 Colorado miner's inches equals 2.60 second-feet.

100 Colorado miner's inches equals 19.5 United States gallons per second.

100 Colorado miner's inches for one day equals 5.17 acre-feet.

100 United States gallons per minute equals 0.223 second-foot.

100 United States gallons per minute for one day equals 0.442 acre-foot.

1,000,000 United States gallons per day equals 1.55 second-feet.

1,000,000 United States gallons equals 3.07 acre-feet.

1,000,000 cubic feet equals 22.95 acre-feet.

1 acre-foot equals 325,850 gallons.

1 inch deep on 1 square mile equals 2,323,200 cubic feet.

1 inch deep on 1 square mile equals 0.0737 second-foot per year.

1 foot equals 0.3048 meter.

1 mile equals 1.60935 kilometers.

1 mile equals 5,280 feet.

1 acre equals 0.4047 hectare.

1 acre equals 43,560 square feet.

1 acre equals 209 feet square, nearly.

1 square mile equals 2.59 square kilometers.

1 cubic foot equals 0.0283 cubic meter.

1 cubic foot of water weighs 62.5 pounds.

1 cubic meter per minute equals 0.5886 second-foot.

1 horsepower equals 550 foot-pounds per second.

1 horsepower equals 76.0 kilogram-meters per second.

1 horsepower equals 746 watts.

1 horsepower equals 1 second-foot falling 8.80 feet.

1½ horsepower equal about 1 kilowatt.

To calculate water power quickly:
$$\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11} = \text{net horsepower on water}$$
 wheel realizing 80 per cent of theoretical power.

EXPLANATION OF DATA.

For each regular current-meter gaging station the following data, so far as available, are given: Description of the station, list of discharge measurements, table of daily gage heights, table of daily discharge, table of monthly and yearly discharge and run-off. For stations located at weirs or dams the gage-height table is omitted.

In addition to statements regarding the location and installation of current-meter stations the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such points as ice, logging, shifting channels, and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy and reliability of the data.

The table of daily gage heights records the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day, usually in the morning and in the evening. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams or by backwater from obstructions are published as recorded, with suitable footnotes. The rating table is not applicable for such periods unless the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general the zero is located somewhat below the lowest known flow, to avoid negative readings.

The discharge measurements and gage heights are the base data from which rating tables, daily-discharge tables, and monthly-discharge tables are computed.

The rating table gives, either directly or by interpolation, the discharge in second-feet corresponding to every stage of the river recorded during the period for which it is applicable. It is not published in this report, but can be determined from the tables of daily gage heights and daily discharge as follows:

First plot the discharge measurements for the current and earlier years on cross-section paper, with gage heights in feet as ordinates and discharge in second-feet as abscissas. Then tabulate a number of gage heights taken from the daily gage-height table for the com-

plete range of stage given and the corresponding discharges for the days selected from the daily-discharge table and plot the values on cross-section paper. The last points plotted will define the rating curve used and will lie among the plotted discharge measurements. After drawing the rating curve a table can be developed by scaling off the discharge in second-feet for each tenth-foot of gage height. These values should be so adjusted that the first differences shall always be increasing or constant except for known backwater periods.

The table of daily discharge gives the discharges in second-feet corresponding to the observed gage heights as determined from the rating tables.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, 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 of "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 the computations for the remaining columns, which are defined on page 9, are based.

The field methods used in the collection of the data presented in this series of reports are described in the introductory sections of Water-Supply Papers 261 to 272, inclusive, "Surface water supply of the United States, 1909."

Plates I and II show the average precipitation and run-off in the United States, as determined from the measurements of stream flow made by the Geological Survey and records of rainfall collected by the Weather Bureau.

Plate III shows typical gaging stations.

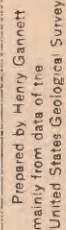
Plate IV shows current meters ¹ used in the work.

ACCURACY AND RELIABILITY OF FIELD DATA AND COMPARATIVE RESULTS.

The accuracy of stream-flow data depends primarily on the natural conditions at the gaging station and on the methods and care with which the data are collected. Errors of the first group depend on the degree of permanency of channel and of permanency of the relation between discharge and stage.

Errors of the second class are due, first, to errors in observation of stage; second, to errors in measurements of flow; third, to errors due to misinterpretation of stage and flow data.

¹ See Hoyt, J. C., and others, *Use and care of current meter as practiced by the United States Geological Survey*: Trans. Am. Soc. Civil Eng., vol. 66, 1910, p. 70.



MAP OF UNITED STATES, SHOWING MEAN ANNUAL RUN-OFF

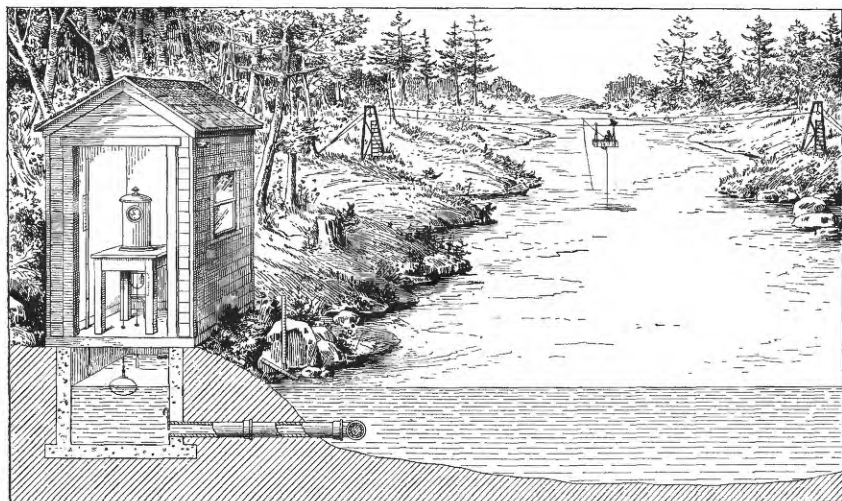
Blue lines and figures indicate average annual run-off in depth in inches



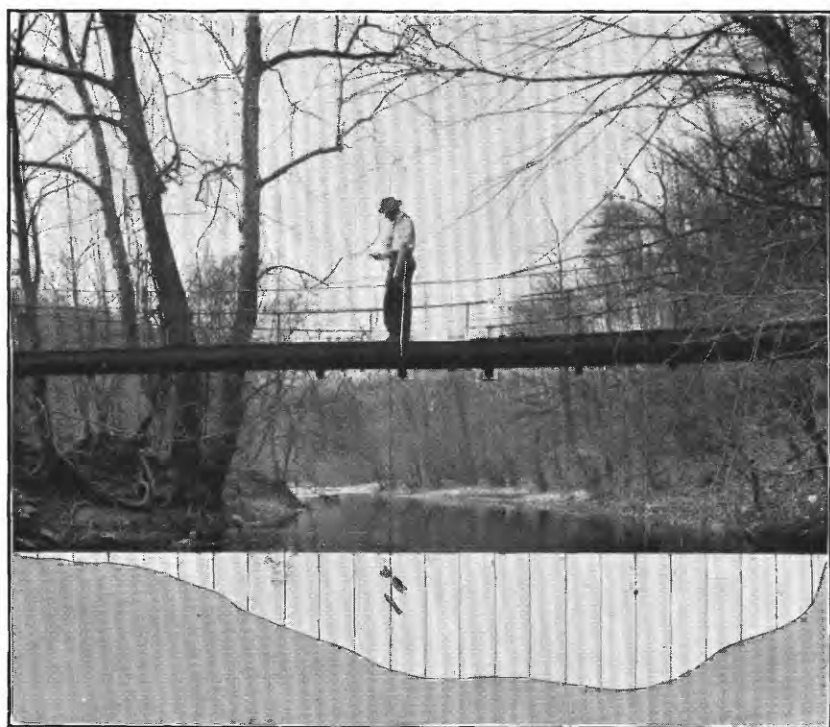
ENGRAVED AND PRINTED BY THE U.S. GEOLOGICAL SURVEY

MAP OF UNITED STATES, SHOWING MEAN ANNUAL PRECIPITATION
Blue lines and figures indicate average annual precipitation in depth in inches

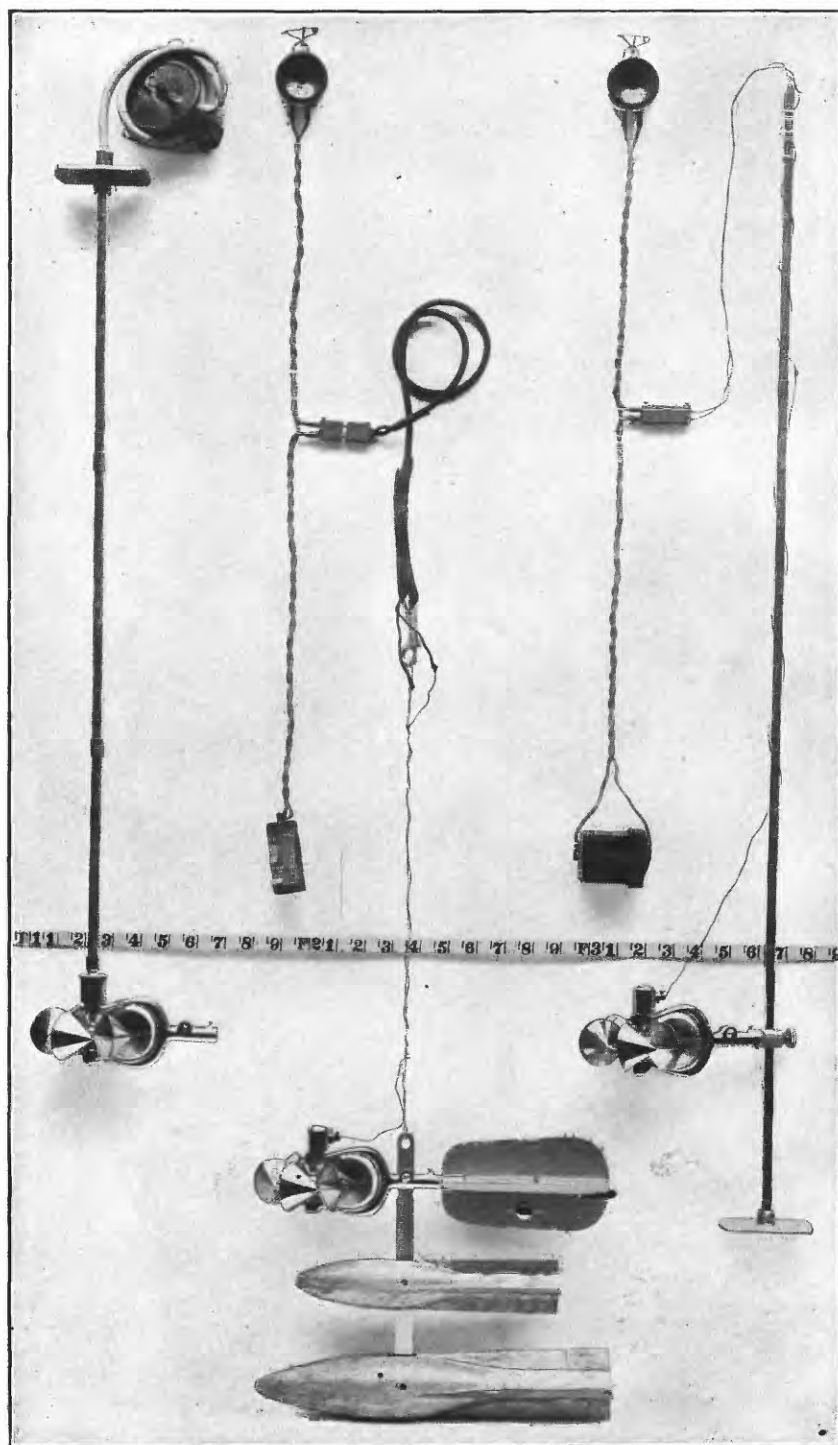
Prepared by Henry Gannett
mainly from data of the
United States Geological Survey
and United States Weather Bureau



A. CABLE STATION WITH AUTOMATIC GAGE.



B. FOR BRIDGE MEASUREMENT.
TYPICAL GAGING STATIONS.



SMALL PRICE CURRENT METERS.

In order to give engineers and others information regarding the probable accuracy of the computed results, footnotes are added to the daily-discharge tables, stating the probable accuracy of the rating tables used, and an accuracy column is inserted in the monthly-discharge table. 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" or "approximate," 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 accuracy column in the monthly-discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the probable reliability of the observer, and knowledge of local conditions. In this column A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

Even though the monthly means for any station may represent with a high degree of accuracy the quantity of water flowing past the gage, the figures showing discharge per square mile and depth of run-off in inches may be subject to gross errors which result from including in the measured drainage area large noncontributing districts or omitting estimates of water diverted for irrigation or other use, and they should, therefore, be considered as only approximate, particularly for periods of irrigation or of low water. For these errors it is as a rule not feasible to make adequate correction.

In general the base data collected each year by the Survey engineers are published not only to comply with the law but to afford any engineer the means of examining and adjusting to his own needs the results of the computations. The table of monthly discharge is so arranged as to give only a general idea of the flow at the station and should not be used for other than preliminary estimates. The determinations of daily discharge allow more detailed studies of the variation in flow by which the period of deficiency may be determined.

It should be borne in mind that the observations in each succeeding year may be expected to throw new light on data already collected and published, and the engineer who makes use of the figures presented in these papers should verify all ratings and make such adjustments for earlier years as may seem necessary.

COOPERATION AND ACKNOWLEDGMENTS.

For assistance rendered and records furnished special acknowledgment is due the members of the United States Corps of Engineers, the United States Weather Bureau, the Water Supply Commission

of Pennsylvania, the Ohio Agricultural Experiment Station, F. W. Scheidenhelm, and the Knoxville Power Co.

The State of Illinois has paid for the stream gaging work in that State, the appropriation being in charge of the Internal Improvement Commission, Isham Randolph, chairman, and the Rivers and Lakes Commission, Robert R. McCormick, chairman.

DIVISION OF WORK.

The field data for Allegheny River at Red House, N. Y., have been collected under the direction of C. C. Covert, district engineer, assisted by F. J. Shuttleworth and C. S. De Golyer.

The field data for the Ohio River drainage basin, with the exception of Allegheny River at Red House, N. Y., and for the Tennessee River drainage basin have been collected under the direction of A. H. Horton, district engineer, assisted by C. T. Bailey, P. S. Monk, and Richard Perwien. Stations in Pennsylvania are now maintained and the stream-flow data collected by the Water Supply Commission of Pennsylvania.

The field data in the Tennessee River drainage basin have been collected under the direction of M. R. Hall, district engineer, assisted by R. E. Robertson.

The ratings, special estimates, and studies of the completed data were made by M. R. Hall, A. H. Horton, R. H. Bolster, and H. J. Jackson. The completed data were prepared for publication by H. J. Jackson, assistant engineer. The computations were made, under the direction of R. H. Bolster and H. J. Jackson, by J. G. Mathers, H. D. Padgett, A. H. Tuttle, H. J. Dean, C. L. Batchelder, W. R. King, and M. I. Walters.

The report was edited by Mrs. B. D. Wood.

STATION RECORDS.

ALLEGHENY RIVER BASIN.

ALLEGHENY RIVER AT RED HOUSE, N. Y.

Location.—At highway bridge at Red House, N. Y., on the road leading from the Pennsylvania Railroad station to the Erie Railroad station; about 5 miles below Salamanca and 13 miles above the State line between New York and Pennsylvania. Conewango Creek, the outlet of Chautauqua Lake, enters the Allegheny in the State of Pennsylvania.

Records available.—September 4, 1903, to December 31, 1911.

Drainage area.—1,640 square miles.

Gage.—Standard chain, attached to the upstream side of bridge near left hand end; datum unchanged.

Channel.—Practically permanent since station was established; broken by three bridge piers. Bed of stream, coarse gravel. Current good for medium and high stages; rather slow at low stages.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Ice affects the relation of gage height to discharge for short periods during December, January, February, and March.

Artificial control.—Low-water flow may be slightly affected by the operation of several small power plants above Salamanca. At Olean, N. Y., a wasteway from Cuba reservoir enters the river through Olean Creek. This reservoir is on the divide between Oil Creek, tributary to Allegheny River, and Genesee River, tributary to Lake Ontario. The stored water is commonly turned into Genesee River through the abandoned summit level of Genesee River canal, but may be diverted into Oil Creek through a guard lock at the head of the canal.

Accuracy.—Records good except for three winter months.

Discharge measurements of Allegheny River at Red House, N. Y., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
		<i>Feet.</i>	<i>Sec.-feet.</i>
Feb. 14	F. J. Shuttleworth.....	4.00	1,470
Apr. 19	C. S. De Golyer.....	5.52	4,360

Daily gage height, in feet, of Allegheny River at Red House, N. Y., for 1911.

[W. E. Coe, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	6.4	6.3	4.8	5.6	5.2	3.6	3.7	2.95	4.4	5.2	4.25	5.3
2.....	7.1	5.7	4.7	5.2	5.2	3.65	3.5	3.05	4.4	6.6	4.2	5.5
3.....	8.8	5.4	4.6	4.9	5.4	3.6	3.35	3.0	4.6	6.4	4.5	5.2
4.....	8.1	5.2	4.5	5.0	5.2	3.55	3.2	3.0	4.6	6.3	4.25	4.7
5.....	7.4	4.1	4.25	6.2	4.9	3.55	3.2	3.1	4.6	6.1	4.8	4.5
6.....	6.8	4.1	4.0	6.8	4.8	3.6	3.2	3.35	5.8	5.4	5.0	4.45
7.....	5.7	4.2	4.0	8.0	4.8	3.5	3.05	3.85	6.0	4.8	5.2	4.45
8.....	5.4	4.25	4.2	8.1	4.5	3.45	3.05	3.4	5.9	4.6	5.3	4.3
9.....	5.6	4.4	4.8	7.7	4.2	3.4	3.25	3.25	5.6	4.6	5.4	4.6
10.....	6.0	4.3	5.0	7.2	4.25	3.35	3.2	3.2	6.6	4.6	5.4	4.7
11.....	6.5	4.3	5.2	6.6	4.25	4.2	3.2	3.0	5.6	4.45	5.8	4.8
12.....	6.9	4.0	5.6	6.6	3.9	4.8	3.45	2.9	5.4	4.6	5.6	5.2
13.....	7.2	4.05	5.7	6.4	3.8	5.6	3.4	3.1	5.0	4.6	5.6	7.1
14.....	8.0	4.1	5.8	6.2	3.75	5.7	3.45	3.25	4.5	4.6	5.8	7.4
15.....	8.6	4.8	6.3	6.2	3.7	5.3	3.3	3.15	4.45	4.7	5.7	7.0
16.....	8.2	5.1	6.2	6.0	3.7	4.8	3.2	3.6	4.6	4.8	5.9	6.9
17.....	7.5	5.9	5.4	5.8	3.85	4.3	3.15	3.55	4.25	4.8	6.6	6.0
18.....	6.8	6.2	5.2	5.5	3.85	4.1	3.15	3.55	4.2	4.7	6.7	5.9
19.....	6.5	5.8	5.3	5.5	3.8	3.35	3.1	3.55	4.1	4.6	6.6	4.7
20.....	6.2	5.4	5.4	5.5	3.95	3.3	3.1	3.15	4.15	4.5	6.0	4.6
21.....	6.0	4.9	5.2	5.8	3.85	3.3	3.0	3.15	3.9	4.2	5.3	5.2
22.....	5.6	5.0	5.2	6.2	3.7	3.55	3.0	3.3	3.55	4.2	5.3	5.0
23.....	5.2	5.0	6.2	6.0	3.6	3.5	3.1	3.35	3.55	4.25	5.0	5.1
24.....	4.0	5.0	5.6	5.7	3.85	3.6	3.0	3.2	3.6	4.25	5.2	5.2
25.....	5.2	5.0	5.2	5.6	4.75	3.65	3.0	3.25	3.65	4.1	5.4	5.0
26.....	6.6	4.9	5.6	5.2	5.3	3.6	3.0	3.35	3.65	4.0	5.0	4.8
27.....	6.8	5.0	6.2	5.2	4.8	3.95	2.9	3.85	3.75	4.0	4.9	4.6
28.....	9.2	4.9	8.1	5.0	4.0	4.3	2.95	6.4	3.8	3.9	4.9	4.7
29.....	8.2	.....	7.8	4.8	3.85	3.8	2.8	8.6	3.8	3.95	5.4	5.3
30.....	7.6	.....	6.6	4.8	3.8	3.65	2.9	7.0	5.3	3.95	5.6	5.6
31.....	7.0	.....	5.8	.....	3.8	.....	2.9	5.4	.....	4.1	.....	5.4

NOTE.—The extent of effect from ice during January, February, and March is very uncertain. It is quite probable that the relation of gage height to discharge was affected by ice Jan. 21 to 26 and Feb. 22 to 27, and also more or less for other short periods from about Jan. 9 to Mar. 10.

Daily discharge, in second-feet, of Allegheny River at Red House, N. Y., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	6,840	6,540	2,720	4,570	3,580	945	1,070	285	2,040	3,580	1,820	3,820
2.....	9,070	4,830	2,540	3,580	3,580	1,010	825	362	2,040	7,460	1,750	4,320
3.....	15,700	4,060	2,360	2,920	4,060	945	655	320	2,360	6,840	2,200	3,580
4.....	12,700	3,580	2,200	3,130	3,580	885	500	320	2,360	6,540	1,820	2,540
5.....	10,100	1,610	1,820	6,240	2,920	885	500	405	2,360	5,950	2,720	2,200
6.....	8,090	1,610	1,470	8,090	2,720	945	500	655	5,100	4,060	3,130	2,100
7.....	4,830	1,750	1,470	12,300	2,720	825	362	1,270	5,660	2,720	3,580	2,122
8.....	4,060	1,820	1,750	12,700	2,200	768	362	710	5,380	2,360	3,820	1,900
9.....	4,570	2,040	2,720	11,200	1,750	710	550	550	4,570	2,360	4,060	2,360
10.....	5,660	1,900	3,130	9,400	1,820	655	500	500	7,460	2,360	4,060	2,540
11.....	7,150	1,900	3,580	7,460	1,820	1,750	500	320	4,570	2,120	5,100	2,720
12.....	8,410	1,470	4,570	7,460	1,340	2,720	768	250	4,060	2,360	4,570	3,580
13.....	9,400	1,540	4,830	6,840	1,200	4,570	710	405	3,130	2,360	4,570	9,070
14.....	12,300	1,610	5,100	6,240	1,140	4,830	768	550	2,200	2,360	5,100	10,100
15.....	14,800	2,720	6,540	6,240	1,070	3,820	600	452	2,120	2,540	4,830	8,740
16.....	13,100	3,350	6,240	5,660	1,070	2,720	500	945	2,360	2,720	5,380	8,410
17.....	10,400	5,380	4,060	5,100	1,270	1,900	452	885	1,820	2,720	7,460	5,660
18.....	8,090	6,240	3,580	4,320	1,270	1,610	452	885	1,750	2,540	7,770	5,380
19.....	7,150	5,100	3,820	4,320	1,200	655	405	885	1,610	2,360	7,460	2,540
20.....	6,240	4,060	4,060	4,320	1,400	600	405	452	1,680	2,200	5,660	2,360
21.....	5,000	2,920	3,580	5,100	1,270	600	320	452	1,340	1,750	3,820	3,580
22.....	3,700	2,000	3,580	6,240	1,070	885	320	600	885	1,750	3,820	3,130
23.....	2,500	1,500	6,240	5,660	945	825	405	655	885	1,820	3,130	3,350
24.....	1,470	1,200	4,570	4,830	1,270	945	320	500	945	1,820	3,580	3,580
25.....	2,500	1,200	3,580	4,570	2,630	1,010	320	550	1,010	1,610	4,060	3,130
26.....	5,000	1,900	4,570	3,580	3,820	945	320	655	1,010	1,470	3,130	2,720
27.....	8,090	2,500	6,240	3,580	2,720	1,400	250	1,270	1,140	1,470	2,920	2,360
28.....	17,400	2,920	12,700	3,130	1,470	1,900	285	6,840	1,200	1,340	2,920	2,540
29.....	13,100	.....	11,500	2,720	1,270	1,200	190	14,800	1,200	1,400	4,060	3,820
30.....	10,800	.....	7,460	2,720	1,200	1,010	250	8,740	3,820	1,400	4,570	4,570
31.....	8,740	.....	5,100	.....	1,200	.....	250	4,060	.....	1,610	.....	4,060

NOTE.—Daily discharge determined from a well-defined discharge rating curve. Discharge has been applied from the open-channel rating curve throughout January, February, and March, except Jan. 21 to 26 and Feb. 22 to 27, for which days it was estimated by means of climatologic records, the discharge at Kittanning, and the records of discharge from adjacent drainage areas. Daily discharge for these three months, particularly at low stages, is uncertain.

Monthly discharge of Allegheny River at Red House, N. Y., for 1911.

[Drainage area, 1,640 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	17,400	1,470	8,290	5.05	5.82	B.
February.....	6,540	1,200	2,820	1.72	1.79	C.
March.....	12,700	1,470	4,440	2.71	3.12	A.
April.....	12,700	2,720	5,810	3.54	3.95	A.
May.....	4,060	945	1,950	1.19	1.37	A.
June.....	4,830	600	1,480	.902	1.01	A.
July.....	1,070	190	471	.287	.33	A.
August.....	14,800	250	1,630	.994	1.15	A.
September.....	7,460	885	2,600	1.59	1.77	A.
October.....	7,460	1,340	2,770	1.69	1.95	A.
November.....	7,770	1,750	4,100	2.50	2.79	A.
December.....	10,100	1,900	3,960	2.41	2.78	A.
The year.....	17,400	190	3,360	2.05	27.83	

ALLEGHENY RIVER AT KITTANNING, PA.

Location.—At the Market Street Bridge in the city of Kittanning, Pa., about 4 miles above the mouth of Crooked River and more than 12 miles above the mouth of Kiskiminitas River,

Records available.—August 18, 1904, to December 31, 1911.

Drainage area.—9,010 square miles. (Revised since last report.)

Gage.—Chain gage attached to bridge; datum unchanged since established.

Channel.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Ice may affect the relation of gage height to discharge for short periods during December, January, and February. No ice was reported by the observer during 1911.

Accuracy.—Conditions of flow are practically constant and an excellent low and medium stage rating curve has been developed. At high stages numerous measurements have been made. There is, however, a marked difference between the discharge at a given high gage height for rising and for falling stage, due to increase and decrease of slope. The difference at times amounts to as much as 15 per cent, and as the variation differs for each flood it is difficult to determine accurately the daily discharge at high stages. No discharge measurements were made during 1911. The gage was inspected February 21, 1911, and February 2, 1912 (prior to the preparation of this report). The last discharge measurement was made March 5, 1910, and the accuracy of the daily and monthly discharge in the following tables depends upon the permanency of the conditions of flow since that date.

Cooperation.—This station is now maintained by the Water Supply Commission of Pennsylvania, which has furnished the records of gage heights for 1911.

Daily gage height, in feet, of Allegheny River at Kittanning, Pa., for 1911.

[S. B. Cochrane and Blaine Mast, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	11.55	10.50	6.30	8.62	6.83	3.80	4.00	1.55	7.85	11.05	4.95	8.85
2.....	11.32	9.50	5.50	7.81	7.10	3.78	3.60	1.50	7.00	18.92	5.70	8.25
3.....	12.50	8.52	5.23	7.40	7.21	3.75	3.35	1.85	6.15	14.40	8.40	7.65
4.....	14.30	8.30	4.62	7.10	7.51	3.70	3.00	1.95	5.10	11.05	8.60	7.20
5.....	12.55	7.90	4.12	6.30	6.75	3.55	2.40	1.90	4.45	9.55	8.40	6.80
6.....	10.80	7.20	3.92	8.90	6.35	3.60	2.10	2.50	7.10	8.60	8.10	6.45
7.....	9.95	6.50	3.89	10.93	6.00	3.60	2.00	2.85	8.48	8.40	7.75	6.15
8.....	8.55	5.83	3.46	11.23	5.46	3.55	2.00	2.90	7.90	9.80	7.45	5.85
9.....	8.10	5.80	3.17	10.95	5.20	3.55	1.95	2.65	8.85	9.05	7.05	5.85
10.....	7.50	5.73	3.01	10.50	4.92	3.40	1.85	2.30	10.05	8.25	6.75	6.25
11.....	7.00	5.85	3.87	8.72	4.82	3.50	1.95	2.25	8.53	7.45	6.55	7.75
12.....	8.77	5.30	4.62	8.35	4.80	3.75	1.95	2.10	7.20	6.80	7.40	9.10
13.....	13.30	5.30	5.28	7.99	4.75	4.50	1.93	1.95	6.43	6.30	7.50	10.65
14.....	15.79	5.50	7.24	7.24	4.68	4.95	1.93	1.80	5.85	5.95	7.50	12.05
15.....	19.20	9.00	8.50	8.76	4.50	4.80	1.82	1.60	12.27	6.05	7.25	13.05
16.....	16.64	9.80	8.24	8.85	4.52	4.80	1.92	2.60	14.20	5.85	6.95	13.07
17.....	13.19	9.30	7.92	8.85	4.45	4.60	1.92	3.25	11.75	5.60	6.80	12.10
18.....	11.30	10.72	7.28	8.15	4.00	4.15	1.90	3.50	10.17	9.75	7.55	10.85
19.....	9.62	13.85	7.43	8.07	4.32	3.90	1.90	3.30	8.20	11.10	13.85	9.40
20.....	8.42	12.60	7.12	7.70	4.18	3.60	1.77	2.85	6.65	9.55	11.65	7.75
21.....	7.80	10.53	7.28	10.32	4.25	3.20	1.85	2.70	5.95	8.30	10.30	7.35
22.....	7.00	9.00	7.31	9.82	4.20	2.90	1.85	2.50	5.40	7.40	9.50	7.55
23.....	6.80	7.95	8.89	10.05	4.16	2.55	1.85	2.25	5.00	6.55	8.70	7.65
24.....	6.50	7.10	8.10	9.42	4.12	2.70	1.90	2.20	4.60	6.30	7.90	8.20
25.....	5.80	6.90	7.81	8.70	4.00	3.60	1.75	2.20	4.25	5.95	7.05	8.00
26.....	5.50	6.70	7.45	7.82	4.06	3.90	1.85	3.70	4.05	5.75	7.00	7.55
27.....	5.80	7.20	8.21	7.25	4.02	4.10	1.80	3.50	4.00	5.50	7.20	7.55
28.....	11.55	6.40	9.85	6.80	4.00	4.25	1.75	5.10	4.55	5.20	7.55	7.85
29.....	16.30	.....	11.00	6.49	3.95	4.25	1.75	8.80	6.40	5.00	7.85	7.78
30.....	14.40	.....	10.01	6.57	3.80	4.10	1.60	13.80	7.45	4.65	9.65	7.05
31.....	12.50	.....	9.35	.....	3.85	.....	1.65	9.45	.....	4.60	.....	9.45

NOTE.—No ice reported. Relation of gage height to discharge probably not affected by ice.

Daily discharge, in second-feet, of Allegheny River at Kittanning, Pa., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	49,600	41,900	15,200	29,100	18,100	5,410	5,940	1,030	24,200	45,900	9,010	30,600
2.....	47,800	35,000	11,300	23,900	19,600	5,360	4,900	980	19,000	117,000	12,200	26,700
3.....	56,900	28,400	10,100	21,400	20,300	5,280	4,280	1,380	14,500	72,600	27,700	22,900
4.....	71,700	27,000	7,840	19,600	22,100	5,150	3,460	1,523	9,590	45,900	29,000	20,200
5.....	57,300	24,500	6,280	15,200	17,600	4,780	2,250	1,450	7,280	35,300	27,700	17,900
6.....	44,100	20,200	5,720	30,900	15,500	4,900	1,740	2,440	19,600	29,000	25,700	16,000
7.....	38,100	16,300	5,640	45,000	13,700	4,900	1,590	3,140	28,200	27,700	23,500	14,500
8.....	28,600	12,900	4,550	47,200	11,100	4,780	1,590	3,240	24,500	37,000	21,700	13,000
9.....	25,700	12,700	3,850	45,100	10,000	4,780	1,520	2,730	30,600	31,900	19,300	13,000
10.....	22,000	12,400	3,480	41,900	8,900	4,400	1,380	2,070	38,800	26,700	17,600	15,000
11.....	19,000	13,000	5,590	29,800	8,530	4,650	1,520	1,980	28,500	21,700	16,500	23,500
12.....	30,100	10,400	7,840	27,300	8,460	5,280	1,520	1,740	20,200	17,900	21,400	32,300
13.....	63,200	10,400	10,300	25,000	8,280	7,440	1,490	1,520	15,900	15,200	22,000	43,000
14.....	85,100	11,300	20,400	20,400	8,040	9,010	1,490	1,320	13,000	13,400	22,000	53,400
15.....	120,000	31,600	28,300	30,000	7,440	8,460	1,350	1,080	55,100	14,000	20,500	61,200
16.....	93,100	37,000	26,600	30,600	7,510	8,460	1,480	2,630	70,800	13,000	18,800	61,400
17.....	62,300	33,600	24,600	30,600	7,280	7,770	1,480	4,040	51,100	11,800	17,900	53,800
18.....	47,700	43,500	20,700	26,100	5,940	6,380	1,450	4,650	39,600	36,700	22,300	44,400
19.....	35,800	67,800	21,900	25,500	6,870	5,670	1,450	4,160	26,400	46,200	67,800	34,300
20.....	27,800	57,600	19,700	23,200	6,450	4,900	1,280	3,140	17,100	35,300	50,300	25,500
21.....	23,800	42,100	20,700	40,600	6,660	3,920	1,380	2,830	13,400	27,000	40,500	21,100
22.....	19,000	31,600	20,800	37,200	6,510	3,240	1,380	2,440	10,800	21,400	35,000	22,300
23.....	17,900	24,800	30,900	38,800	6,390	2,540	1,380	1,980	9,200	16,500	29,600	22,900
24.....	16,300	19,600	25,700	34,400	6,280	2,530	1,450	1,900	7,770	15,200	24,500	26,400
25.....	12,700	18,500	23,900	29,600	5,940	4,900	1,260	1,900	6,660	13,400	19,300	25,100
26.....	11,300	17,400	21,700	24,000	6,110	5,670	1,380	5,150	6,080	12,500	19,000	22,300
27.....	12,700	20,200	26,400	20,500	6,000	6,220	1,320	4,650	5,940	11,300	20,200	22,300
28.....	49,600	15,700	37,400	17,900	5,940	6,660	1,260	9,590	7,600	10,000	22,300	24,200
29.....	89,500	.....	45,500	16,200	5,800	6,660	1,260	30,300	15,700	9,200	24,200	23,700
30.....	72,600	.....	38,500	16,600	5,410	6,220	1,080	67,400	21,700	7,940	36,000	19,300
31.....	56,900	.....	34,000	.....	5,540	.....	1,140	34,600	.....	7,770	.....	34,600

NOTE.—Daily discharge determined from a rating curve well defined between 980 and 28,300 second-feet (gage heights 1.5 and 8.5 feet) and fairly well defined throughout the remainder of the table covering the range of stage during 1911.

Monthly discharge of Allegheny River at Kittanning, Pa., for 1911.

[Drainage area, 9,010 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	120,000	11,300	45,400	5.04	5.81	B.
February.....	67,800	10,400	26,300	2.92	3.04	B.
March.....	45,500	3,480	18,900	2.10	2.42	A.
April.....	47,200	15,200	28,800	3.20	3.57	B.
May.....	22,100	5,410	9,620	1.07	1.23	A.
June.....	9,010	2,540	5,550	.616	.69	A.
July.....	5,940	1,080	1,850	.205	.24	A.
August.....	67,400	980	6,740	.748	.86	A.
September.....	70,800	5,940	22,000	2.44	2.72	A.
October.....	117,000	7,770	27,300	3.03	3.49	B.
November.....	67,800	9,010	25,500	2.83	3.16	B.
December.....	61,400	13,000	28,500	3.16	3.64	B.
The year.....	120,000	980	20,500	2.28	30.87	

KISKIMINITAS RIVER AT AVONMORE, PA.

Location.—At the highway bridge near Avonmore station on the Pennsylvania Railroad, about 4 miles below the mouth of Blacklegs Creek, about 1 mile above the mouth of Long Run, and about 5 miles below the junction of Conemaugh River with Loyalhanna Creek to form the Kiskiminitas.

Records available.—June 11, 1907, to December 31, 1911.

Drainage area.—1,720 square miles. (Revised since last report.)

Gage.—Chain gage attached to bridge; datum unchanged since established.

Channel.—Probably permanent.

Discharge measurements.—Made from the downstream side of the bridge.

Floods.—The flood of March 19, 1908, reached a height of 30.8 feet on the gage, and its discharge was estimated at 80,500 second-feet, or about 47 second-feet per square mile from a drainage area of 1,720 square miles.

Winter flow.—Ice may affect the relation of gage height to discharge for short periods during December, January, and February.

Accuracy.—The gage was inspected and checked on June 29, 1911, and on February 1, 1912 (prior to the preparation of this report). No discharge measurements were made during 1911. The last discharge measurement was made March 2, 1910, and the accuracy of the daily and monthly discharge tables depends upon the permanency of conditions of flow since that date.

Cooperation.—This station is now maintained by the Water Supply Commission of Pennsylvania, which has furnished the gage heights for 1911.

Daily gage height, in feet, of Kiskiminitas River at Avonmore, Pa., for 1911.

[Ralph Fickes, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	7.96	8.39	6.44	5.94	5.51	3.33	3.10	1.92	7.25	7.60	3.90	4.52
2.....	8.62	7.51	6.04	5.59	6.05	3.00	2.82	1.90	5.40	11.05	3.85	4.50
3.....	10.13	6.69	5.64	5.71	5.78	2.87	2.68	2.12	3.74	8.75	3.65	4.45
4.....	9.26	6.46	5.39	5.11	5.11	2.74	2.55	2.08	3.65	7.68	3.48	4.35
5.....	7.21	6.51	5.03	8.59	4.74	2.73	2.42	2.09	3.29	7.00	3.35	4.02
6.....	9.51	5.01	5.21	614.02	4.44	5.60	2.38	2.42	3.65	5.95	3.41	3.84
7.....	10.01	5.26	5.47	12.37	4.29	5.54	2.38	2.28	4.44	8.95	4.82	3.75
8.....	6.16	3.79	4.87	10.49	4.05	4.50	2.72	2.05	3.82	9.08	5.80	3.95
9.....	5.86	5.21	5.07	9.64	3.83	3.99	2.60	1.95	4.12	8.01	4.90	4.25
10.....	5.96	4.96	5.09	9.41	3.89	3.54	2.62	1.90	6.10	6.10	4.55	5.88
11.....	7.99	4.47	6.74	8.34	3.99	3.21	2.34	1.85	5.30	6.14	4.32	5.72
12.....	7.01	4.26	6.57	7.41	3.77	3.61	2.50	1.85	5.30	6.08	5.55	5.50
13.....	12.74	4.76	7.27	6.74	3.54	4.25	2.60	1.85	4.30	5.60	5.60	5.72
14.....	14.81	5.01	7.31	6.61	3.37	4.01	2.85	1.82	3.71	5.02	5.25	5.62
15.....	15.76	8.76	6.58	8.37	3.24	3.69	2.90	1.85	14.05	8.40	5.05	7.61
16.....	11.86	8.31	6.19	7.64	3.15	3.34	2.45	1.90	15.80	8.38	5.02	10.15
17.....	8.95	7.13	5.49	6.91	3.09	3.13	2.30	1.90	10.55	7.40	4.72	10.50
18.....	7.39	7.81	5.99	6.34	3.01	3.14	2.22	2.05	8.20	10.48	5.90	8.62
19.....	6.55	9.15	6.11	5.84	2.87	3.19	2.14	2.00	6.70	9.20	8.15	7.65
20.....	5.91	8.26	7.59	6.51	2.84	3.44	2.12	1.90	6.20	7.56	7.25	6.32
21.....	5.63	7.31	7.67	7.61	2.99	3.04	2.32	1.92	5.38	6.62	6.45	5.94
22.....	6.11	6.31	6.51	7.31	2.87	2.74	2.30	1.88	6.62	6.01	5.65	6.04
23.....	5.51	5.93	6.44	8.50	2.69	2.65	2.45	1.88	6.18	5.78	5.30	6.98
24.....	4.66	5.66	6.19	8.13	2.59	2.47	2.30	1.90	4.98	5.72	5.45	7.22
25.....	4.26	5.47	5.59	7.29	3.09	2.47	2.32	1.98	4.48	5.28	5.98	6.35
26.....	4.73	6.19	5.21	6.61	2.94	4.27	2.30	2.32	4.35	4.58	5.45	6.46
27.....	5.99	7.23	5.49	5.99	2.69	4.39	2.22	2.55	4.34	4.34	5.26	8.42
28.....	8.59	7.46	6.27	5.51	2.64	4.14	2.10	2.80	5.80	4.22	5.10	8.92
29.....	8.71	.....	5.64	5.23	2.54	4.42	2.05	4.15	6.05	4.05	5.18	7.18
30.....	13.69	.....	5.67	5.44	3.44	3.62	1.98	8.24	9.28	3.90	5.05	6.86
31.....	10.86	.....	6.14	.....	3.51	.....	1.95	6.68	.....	3.85	.....	8.02

^a Maximum 11.35 feet at 11 a. m.; discharge 13,100 second-feet.

^b Maximum 14.09 feet at 8.30 a. m.; discharge 20,500 second-feet.

^c Maximum 15.91 feet at 9 a. m.; discharge 25,800 second-feet.

^d Maximum 11.00 feet at 9 a. m.; discharge 12,200 second-feet.

NOTE.—No ice reported. Relation of gage height to discharge probably not affected by ice.

Daily discharge, in second-feet, of Kiskiminitas River at Avonmore, Pa., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6,440	7,130	4,260	3,610	3,070	921	765	170	5,350	5,870	1,360	1,940
2	7,520	5,740	3,740	3,170	3,760	700	592	163	2,940	12,400	1,320	1,920
3	10,300	4,590	3,230	3,310	3,400	622	514	248	1,230	7,740	1,160	1,870
4	8,650	4,290	2,930	3,570	2,590	547	445	232	1,160	5,990	1,030	1,770
5	5,290	4,350	2,500	7,470	2,170	542	382	236	893	5,000	935	1,470
6	9,110	3,570	2,710	20,300	1,860	3,180	363	382	1,160	3,620	977	1,310
7	10,100	2,770	3,020	15,700	1,710	3,110	363	317	1,860	8,090	2,260	1,240
8	3,900	3,420	2,320	11,100	1,500	2,010	536	220	1,300	8,320	3,430	1,400
9	3,510	2,710	2,540	9,360	1,390	1,440	470	182	1,560	6,520	2,350	1,680
10	3,250	2,420	2,570	8,920	1,350	1,070	481	163	3,820	3,820	1,970	3,530
11	6,480	1,890	4,650	7,050	1,440	837	344	146	2,820	3,870	1,740	3,330
12	5,010	1,680	4,430	5,580	1,260	1,130	420	146	2,820	3,790	3,120	3,060
13	16,700	2,200	5,380	4,650	1,070	1,680	470	146	1,720	3,180	3,180	3,330
14	22,500	2,470	5,440	4,480	949	1,460	610	135	1,210	2,480	2,760	3,200
15	25,300	7,760	4,440	7,100	858	1,190	640	146	20,400	7,150	2,520	5,880
16	14,400	7,000	3,940	5,930	798	928	396	163	25,400	7,120	2,480	10,400
17	8,090	5,180	3,050	4,870	758	784	326	163	11,200	5,570	2,150	11,100
18	5,560	6,200	3,680	4,130	706	791	291	220	6,820	11,000	3,560	7,520
19	4,400	8,450	3,830	3,480	622	824	257	200	4,600	8,540	6,740	5,940
20	3,570	6,920	5,860	4,350	604	998	248	163	3,950	5,810	3,560	4,370
21	3,220	5,440	5,980	5,880	694	726	335	170	2,920	4,500	4,280	3,610
22	3,830	4,090	4,350	5,440	622	547	326	156	4,500	3,700	3,240	3,740
23	3,070	3,600	4,260	7,320	520	445	396	156	3,920	3,400	2,820	4,970
24	2,090	3,250	3,940	6,710	465	406	326	163	2,440	4,330	3,000	5,310
25	1,680	3,170	3,170	5,410	758	406	335	193	1,900	2,800	3,660	4,140
26	2,160	3,940	2,710	4,480	664	1,690	326	335	1,770	2,000	3,000	4,290
27	3,680	5,320	3,050	3,680	520	1,810	291	445	1,760	1,760	2,770	7,180
28	7,470	5,660	4,040	3,070	492	1,580	240	580	3,430	1,650	2,580	8,040
29	7,680	3,230	2,740	440	1,840	220	1,580	3,760	1,500	2,680	5,250	
30	19,300	3,260	2,990	998	1,140	193	6,880	8,680	1,360	2,520	4,810	
31	11,900	3,870		1,050			182	4,570		1,320		6,530

NOTE.—Daily discharge determined by means of a rating curve well defined throughout the range of stage during 1911. See footnotes to table of daily gage heights for crest discharges.

Monthly discharge of Kiskiminitas River at Avonmore, Pa., for 1911.

[Drainage area, 1,720 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	25,300	1,680	7,940	4.62	5.33	B.
February	8,450	1,680	4,470	2.60	2.71	A.
March	5,980	2,320	3,750	2.18	2.51	A.
April	20,300	2,740	6,200	3.60	4.02	A.
May	3,760	440	1,260	.733	.85	A.
June	3,180	406	1,180	.686	.77	A.
July	765	182	390	.227	.26	A.
August	6,880	135	618	.359	.41	A.
September	25,400	893	4,580	2.66	2.97	A.
October	12,400	1,320	4,940	2.87	3.31	A.
November	6,740	935	2,700	1.57	1.75	A.
December	11,100	1,240	4,330	2.52	2.91	A.
The year	25,400	135	3,520	2.05	27.80	

BLACKLICK CREEK AT BLACKLICK, PA.

Location.—At highway bridge about one-fourth mile from the railroad station at Blacklick, Pa., about 1 mile below the junction of Blacklick and Two Lick creeks and about 6 miles above the junction of Blacklick Creek with Conemaugh River.

Records available.—August 16, 1904, to July 15, 1906; January 8, 1907, to December 31, 1911.

Drainage area.—386 square miles. (Revised since last report.)

Gage.—Chain gage attached to bridge; datum unchanged since established.

Channel.—Fairly permanent.

Discharge measurements.—At high and medium stages made from the upstream side of the highway bridge; at low stages made by wading at a section just above the bridge. Extreme high-water measurements are made from the coal tippie one-fourth mile above the bridge, but no measurements have been made from it in the last few years.

Winter flow.—Ice may affect the relation of gage height to discharge for short periods during December, January, and February.

Accuracy.—No discharge measurements were made during 1911. On June 30, 1911, the gage was checked. On February 1, 1912 (previous to the preparation of this report), the gage was checked and a discharge measurement made. This discharge measurement checks the discharge rating table used for 1911. The records are believed to be accurate and reliable.

Cooperation.—Since January 8, 1907, station has been maintained by the Water Supply Commission of Pennsylvania, which supplied the gage heights for 1911.

Changes in rating curves necessitated by the reconstruction of the highway bridge have been discussed in Water-Supply Paper 263.

Daily gage height, in feet, of Blacklick Creek at Blacklick, Pa., for 1911.

[D. J. Walling, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	5.23	4.58	3.74	3.74	3.52	2.34	2.26	1.97	3.08	4.51	3.10	3.19
2.....	5.30	4.30	3.80	3.70	3.76	2.34	2.12	1.97	2.77	7.35	3.08	3.35
3.....	5.54	4.00	3.60	3.72	3.54	2.36	2.10	1.99	2.58	5.43	2.91	3.29
4.....	4.76	4.33	3.56	3.75	3.32	2.30	2.14	2.17	2.44	4.73	2.82	3.17
5.....	4.15	4.15	3.28	4.92	3.17	3.01	2.11	2.18	2.40	4.08	2.76	2.99
6.....	4.01	3.74	3.45	5.98	3.10	3.18	2.10	2.43	3.08	3.72	2.84	2.90
7.....	3.88	3.69	3.44	6.02	3.03	2.76	2.10	2.23	3.09	6.65	3.82	3.04
8.....	3.66	3.62	3.36	5.26	2.98	2.64	2.26	2.15	2.74	5.11	3.46	3.03
9.....	3.93	3.65	3.28	5.00	2.92	2.48	2.24	2.06	2.74	4.87	3.24	3.33
10.....	3.56	3.44	3.62	4.86	2.90	2.40	2.16	2.03	3.62	3.94	3.18	4.15
11.....	3.74	3.25	3.80	4.38	2.87	2.36	2.18	2.01	3.04	3.86	3.16	3.79
12.....	5.24	3.22	3.70	4.12	2.81	2.89	2.17	1.99	2.76	3.75	3.80	3.79
13.....	6.49	3.38	4.17	4.02	2.74	3.64	2.14	1.99	2.57	3.49	3.97	3.99
14.....	8.97	3.40	3.90	4.12	2.67	3.16	2.12	1.99	2.49	3.31	3.66	3.85
15.....	8.31	5.30	3.72	4.68	2.63	2.78	2.10	1.97	7.86	5.02	3.60	5.22
16.....	6.04	4.60	3.44	4.32	2.58	2.62	2.08	1.95	6.53	4.61	3.65	6.20
17.....	4.83	4.29	3.54	4.07	2.56	2.52	2.04	2.09	4.70	4.14	3.44	5.58
18.....	4.20	5.12	3.63	3.82	2.56	2.46	2.04	2.21	4.00	5.87	5.13	4.77
19.....	4.10	5.20	3.66	3.68	2.52	2.45	2.03	2.11	3.72	4.87	4.81	4.33
20.....	3.84	4.66	4.22	4.76	2.56	2.40	2.00	2.03	3.53	4.35	4.30	3.95
21.....	3.78	4.20	3.94	4.58	2.55	2.34	2.10	2.00	3.22	3.97	4.02	3.83
22.....	3.96	3.78	3.83	4.59	2.50	2.28	2.08	1.99	4.60	3.73	3.80	3.81
23.....	3.64	3.78	4.03	5.20	2.44	2.22	2.09	2.05	3.66	3.79	3.63	4.73
24.....	3.26	3.62	3.68	4.76	2.58	2.18	2.12	2.06	3.82	3.58	3.82	4.25
25.....	3.40	3.58	3.54	4.35	2.57	2.28	2.20	2.12	3.08	3.35	3.78	4.06
26.....	3.58	3.90	3.50	4.04	2.44	2.73	2.17	2.25	3.06	3.21	3.56	4.01
27.....	3.96	4.43	3.78	3.82	2.40	2.75	2.12	2.43	3.10	3.13	3.51	5.13
28.....	6.07	4.10	3.80	3.60	2.34	2.54	2.10	3.10	4.42	3.10	3.49	4.42
29.....	5.06	-----	3.61	3.46	2.30	2.46	2.08	3.26	5.00	3.00	3.59	3.93
30.....	6.50	-----	3.79	3.55	2.34	2.34	2.04	3.86	5.25	2.95	3.46	3.87
31.....	5.06	-----	3.88	-----	2.40	-----	2.00	3.19	-----	3.03	-----	4.82

NOTE.—No ice reported. Relation of gage height to discharge probably not affected by ice during 1911.

Daily discharge, in second-feet, of Blacklick Creek at Blacklick, Pa., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	2,230	1,500	760	760	604	94	73	17	356	1,430	365	410
2.....	2,320	1,230	805	730	775	94	42	17	230	5,880	356	498
3.....	2,640	965	660	745	618	99	38	20	166	2,490	284	464
4.....	1,690	1,260	632	768	481	83	46	53	122	1,650	248	400
5.....	1,100	1,100	459	1,860	400	324	40	55	110	1,030	226	316
6.....	974	760	558	3,300	365	405	38	119	356	745	256	316
7.....	869	723	551	3,360	334	226	38	66	360	4,480	821	338
8.....	702	674	503	2,270	312	185	73	48	219	2,080	564	334
9.....	909	695	459	1,950	288	134	69	31	219	1,290	437	486
10.....	632	551	674	1,800	280	110	51	26	674	917	405	1,100
11.....	760	442	805	1,300	268	99	55	23	338	853	395	798
12.....	2,240	426	730	1,070	244	276	53	20	226	768	805	798
13.....	4,180	514	1,110	982	219	688	46	20	162	584	941	957
14.....	9,500	525	885	1,070	195	395	42	20	137	476	702	845
15.....	7,980	2,320	745	1,600	182	233	38	17	6,980	1,970	660	2,220
16.....	3,400	1,520	551	1,250	166	179	35	14	4,260	1,530	695	3,670
17.....	1,760	1,220	618	1,020	159	146	28	36	1,620	1,090	551	2,690
18.....	1,140	2,090	681	821	159	128	28	61	965	3,120	2,110	1,700
19.....	1,050	2,190	702	716	146	125	26	40	745	1,810	1,740	1,260
20.....	837	1,580	1,160	1,690	159	110	21	26	611	1,280	1,230	925
21.....	790	1,140	917	1,500	156	94	38	21	426	941	982	829
22.....	933	790	829	1,510	140	78	35	20	1,520	752	805	813
23.....	688	790	990	2,190	122	64	36	30	702	798	681	1,650
24.....	448	674	716	1,690	166	55	42	31	481	646	821	1,180
25.....	525	646	618	1,280	162	78	59	42	356	498	790	1,010
26.....	646	885	590	999	122	216	53	71	347	420	632	974
27.....	933	1,350	790	821	110	222	42	119	365	380	597	2,110
28.....	3,450	1,050	805	660	94	153	38	365	1,340	365	584	1,340
29.....	2,020	.....	667	564	83	128	35	448	1,950	320	653	909
30.....	4,200	.....	798	625	94	94	28	853	2,260	300	564	861
31.....	2,020	.....	869	.....	110	.....	21	410	.....	334	.....	1,750

NOTE.—Daily discharge determined from a rating curve well defined below 1,320 second-feet (gage height 4.4 feet), poorly defined between 1,420 and 7,290 second-feet (gage heights 4.5 and 8 feet), and is an extension above 7,290 second-feet (gage height 8 feet).

Monthly discharge of Blacklick Creek at Blacklick, Pa., for 1911.

[Drainage area, 386 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	9,500	448	2,050	5.31	6.12	B.
February.....	2,320	426	1,060	2.75	2.86	A.
March.....	1,160	459	730	1.89	2.18	A.
April.....	3,360	564	1,360	3.52	3.93	A.
May.....	775	83	249	.645	.74	A.
June.....	688	55	177	.459	.51	A.
July.....	73	21	42.2	.109	.13	A.
August.....	853	14	101	.262	.50	A.
September.....	6,980	110	953	2.47	2.76	A.
October.....	5,880	360	1,350	3.45	3.98	A.
November.....	2,110	226	697	1.81	2.02	A.
December.....	3,670	316	1,100	2.85	3.29	A.
The year.....	9,500	14	819	2.12	28.82	

MONONGAHELA RIVER BASIN.

TYGART RIVER AT BELINGTON, W. VA.

Location.—At highway bridge at Belington, W. Va., one-fourth mile above the mouth of Mill Creek.

Records available.—June 5, 1907, to December 31, 1911.

Drainage area.—390 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Permanent.

Discharge measurements.—Made from upstream side of the bridge.

Floods.—The flood of January 30, 1911, reached a height of about 15.3 feet by the present gage datum.

Point of zero flow.—A determination by leveling, August 22, 1910, indicates that there would be no flow past the gage if the river stage were to fall to about 1.6 feet, referred to the gage datum.

Winter flow.—Ice may affect the relation of gage height to discharge for two or three weeks at a time during December, January, and February.

Discharge measurements of Tygart River at Belington, W. Va., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Jan. 17	C. T. Bailey.....	<i>Feet.</i> 6.38	<i>Sec.-feet.</i> 2,000
Feb. 1	.....do.....	6.43	2,080
Nov. 1	R. Perwien.....	3.14	227

Daily gage height, in feet, of Tygart River at Belington, W. Va., for 1911.

[S. A. Campbell, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	7.0	6.7	5.0	5.6	3.8	2.8	3.0	2.1	7.3	4.3	3.1	4.17
2.....	7.2	6.3	4.7	5.4	3.7	2.7	2.9	2.1	4.7	5.5	3.03	3.95
3.....	7.6	6.0	4.1	5.2	3.6	2.6	2.8	2.1	4.1	9.9	2.90	3.84
4.....	7.8	5.3	4.0	6.7	3.6	2.5	2.6	2.1	3.4	6.2	2.97	3.72
5.....	6.0	5.1	4.0	10.1	3.5	2.5	2.5	2.3	3.1	4.9	2.91	3.56
6.....	4.8	4.5	3.9	8.2	3.4	2.4	2.8	3.1	3.3	4.2	2.86	3.45
7.....	4.5	4.5	7.8	6.4	3.4	2.5	2.6	2.7	2.9	4.1	8.21	3.40
8.....	4.2	4.4	6.3	6.4	3.3	4.2	3.6	2.5	2.9	12.3	6.50	3.40
9.....	3.8	4.4	6.0	6.6	3.3	3.6	3.4	2.5	2.9	8.4	5.00	3.40
10.....	3.9	4.9	6.0	7.2	3.3	3.2	3.3	2.6	2.9	5.2	4.35	3.43
11.....	3.7	4.5	6.3	5.7	3.2	3.2	3.0	2.5	3.0	5.4	3.93	3.47
12.....	4.6	4.2	6.3	5.2	3.1	3.8	4.0	2.4	4.4	7.0	3.82	3.39
13.....	7.0	4.0	6.6	4.4	3.0	3.0	3.5	2.3	5.0	5.7	3.70	3.45
14.....	10.8	3.8	6.7	4.1	3.0	3.5	3.0	2.2	4.2	4.9	3.84	3.47
15.....	7.2	3.8	6.6	6.4	2.9	3.2	2.8	2.5	4.2	6.2	3.80	3.50
16.....	9.0	3.7	6.1	6.0	2.8	3.0	2.6	2.5	12.1	7.0	3.90	4.26
17.....	7.4	3.5	5.2	5.4	2.8	2.9	2.6	2.5	11.7	5.6	3.97	4.84
18.....	5.2	3.4	4.9	4.8	2.8	5.8	2.5	2.3	6.1	9.0	4.21	5.16
19.....	4.6	3.4	5.2	4.4	2.8	5.3	2.4	2.2	4.6	9.4	4.62	4.50
20.....	4.2	4.1	6.6	4.7	3.3	3.7	2.3	2.2	4.1	6.1	5.44	4.09
21.....	4.1	4.8	6.5	7.0	3.2	3.6	2.4	2.2	3.7	5.0	4.63	3.98
22.....	7.2	4.4	6.3	7.2	3.0	3.3	2.4	2.0	4.2	4.7	4.21	3.82
23.....	6.9	4.0	5.0	6.8	2.8	3.0	2.4	2.0	4.7	4.2	3.97	3.95
24.....	5.5	3.9	4.9	6.4	2.8	2.8	2.4	2.0	4.2	4.3	3.76	4.28
25.....	5.0	4.0	4.6	5.8	2.6	4.2	2.3	2.0	3.6	4.0	4.05	5.35
26.....	4.9	4.4	4.4	5.1	2.6	3.8	2.2	2.0	3.5	3.3	4.13	4.99
27.....	10.2	4.8	4.0	4.6	2.6	3.8	2.2	1.9	3.2	3.5	4.20	7.54
28.....	8.8	5.4	4.1	4.2	2.9	3.6	2.3	2.5	4.6	3.6	4.19	6.65
29.....	8.7	-----	4.0	4.0	2.7	3.2	2.1	2.9	4.2	3.4	4.40	5.40
30.....	13.7	-----	4.5	3.9	2.7	3.1	2.1	4.0	4.4	3.1	4.40	4.79
31.....	14.7	-----	6.4	-----	3.0	-----	2.2	10.2	-----	3.2	-----	6.32

NOTE.—No ice reported by observer. Relation of gage height to discharge probably not affected by ice during 1911.

Daily discharge, in second-feet, of Tygart River at Belington, W. Va., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	2,540	2,300	1,130	1,500	498	132	183	26	2,790	745	213	679
2.....	2,700	2,000	959	1,370	452	110	156	26	959	1,440	192	571
3.....	3,050	1,780	644	1,250	407	90	132	26	644	5,390	156	517
4.....	3,230	1,310	595	2,300	407	73	90	26	321	1,920	175	461
5.....	1,780	1,190	595	5,610	363	73	73	47	213	1,070	159	389
6.....	1,020	850	546	3,620	321	59	132	213	282	694	146	342
7.....	850	850	3,230	2,070	321	73	90	110	156	644	3,630	321
8.....	694	797	2,000	2,070	282	694	407	73	156	8,190	2,150	321
9.....	498	797	1,780	2,230	282	407	321	73	156	3,810	1,130	321
10.....	546	1,070	1,780	2,700	282	246	282	90	156	1,250	771	334
11.....	452	850	2,000	1,560	246	246	183	73	183	1,370	561	350
12.....	904	694	2,000	1,250	213	498	595	59	797	2,540	508	317
13.....	2,540	595	2,230	797	183	183	363	47	1,130	1,560	452	342
14.....	6,410	498	2,300	644	183	363	183	36	694	1,070	517	350
15.....	2,700	498	2,230	2,070	156	246	132	73	694	1,920	498	363
16.....	4,410	452	1,850	1,780	132	183	90	73	7,950	2,540	546	725
17.....	2,870	363	1,250	1,370	132	156	90	73	7,470	1,500	546	1,040
18.....	1,250	321	1,070	1,020	132	1,630	73	47	1,850	4,410	699	1,220
19.....	904	321	1,250	797	132	1,310	59	36	904	4,840	915	850
20.....	694	644	2,230	959	282	452	47	36	644	1,850	1,400	639
21.....	644	1,020	2,150	2,540	246	407	59	36	452	1,130	920	585
22.....	2,700	797	2,000	2,700	183	282	59	18	694	959	699	508
23.....	2,460	595	1,130	2,380	132	183	59	18	959	694	580	571
24.....	1,440	546	1,070	2,070	132	132	59	18	694	745	480	735
25.....	1,130	595	904	1,630	90	694	47	18	407	595	620	1,340
26.....	1,070	797	797	1,190	90	498	36	18	363	282	659	1,120
27.....	5,720	1,020	595	904	90	498	36	12	246	363	694	3,000
28.....	4,210	1,370	644	694	156	407	47	73	904	407	689	2,260
29.....	4,110	.....	595	595	110	246	26	156	694	321	797	1,370
30.....	9,920	.....	850	546	110	213	26	595	797	213	797	1,010
31.....	11,200	.....	2,070	.....	183	.....	36	5,720	.....	246	.....	2,010

NOTE.—Daily discharge determined from a discharge rating curve well defined between 73 and 2,540 second-feet (gage heights, 2.5 and 7.0 feet).

Monthly discharge of Tygart River at Belington, W. Va., for 1911.

[Drainage area, 390 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	11,200	452	2,730	7.00	8.07	B.
February.....	2,300	321	890	2.28	2.37	A.
March.....	3,230	546	1,430	3.67	4.23	A.
April.....	5,610	546	1,740	4.46	4.98	A.
May.....	498	90	223	.572	.66	A.
June.....	1,630	59	359	.921	1.03	A.
July.....	595	26	135	.346	.40	A.
August.....	5,720	12	256	.656	.76	B.
September.....	7,950	156	1,150	2.95	3.29	B.
October.....	8,190	213	1,760	4.51	5.20	B.
November.....	3,630	146	744	1.91	2.13	A.
December.....	3,000	317	805	2.06	2.38	A.
The year.....	11,200	12	1,020	2.62	35.50	

TYGART RIVER AT FETTERMAN, W. VA.

Location.—At highway bridge at Fetterman, W. Va., three-fourths mile above mouth of Otter Creek.

Records available.—June 3, 1907, to December 31, 1911.

Drainage area.—1,340 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Permanent; broken by one pier. Current low at low stages.

Discharge measurements.—Made from downstream side of bridge.

Floods.—No records of floods previous to installation of gage are available. Maximum gage height since installation of gage was 21.5 feet January 30, 1911.

Point of zero flow.—A determination by leveling, August 20, 1910, indicates that there would be no flow past the gage if the river stage were to fall to 1.65 feet, ± 0.1 foot, referred to the gage datum.

Winter flow.—Ice may affect the relation of gage height to discharge for two or three weeks at a time during December, January, and February.

Discharge measurements of Tygart River at Fetterman, W. Va., in 1911.

Date.	Hydrographer.	Gage height.	Dis-charge.	Date.	Hydrographer.	Gage height.	Dis-charge.
Jan. 16	C. T. Bailey.....	<i>Fed.</i> 10.92	<i>Sec.-ft.</i> 12,600	Jan. 31	C. T. Bailey.....	<i>Fed.</i> 15.39	<i>Sec.-ft.</i> 22,900
16	.....do.....	10.70	12,400	Oct. 30	R. Perwien.....	4.37	866
18	.....do.....	6.56	4,620				

Daily gage height, in feet, of Tygart River at Fetterman, W. Va., for 1911.

[Joseph Gerkin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	7.1	9.5	5.6	6.65	4.85	3.5	3.85	3.0	9.25	6.05	4.20	5.36
2.....	7.35	7.0	5.35	6.4	4.75	3.5	3.75	3.0	7.0	9.05	4.05	5.15
3.....	8.55	6.5	5.25	6.1	4.55	3.5	3.7	3.0	5.0	11.65	4.00	4.96
4.....	8.75	6.25	5.1	7.85	4.5	3.5	3.65	3.0	4.8	7.60	3.95	4.85
5.....	7.2	5.95	4.85	11.6	4.35	3.45	3.5	3.0	4.35	6.55	3.90	4.70
6.....	6.15	5.45	4.75	9.75	4.3	3.4	3.45	2.95	4.15	5.95	4.00	4.56
7.....	5.4	5.5	6.75	8.05	4.3	4.2	3.5	2.9	4.1	9.45	6.55	4.50
8.....	5.15	5.5	7.6	7.7	4.25	4.05	3.9	3.35	4.05	14.70	7.05	4.40
9.....	5.4	5.7	7.45	8.75	4.15	3.95	3.6	3.5	4.0	10.30	5.85	4.40
10.....	4.85	6.0	7.1	8.8	4.1	4.15	3.95	3.4	4.0	8.00	5.32	4.36
11.....	4.7	5.7	6.85	7.8	4.05	3.9	3.9	3.35	4.25	7.40	5.10	4.44
12.....	4.85	5.35	6.65	6.65	4.0	4.05	3.75	3.25	4.7	7.80	4.75	4.50
13.....	11.5	5.15	6.3	5.65	3.9	3.95	3.9	3.2	5.8	6.90	5.01	4.51
14.....	14.8	4.95	6.3	5.45	3.9	4.35	3.95	3.2	5.4	5.85	4.98	4.70
15.....	10.5	4.9	6.5	7.65	3.85	4.65	3.75	3.2	5.95	6.05	4.90	5.40
16.....	10.75	4.85	6.3	7.7	3.75	4.6	3.55	3.2	14.55	7.05	4.80	7.40
17.....	8.15	4.55	5.85	6.55	3.65	4.3	3.45	3.2	15.05	7.70	4.80	8.18
18.....	6.45	4.45	5.65	5.85	3.55	5.5	3.4	3.15	9.2	11.10	6.00	6.92
19.....	5.55	4.3	6.3	5.55	3.5	6.5	3.35	3.1	6.5	10.70	6.58	6.02
20.....	5.5	5.5	7.4	5.65	3.45	5.9	3.3	3.1	5.5	7.85	6.28	5.32
21.....	5.2	6.1	7.2	6.8	3.75	5.5	3.25	3.05	5.2	6.25	5.71	5.15
22.....	6.15	5.85	6.75	7.4	3.95	4.75	3.2	3.0	5.9	5.45	5.31	5.02
23.....	7.65	5.25	6.2	7.85	3.85	4.25	3.2	3.0	6.0	5.10	5.02	5.20
24.....	6.95	5.2	5.7	7.5	3.65	4.15	3.2	2.95	5.25	4.95	4.91	5.78
25.....	6.1	5.2	5.3	6.9	3.55	4.1	3.3	2.9	4.95	5.05	5.26	6.26
26.....	6.15	5.25	5.15	6.15	3.5	4.75	3.3	3.0	4.85	4.90	5.48	6.18
27.....	11.4	5.4	5.05	5.7	3.5	5.0	3.25	3.15	4.7	4.75	5.45	9.98
28.....	10.7	5.65	4.95	5.3	3.6	4.95	3.15	3.35	4.55	4.60	5.40	8.46
29.....	10.3	.....	4.95	5.1	3.6	4.5	3.05	5.15	5.35	4.55	5.48	7.41
30.....	20.35	.....	5.2	4.9	3.55	4.1	3.0	6.65	5.3	4.35	5.52	6.16
31.....	15.95	.....	6.4	.....	3.5	.....	3.0	10.1	.....	4.30	.....	6.68

NOTE.—No ice reported by observer. Relation of gage height to discharge probably not affected by ice during 1911.

Daily discharge, in second-feet, of Tygart River at Fetterman, W. Va., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	5,550	10,000	2,850	4,730	1,570	218	418	63	9,580	3,650	699	2,440
2.....	6,010	5,370	2,420	4,280	1,400	218	354	63	5,370	9,200	566	2,080
3.....	8,260	4,460	2,250	3,740	1,110	218	323	63	1,820	14,300	525	1,750
4.....	8,630	4,010	1,990	6,940	1,040	218	296	63	1,480	6,480	488	1,570
5.....	5,740	3,470	1,570	14,200	859	195	218	63	859	4,550	451	1,320
6.....	3,830	2,590	1,400	10,500	802	172	195	56	653	3,470	525	1,120
7.....	2,510	2,680	4,910	7,310	802	699	218	50	607	9,960	4,550	1,040
8.....	2,080	2,680	6,480	6,660	750	566	451	153	566	21,200	5,460	916
9.....	2,510	3,030	6,200	8,630	653	488	268	218	525	11,600	3,200	882
10.....	1,570	3,560	5,550	8,720	607	653	488	172	525	7,220	2,370	871
11.....	1,320	3,030	5,090	6,850	566	451	451	153	750	6,110	1,990	966
12.....	1,570	2,420	4,730	4,750	525	566	354	118	1,320	6,850	1,400	1,040
13.....	14,000	2,080	4,700	2,940	451	488	451	103	3,210	5,190	1,840	1,050
14.....	21,400	1,740	4,100	2,590	451	859	488	103	2,510	3,290	1,790	1,320
15.....	12,000	1,650	4,460	6,570	418	1,250	354	103	3,470	3,650	1,650	2,510
16.....	12,400	1,570	4,100	6,660	354	1,180	243	103	20,900	5,460	1,480	6,110
17.....	7,500	1,110	3,290	4,550	296	802	195	103	22,000	6,660	1,480	7,550
18.....	4,370	978	2,940	3,290	243	2,680	172	92	9,480	13,100	3,560	5,220
19.....	2,770	802	4,100	2,770	218	4,460	153	80	4,460	12,300	4,600	3,600
20.....	2,330	2,680	6,110	2,940	195	3,380	134	80	2,680	6,940	4,060	2,370
21.....	2,160	3,740	5,740	5,000	354	2,680	118	72	2,160	4,010	3,050	2,080
22.....	3,830	3,290	4,910	6,110	488	1,400	103	63	3,380	2,590	2,350	1,850
23.....	6,570	2,250	3,920	6,940	418	750	103	63	3,860	1,990	1,850	2,160
24.....	5,280	2,160	3,030	6,290	296	653	103	56	2,250	1,740	1,670	3,170
25.....	3,740	2,160	2,330	5,190	243	607	134	50	1,740	1,900	2,270	4,020
26.....	3,830	2,250	2,080	3,830	218	1,400	134	63	1,570	1,650	2,650	3,880
27.....	13,800	2,510	1,900	3,030	218	1,820	118	92	1,320	1,400	2,590	11,000
28.....	12,300	2,940	1,740	2,330	268	1,740	92	153	1,110	1,180	2,510	8,080
29.....	11,600	.....	1,740	1,990	268	1,040	72	2,080	2,420	1,110	2,650	6,130
30.....	35,000	.....	2,160	1,650	243	607	63	4,730	2,340	859	2,710	3,840
31.....	24,200	.....	4,280	.....	218	.....	63	11,200	.....	802	.....	4,780

NOTE.—Daily discharge determined from a rating curve well defined between 63 and 24,300 second-feet (gage heights 3.0 and 16.0 feet).

Monthly discharge of Tygart River at Fetterman, W. Va., for 1911.

[Drainage area, 1,340 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	35,000	1,320	8,020	5.99	6.91	A.
February.....	10,000	802	2,900	2.16	2.25	A.
March.....	6,480	1,400	3,630	2.71	3.12	A.
April.....	14,200	1,650	5,400	4.03	4.60	A.
May.....	1,570	195	534	.399	.46	A.
June.....	4,460	172	1,080	.806	.90	A.
July.....	488	63	236	.176	.20	A.
August.....	11,200	50	859	.641	.74	A.
September.....	22,000	525	3,820	2.85	3.18	A.
October.....	21,200	802	5,820	4.34	5.00	A.
November.....	5,460	451	2,240	1.67	1.86	A.
December.....	11,000	871	3,120	2.33	2.69	A.
The year.....	35,000	50	3,140	2.34	31.81	

WEST FORK RIVER AT ENTERPRISE, W. VA.

Location.—At the highway bridge at Enterprise, W. Va., three-fourths mile above the mouth of Binghamon Creek.

Records available.—June 2, 1907, to December 31, 1911.

Drainage area.—750 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Permanent; broken by one pier; smooth, rock bottom.

Discharge measurements.—Made from downstream side of bridge.

Floods.—No record of floods previous to establishment of gage is available. Maximum gage height since recorded is 17.6 feet, January 30, 1911.

Point of zero flow.—A determination by leveling August 17, 1910, indicates that there would be no flow past the gage if the river stage were to fall to 0.1 foot, ± 0.1 foot, referred to the gage datum.

Winter flow.—Ice may affect the relation of gage height to discharge for two or three weeks at a time during December, January, and February.

Accuracy.—The gage reader stated that during the summer of 1908 the only water running in the river was pumpage from numerous coal mines along the stream; otherwise the records are good.

Discharge measurements of West Fork River at Enterprise, W. Va., in 1911.

Date.	Hydrographer.	Gage height.	Dis-charge.	Date.	Hydrographer.	Gage height.	Dis-charge.
Jan. 15	C. T. Bailey	<i>Feet.</i> 7.67	<i>Sec.-feet.</i> 4,920	Feb. 2	C. T. Bailey	<i>Feet.</i> 4.52	<i>Sec.-feet.</i> 1,750
18	do	3.91	1,320	Oct. 28	R. Perwien	2.26	333

Daily gage height, in feet, of West Fork River at Enterprise, W. Va., for 1911.

[C. M. Tetrick, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	6.0	5.2	3.1	5.1	2.5	1.3	1.6	0.9	7.5	4.0	2.00	3.00
2.....	5.6	4.4	2.9	4.5	2.7	1.3	1.6	.9	4.3	4.8	1.90	3.90
3.....	5.0	3.9	2.7	4.1	2.5	1.2	1.5	.8	3.2	9.3	1.82	2.80
4.....	6.7	5.3	2.5	5.4	2.4	1.7	1.8	.8	2.4	5.5	1.80	2.60
5.....	4.9	4.8	2.4	10.5	2.2	1.6	1.7	.8	2.3	3.8	1.76	2.40
6.....	4.7	4.0	2.5	7.5	2.1	1.5	1.6	.9	2.1	3.5	1.90	2.30
7.....	3.3	4.1	3.3	6.3	2.0	1.3	1.5	1.0	2.7	8.1	5.50	2.20
8.....	3.0	4.0	6.0	5.7	2.0	1.3	1.8	1.0	2.5	13.1	5.18	2.17
9.....	4.0	3.8	8.2	7.5	1.8	1.3	1.7	1.0	2.3	7.2	3.65	2.05
10.....	3.4	3.8	5.6	6.9	1.8	1.2	1.6	.9	2.6	4.4	3.04	1.90
11.....	3.2	3.4	4.4	4.9	1.8	1.2	1.4	.9	2.7	4.6	2.70	1.90
12.....	3.0	3.1	3.7	3.9	1.7	1.4	1.3	.8	4.8	5.9	2.56	2.19
13.....	9.8	2.9	3.4	3.8	1.7	1.3	1.2	.8	3.5	4.2	2.32	2.00
14.....	12.7	2.8	4.5	3.7	1.6	1.2	1.2	.8	2.8	3.5	5.10	2.00
15.....	7.6	2.7	4.2	9.1	1.6	1.1	1.1	.9	5.0	3.8	4.00	5.05
16.....	8.0	2.5	3.9	7.0	1.5	1.0	1.1	.8	10.3	4.2	3.20	7.35
17.....	5.0	2.3	3.3	4.6	1.5	1.0	1.0	.8	11.0	9.6	2.90	8.24
18.....	4.1	2.3	3.1	4.1	1.5	1.2	1.0	2.0	6.1	7.1	4.51	6.20
19.....	3.5	2.2	3.8	4.7	1.4	3.3	1.0	1.5	3.5	6.8	4.80	5.10
20.....	3.0	3.7	4.6	5.6	1.4	3.0	1.0	1.2	3.3	4.8	4.40	4.20
21.....	3.0	4.7	5.0	4.9	1.4	2.4	.9	1.1	2.9	3.7	3.60	4.00
22.....	7.0	5.8	3.9	4.5	1.7	2.2	.9	1.1	7.5	3.3	3.00	3.72
23.....	5.9	4.4	3.5	4.1	1.6	1.9	.9	1.1	5.5	3.0	2.70	3.50
24.....	4.4	3.9	3.2	4.5	1.6	1.7	1.0	1.1	3.2	3.0	2.51	3.20
25.....	3.8	3.5	2.8	4.0	1.6	1.6	1.0	1.2	2.5	2.9	3.80	5.62
26.....	4.2	3.9	2.6	3.4	1.6	1.9	.9	1.6	2.5	2.6	3.71	4.86
27.....	7.6	3.8	2.5	3.0	1.5	1.8	.8	1.8	2.3	2.4	3.62	10.82
28.....	8.3	3.5	2.5	2.9	1.4	1.7	.8	1.5	2.0	2.27	3.40	6.72
29.....	5.8	.....	2.5	2.8	1.3	1.8	.8	1.9	4.0	2.21	3.21	4.61
30.....	17.6	.....	2.4	2.7	1.3	1.7	.8	7.7	3.5	2.04	3.10	5.42
31.....	9.7	.....	5.7	.....	1.3	.....	.8	10.7	.....	2.02	.....	4.22

NOTE.—No ice reported. Relation of gage height to discharge probably not affected by ice during 1911.

Daily discharge, in second-feet, of West Fork River at Enterprise, W. Va., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	3,150	2,360	767	2,270	441	52	99	25	4,740	1,380	227	707
2.....	2,750	1,680	649	1,760	540	52	99	25	1,600	2,010	190	1,300
3.....	2,180	1,300	540	1,450	441	43	79	20	829	6,820	162	593
4.....	3,880	2,460	441	2,550	395	124	155	20	395	2,650	155	489
5.....	2,090	2,010	395	8,280	307	99	124	20	350	1,230	143	395
6.....	1,920	1,380	441	4,740	266	79	99	25	266	1,030	190	350
7.....	893	1,450	893	3,460	227	52	79	30	540	5,400	2,650	307
8.....	707	1,380	3,150	2,850	227	52	155	30	441	11,600	2,340	295
9.....	1,880	1,230	5,510	4,740	155	52	124	30	350	4,420	1,130	246
10.....	959	1,230	2,750	4,090	155	43	99	25	489	1,680	731	190
11.....	829	959	1,680	2,090	155	43	64	25	540	1,840	540	190
12.....	707	767	1,160	1,300	124	64	52	20	2,010	3,050	470	303
13.....	7,430	649	959	1,230	124	52	43	20	1,030	1,530	359	227
14.....	11,100	593	1,760	1,160	99	43	43	20	593	1,030	2,270	227
15.....	4,850	540	1,530	6,580	99	36	36	25	2,180	1,230	1,380	2,220
16.....	5,290	441	1,300	4,200	79	30	36	20	8,040	1,530	829	4,580
17.....	2,180	350	893	1,840	79	30	30	20	8,900	7,180	649	5,560
18.....	1,450	350	767	1,450	79	43	30	227	3,250	4,310	1,770	3,360
19.....	1,030	307	1,230	1,920	64	893	30	79	1,030	3,990	2,010	2,270
20.....	707	1,160	1,840	2,750	64	707	30	43	893	2,010	1,680	1,530
21.....	707	1,920	2,180	2,090	64	395	25	36	649	1,160	1,090	1,380
22.....	4,200	2,950	1,300	1,760	124	307	25	36	4,740	893	707	1,180
23.....	3,050	1,680	1,030	1,450	99	190	25	36	2,650	707	540	1,030
24.....	6,680	1,300	829	1,760	99	124	30	36	829	707	446	829
25.....	1,230	1,030	593	1,380	99	99	30	43	441	649	1,230	2,770
26.....	1,530	1,300	489	959	99	190	25	99	441	489	1,170	2,060
27.....	4,850	1,230	441	707	79	155	20	155	350	395	1,110	8,680
28.....	5,620	1,030	441	649	64	124	20	79	227	337	959	3,900
29.....	2,950	.....	441	593	52	155	20	190	1,380	311	835	1,850
30.....	17,700	.....	395	540	52	124	20	4,960	1,030	243	767	2,570
31.....	7,300	.....	2,850	.....	52	.....	20	8,530	.....	235	.....	1,540

NOTE.—Daily discharge determined from a rating curve that is well defined between 0 and 2,180 second-feet (gage heights 0.0 and 5.0 feet) and fairly well defined between 2,270 and 6,460 second-feet (gage heights 5.1 and 9.0 feet).

Monthly discharge of West Fork River at Enterprise, W. Va., for 1911.

[Drainage area, 750 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	17,700	707	3,430	4.57	5.27	B.
February.....	2,950	307	1,250	1.67	1.74	A.
March.....	5,510	395	1,280	1.71	1.97	A.
April.....	8,280	540	2,420	3.23	3.60	A.
May.....	540	52	161	.215	.25	B.
June.....	893	30	148	.197	.22	B.
July.....	155	20	57.0	.076	.09	B.
August.....	8,530	20	482	.643	.74	B.
September.....	8,900	227	1,710	2.28	2.54	A.
October.....	11,600	235	2,320	3.09	3.56	A.
November.....	2,650	143	958	1.28	1.43	A.
December.....	8,680	190	1,710	2.28	2.63	A.
The year.....	17,700	20	1,330	1.77	24.04	

CHEAT RIVER NEAR MORGANTOWN, W. VA.

Location.—At highway bridge at Uneva, W. Va., 10-miles above mouth of river.

Parallel of latitude 39° 40' crosses the river at this bridge.

Records available.—July 8 to December 30, 1899; July 1 to December 29, 1900; August 21, 1902, to December 31, 1905; November 18, 1908, to December 31, 1911.

Drainage area.—1,380 square miles.

Gage.—Standard chain gage attached to bridge. See history of this station in Water-Supply Papers 263 and 283.

Channel.—Probably permanent.

Discharge measurements.—Made from upstream side of bridge or by wading at low water.

Winter flow.—Ice forms sometimes to a thickness of several inches, and large ice jams may affect the relation of gage height to discharge during short periods in December, January, and February.

Accuracy.—This station has not been inspected by United States Geological Engineers during 1910 and 1911. Gage heights since January, 1909, are considered excellent. Discharge measurements made during 1912 and January 1913 (prior to the preparation of this report) by H. P. Drake, an engineer of the Pittsburgh Hydro-Electro Co., indicate that a revision of the rating curve used from 1902 to 1911 is necessary. This indicated change begins at gage-height 4.6 feet and is about +24 per cent at gage height 13.0 feet. Discharge estimates above 5,000 second-feet during 1902–1911 should therefore be used with caution.

Cooperation.—The gage reader's salary is paid by F. W. Scheidenhelm.

The following discharge measurement was made by H. P. Drake, an engineer of the Pittsburgh Hydro-Electric Co.:

October 7, 1911: Gage height, 4.79 feet; discharge, 6,220 second-feet.

Daily gage height, in feet, of Cheat River near Morgantown, W. Va., for 1911.

[C. F. Baker, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	4.97	5.68	4.41	4.07	3.77	2.96	3.09	2.09	7.02	4.33	3.13	3.92
2.....	5.87	5.08	4.07	3.87	3.98	3.22	2.93	2.03	5.12	6.50	3.02	3.66
3.....	6.79	4.74	3.81	4.06	3.81	3.03	2.77	2.05	4.16	7.34	3.00	3.60
4.....	6.63	4.70	3.65	4.51	3.62	2.82	2.69	2.09	3.63	5.61	2.92	3.52
5.....	5.24	4.59	3.49	8.82	3.45	2.69	2.59	2.47	3.40	4.78	2.86	3.34
6.....	4.46	4.40	3.77	8.13	3.32	2.70	2.55	2.35	3.32	4.34	2.92	3.20
7.....	4.09	4.16	5.48	6.49	3.18	5.34	2.80	2.38	3.33	5.04	4.10	3.17
8.....	3.82	4.02	4.77	5.77	3.18	4.92	3.05	2.39	3.16	8.45	4.98	3.21
9.....	3.83	4.35	4.55	6.11	3.10	3.96	2.95	2.33	3.20	5.98	4.32	3.26
10.....	3.56	4.42	4.96	5.79	3.06	3.52	3.25	2.34	3.52	4.94	3.96	3.36
11.....	3.36	4.06	5.77	5.01	2.98	3.24	3.01	2.21	3.32	4.92	3.70	3.74
12.....	3.82	3.83	5.09	4.58	2.92	3.63	2.96	2.12	3.49	5.48	3.58	3.92
13.....	10.40	3.76	5.03	4.22	2.86	3.59	3.59	2.18	3.76	4.92	3.60	3.40
14.....	9.02	3.70	5.75	4.10	2.77	3.79	3.09	.....	3.50	4.48	3.56	3.35
15.....	7.28	3.93	5.00	5.51	2.74	3.59	2.79	2.52	4.82	4.49	3.50	4.35
16.....	7.20	3.88	4.69	5.38	2.66	3.35	2.59	3.02	7.79	5.45	3.50	5.30
17.....	5.60	3.73	4.27	4.52	2.64	3.02	2.50	2.52	7.12	4.92	3.46	5.81
18.....	4.82	3.63	4.34	4.47	2.56	5.27	2.41	2.30	5.32	7.23	4.18	4.86
19.....	4.18	3.69	4.35	4.24	2.56	6.13	2.37	2.38	4.44	6.42	5.16	4.40
20.....	3.99	3.89	5.97	4.53	2.56	4.59	2.33	2.24	4.46	5.26	4.70	3.92
21.....	3.86	3.99	5.27	5.38	2.66	3.97	2.33	2.14	4.06	4.62	4.12	3.78
22.....	4.38	3.77	4.74	5.27	2.78	3.63	2.31	2.06	4.15	4.24	3.92	3.86
23.....	4.93	3.61	4.45	5.88	2.68	3.29	2.35	2.03	4.35	4.22	3.70	4.08
24.....	4.36	3.54	4.41	5.38	2.68	3.11	2.37	2.04	3.86	4.19	3.61	5.26
25.....	4.10	3.45	3.99	4.88	2.72	3.08	2.33	.....	3.54	3.94	3.94	4.70
26.....	4.35	3.89	3.83	4.47	2.72	4.19	2.32	2.72	3.42	3.72	3.92	4.63
27.....	6.34	4.41	3.72	4.17	2.70	4.73	2.26	2.60	3.33	3.58	3.82	7.36
28.....	7.00	4.83	3.82	3.92	3.86	4.23	2.22	2.76	3.54	3.45	3.84	5.76
29.....	6.67	.....	3.83	3.81	3.27	3.68	2.21	5.65	4.83	3.34	4.02	4.89
30.....	13.59	.....	3.81	3.78	3.10	3.34	2.14	6.69	4.93	3.28	4.16	4.51
31.....	7.63	.....	4.23	.....	2.98	.....	2.13	8.82	.....	3.20	.....	5.48

NOTE.—Relation of gage height to discharge probably not affected by ice. No notes made by observer relative to ice.

Daily discharge, in second-feet, of Cheat River near Morgantown, W. Va., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	6,490	9,180	4,290	3,300	2,450	860	1,040	290	14,300	3,950	1,120	2,710
2.....	9,960	6,870	3,300	2,710	3,000	1,180	860	272	6,870	12,300	915	2,200
3.....	13,500	5,370	2,450	3,900	2,450	980	668	272	3,620	15,500	915	1,960
4.....	12,700	5,370	1,960	4,640	1,960	710	625	290	1,960	8,790	805	1,730
5.....	7,250	5,000	1,730	21,600	1,620	625	545	452	1,520	5,740	758	1,430
6.....	4,640	4,290	2,450	18,700	1,340	625	512	400	1,340	3,950	805	1,180
7.....	3,300	3,620	8,400	12,300	1,180	7,630	710	425	1,430	6,490	3,300	1,180
8.....	2,450	3,000	5,740	9,570	1,180	6,110	980	425	1,120	19,900	6,490	1,180
9.....	2,450	4,290	5,000	10,700	1,040	3,000	860	400	1,180	10,400	3,950	1,260
10.....	1,960	4,290	6,490	9,570	980	1,730	1,260	400	1,730	6,110	3,000	1,430
11.....	1,430	3,300	9,570	6,490	915	1,260	915	330	1,340	6,110	2,200	2,200
12.....	2,450	2,450	6,870	5,000	805	1,960	860	290	1,730	8,400	1,960	2,710
13.....	28,000	2,450	6,490	3,620	758	1,960	1,960	330	2,450	6,110	1,960	1,520
14.....	22,400	2,200	9,570	3,300	668	2,450	1,040	a 405	1,730	4,640	1,960	1,430
15.....	15,500	2,710	6,490	8,400	668	1,960	710	480	5,740	4,640	1,730	4,290
16.....	15,100	2,710	5,370	8,010	585	1,430	545	915	17,500	8,010	1,730	7,630
17.....	8,790	2,200	3,950	4,640	585	915	480	480	14,700	6,110	1,620	9,570
18.....	5,740	1,960	3,950	4,640	512	7,630	425	375	7,630	15,100	3,620	6,110
19.....	3,620	2,200	4,290	3,620	512	10,700	400	425	4,290	11,900	7,250	4,290
20.....	3,000	2,710	10,400	4,640	512	5,000	400	352	4,640	7,630	5,370	2,710
21.....	2,710	3,000	7,630	8,010	585	3,000	400	310	3,300	5,000	3,300	2,450
22.....	4,290	2,450	5,370	7,630	710	1,960	375	272	3,620	3,620	2,710	2,710
23.....	6,110	1,960	4,290	9,960	625	1,340	400	272	4,290	3,620	2,300	3,300
24.....	4,290	1,730	4,290	8,010	625	1,040	400	272	2,710	3,620	1,960	7,630
25.....	3,300	1,620	3,000	6,110	625	1,040	400	a 448	1,730	2,710	2,710	5,370
26.....	4,290	2,710	2,450	4,640	625	3,620	375	625	1,520	2,200	2,710	5,000
27.....	11,500	4,290	2,200	3,620	625	5,370	352	545	1,430	1,960	2,450	15,900
28.....	14,300	5,740	2,450	2,710	2,710	3,620	330	668	1,730	1,620	2,450	9,570
29.....	13,100	.....	2,450	2,450	1,260	2,200	330	8,790	5,740	1,430	3,000	6,110
30.....	41,200	.....	2,450	2,450	1,040	1,430	310	13,100	6,110	1,340	3,620	4,640
31.....	16,700	.....	3,620	.....	915	.....	310	21,600	.....	1,180	.....	8,400

a Aug. 14 and 25, daily discharge interpolated.

NOTE.—Daily discharge determined from a rating curve well defined between 115 and 12,300 second-feet (gauge heights 1.5 and 6.5 feet).

Monthly discharge of Cheat River near Morgantown, W. Va., for 1911.

[Drainage area, 1,380 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	41,200	1,430	9,440	6.84	7.89	C.
February.....	9,180	1,620	3,560	2.58	2.69	B.
March.....	10,400	1,730	4,810	3.49	4.02	A.
April.....	21,600	2,450	6,810	4.93	5.50	A.
May.....	3,000	512	1,100	.797	.92	A.
June.....	10,700	625	2,780	2.01	2.24	A.
July.....	1,960	310	638	.462	.53	A.
August.....	21,600	272	1,770	1.28	1.48	A.
September.....	17,500	1,120	4,300	3.12	3.48	A.
October.....	19,900	1,180	6,450	4.67	5.38	B.
November.....	7,250	758	2,620	1.90	2.12	A.
December.....	15,900	1,180	4,190	3.04	3.50	A.
The year.....	41,200	272	4,040	2.93	39.75	

YOUGHIOGHENY RIVER AT CONFLUENCE, PA.

Location.—At highway bridge about half a mile from the railroad station at Confluence, Pa., and about half a mile above the mouth of Casselman River.

Records available.—September 15, 1904, to December 31, 1911.

Drainage area.—435 square miles.

Gage.—Chain gage attached to bridge; datum unchanged since established.

Channel.—Probably permanent.

Discharge measurements.—Made from upstream side of bridge.

Winter flow.—Relation of gage height to discharge is occasionally affected by ice.

Accuracy.—The discharge measurement made July 13, 1911, indicates marked effect from backwater at this station, and estimates of discharge for 1911 are withheld until this effect can be more fully investigated. For a statement of general conditions at this station see Water Supply Papers 263 and 283.

Cooperation.—This station is now maintained by the Water Supply Commission of Pennsylvania, which supplied the records of gage heights and discharge measurements for 1911.

The following discharge measurement was made by F. E. Langenheim, an engineer of the Water Supply Commission of Pennsylvania:

July 13, 1911: Gage height, 2.75 feet; discharge, 396 second-feet.

Daily gage height, in feet, of Youghioghenny River at Confluence, Pa., for 1911.

[L. L. Mountain, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	4.20	5.10	3.70	3.10	3.00	2.60	2.80	1.75	5.20	4.35	2.7	2.9
2.....	5.00	4.45	3.60	3.05	2.85	2.35	2.65	1.75	4.00	6.50	2.7	2.9
3.....	6.10	4.00	3.50	3.00	2.75	2.25	2.50	1.80	3.40	5.50	2.6	2.85
4.....	5.00	3.85	3.40	3.40	2.65	2.15	2.45	3.30	3.00	6.10	2.6	2.85
5.....	4.10	3.75	3.35	7.70	2.60	2.05	2.45	2.75	2.80	4.20	2.45	2.8
6.....	3.60	3.65	3.40	9.50	2.55	2.00	2.40	2.50	3.20	3.80	2.45	2.75
7.....	3.25	3.45	3.40	6.35	2.45	2.00	2.40	2.40	3.20	6.00	4.35	2.8
8.....	3.00	3.30	3.45	5.15	2.40	2.00	2.55	2.30	3.10	5.30	3.75	2.75
9.....	2.80	3.40	3.45	5.05	2.35	1.95	2.25	2.20	3.00	4.60	3.5	2.9
10.....	2.60	3.15	3.40	4.90	2.20	1.80	2.15	2.05	2.80	4.10	3.2	2.95
11.....	2.90	3.15	3.40	4.45	2.25	1.90	2.15	2.15	2.90	4.30	3.05	2.95
12.....	3.20	3.05	3.40	4.00	2.20	2.95	2.15	2.10	2.85	4.20	3.0	2.95
13.....	12.40	3.05	3.30	3.70	2.15	3.60	2.10	2.05	2.85	3.80	2.95	2.9
14.....	8.60	3.35	3.40	3.65	2.15	3.20	2.05	2.05	3.00	3.70	3.1	2.95
15.....	7.20	4.00	3.80	4.20	2.10	3.00	2.05	2.00	10.10	4.40	2.95	3.65
16.....	5.80	3.65	3.70	4.00	2.10	2.75	1.95	1.95	9.70	4.10	2.85	6.45
17.....	4.75	3.45	3.65	3.80	2.05	2.85	1.85	1.90	5.80	4.0	2.9	5.5
18.....	4.00	3.20	3.60	3.70	2.05	8.20	1.75	1.90	4.40	6.2	4.45	4.85
19.....	3.55	3.00	3.75	3.60	2.00	5.10	1.70	1.85	4.20	5.2	4.3	4.05
20.....	3.20	2.80	4.80	3.90	1.90	3.90	1.70	1.70	4.30	4.4	3.7	3.85
21.....	3.20	2.80	4.40	3.90	2.00	3.45	1.70	1.70	4.40	4.1	3.55	3.75
22.....	3.20	2.70	4.10	4.05	2.00	3.00	1.70	1.60	4.40	3.8	3.5	3.85
23.....	3.15	2.70	3.90	4.55	2.00	2.80	1.70	1.50	3.85	3.9	3.35	3.8
24.....	3.10	2.75	3.75	4.15	2.25	2.65	1.70	1.40	3.50	3.7	3.3	4.05
25.....	3.05	2.85	3.60	3.95	2.15	2.50	1.70	1.60	3.00	3.45	3.15	3.95
26.....	3.30	3.20	3.50	3.75	2.05	3.60	1.70	2.00	2.90	3.4	3.1	3.95
27.....	4.80	4.00	3.40	3.50	1.95	4.50	1.70	2.60	2.80	3.2	3.1	6.95
28.....	4.90	3.75	3.35	3.30	1.90	3.90	1.70	2.90	3.40	3.0	3.0	5.05
29.....	5.55	.....	3.30	3.15	1.90	3.40	1.70	7.50	6.00	2.9	3.0	4.4
30.....	12.65	.....	3.20	2.90	2.00	3.35	1.70	7.60	5.60	2.7	2.95	3.85
31.....	7.15	.....	3.20	.....	2.10	.....	1.70	9.65	.....	2.8	.....	6.1

CASSELMAN RIVER AT CONFLUENCE, PA.

Location.—At highway bridge about 500 yards from the railroad station and a few hundred yards above the junction of Casselman and Youghioghenny rivers.

Records available.—September 15, 1904, to December 31, 1911.

Drainage area.—450 square miles.

Gage.—Chain gage attached to bridge; datum unchanged since established.

Channel.—Probably permanent.

Discharge measurements.—Made from upstream side of bridge.

Winter flow.—Relation of gage height to discharge is more or less affected by ice during the winter months.

Accuracy.—Estimates of discharge for 1911 are withheld for the present. For a discussion of the general conditions at this station see Water-Supply Papers 263 and 283.

Cooperation.—Station is now maintained by the Water Supply Commission of Pennsylvania, which furnished the records of gage heights and discharge measurements for 1911.

The following discharge measurement was made by F. E. Langenheim, an engineer of the Water Supply Commission of Pennsylvania:

July 13, 1911: Gage height, 2.32 feet; discharge, 381 second-feet.

Daily gage height, in feet, of Casselman River at Confluence, Pa., for 1911.

[L. L. Mountain, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	3.05	4.05	3.00	2.85	2.65	2.45	2.25	1.6	4.5	3.25	2.4	2.4
2.....	3.90	3.55	2.95	2.75	2.95	2.2	2.15	1.6	3.5	5.7	2.35	2.35
3.....	5.45	3.15	2.85	2.65	2.85	2.1	2.1	1.65	2.9	4.25	2.3	2.35
4.....	3.90	3.05	2.75	3.00	2.75	2.0	2.1	1.8	2.8	4.4	2.25	2.3
5.....	3.05	2.95	2.70	6.85	2.65	1.9	2.05	2.1	2.65	3.65	2.25	2.3
6.....	2.80	2.85	2.90	8.95	2.55	2.3	2.05	1.9	3.1	3.35	2.25	2.3
7.....	2.65	2.80	2.85	5.70	2.45	2.15	2.05	1.9	3.0	5.9	3.4	2.3
8.....	2.55	2.75	2.85	4.35	2.35	2.05	2.2	1.85	2.9	4.45	3.05	2.3
9.....	2.50	2.80	2.80	4.15	2.30	1.95	2.1	1.85	2.85	3.5	2.85	2.35
10.....	2.45	2.70	2.75	4.00	2.25	1.9	2.05	1.75	2.7	3.15	2.75	2.55
11.....	2.65	2.60	2.75	3.70	2.15	1.9	2.05	1.8	2.75	3.35	2.55	2.55
12.....	3.35	2.55	2.75	3.40	2.10	3.2	2.05	1.8	2.7	3.2	2.45	2.5
13.....	11.70	2.55	2.85	3.20	2.05	2.95	2.0	1.8	2.75	2.85	2.55	2.5
14.....	7.45	3.00	2.95	3.15	2.05	2.7	2.0	1.75	2.9	2.75	2.55	2.55
15.....	6.05	3.95	3.20	3.55	2.05	2.55	2.0	1.7	10.9	3.3	2.5	3.45
16.....	4.35	3.35	3.10	3.15	2.05	2.35	1.9	1.7	10.2	3.05	2.4	6.1
17.....	3.45	3.15	3.05	3.05	2.00	2.55	1.8	1.7	7.6	3.0	2.4	4.6
18.....	3.15	2.95	2.95	2.95	2.00	8.95	1.7	1.65	4.0	5.3	4.05	3.95
19.....	2.95	2.80	3.20	2.85	1.95	4.35	1.6	1.65	3.8	4.2	3.45	3.25
20.....	2.75	2.70	3.95	3.35	1.95	3.45	1.6	1.55	3.3	3.45	3.0	3.05
21.....	2.75	2.65	3.75	3.20	1.95	3.0	1.6	1.6	3.3	3.2	2.85	2.95
22.....	2.65	2.60	3.60	3.20	1.95	2.75	1.6	1.55	3.2	3.05	2.8	3.05
23.....	2.55	2.60	3.50	3.65	1.95	2.55	1.6	1.5	2.9	3.35	2.7	3.05
24.....	2.50	2.75	3.40	3.25	2.45	2.45	1.6	1.4	2.6	3.15	2.65	3.35
25.....	2.40	2.85	3.35	3.15	2.35	2.35	1.6	1.6	2.35	2.9	2.65	3.45
26.....	2.75	3.15	3.30	3.05	2.25	3.15	1.6	1.8	2.35	2.8	2.55	3.45
27.....	3.85	3.65	3.25	2.95	2.1	2.95	1.6	2.0	2.25	2.75	2.55	6.7
28.....	3.95	3.35	3.15	2.85	1.95	3.0	1.6	2.5	3.8	2.55	2.5	4.65
29.....	4.50	.....	3.10	2.75	1.95	2.65	1.6	6.7	5.75	2.5	2.5	3.45
30.....	11.75	.....	3.05	2.65	2.45	2.4	1.6	6.4	3.9	2.45	2.5	3.25
31.....	5.95	.....	2.95	.....	2.25	.....	1.6	8.9	.....	2.5	.....	5.35

NOTE.—Relation of gage height to discharge affected by backwater from Youghiogheny River Jan. 3, 13 to 16, 29 to 31; Apr. 5 to 10; June 18, 19; Aug. 29 to 31; Sept. 1, 15 to 17, 29; Oct. 2 to 4, 7, 8, 18, 19, and Dec. 16, 17, 27, 28, and 31.

LAUREL HILL CREEK AT CONFLUENCE, PA.

Location.—At highway bridge about one-fourth mile from the railroad station and only a few hundred yards above the junction of the creek with Youghiogheny River.

Records available.—September 15, 1904, to December 31, 1911.

Drainage area.—126 square miles. (Revised since last report.)

Gage.—Chain gage attached to bridge; datum unchanged since established.

Channel.—Shifts as result of refuse dumped into the creek from a tannery a short distance above the bridge.

Discharge measurements.—Made from the downstream side of the bridge.

Winter flow.—Ice may affect the relation of gage height to discharge during short periods.

Accuracy.—Relation of gage height to discharge is affected by backwater from the Youghiogheny and by shift of channel at bridge. As a result the records of flow at this station are not so good as at the other two stations at Confluence. Estimates of discharge for 1911 are withheld for the present. For a discussion of general conditions at this station, see Water Supply Papers 263 and 283.

Cooperation.—This station is now maintained by the Water Supply Commission of Pennsylvania, which furnished the records of gage heights and discharge measurements for 1911.

The following discharge measurement was made by F. E. Langenheim, an engineer of the Water Supply Commission of Pennsylvania:

July 13, 1911: Gage height, 4.10 feet; discharge, 875 second-feet.

Daily gage height, in feet, of Laurel Hill Creek at Confluence, Pa., for 1911.

[L. L. Mountain, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	3.06	3.36	3.06	2.71	2.58	2.58	2.23	1.70	3.85	2.80	2.20	2.45
2.....	3.26	3.01	3.01	2.66	2.88	2.28	2.08	1.70	2.80	4.00	2.15	2.40
3.....	4.26	2.66	2.96	2.61	2.78	2.18	2.03	1.65	2.20	3.50	2.10	2.40
4.....	3.36	2.66	2.86	3.01	2.68	2.08	1.98	1.60	2.15	3.25	2.10	2.35
5.....	2.96	2.66	2.81	4.86	2.58	1.93	1.98	1.70	2.10	3.10	2.05	2.35
6.....	2.71	2.61	2.81	6.56	2.48	2.03	1.93	1.65	2.70	2.80	2.20	2.35
7.....	2.56	2.61	2.81	3.71	2.38	1.93	1.93	1.65	2.70	4.55	3.05	2.35
8.....	2.46	2.56	2.81	3.76	2.28	1.88	2.18	1.65	2.60	3.50	2.90	2.40
9.....	2.41	2.56	2.76	3.36	2.18	1.83	1.98	1.65	2.60	3.00	2.80	2.45
10.....	2.36	2.51	2.76	3.36	2.13	1.78	1.93	1.65	2.50	3.15	2.70	2.65
11.....	2.66	2.46	2.76	3.26	2.08	1.78	1.93	1.60	2.50	3.00	2.60	2.65
12.....	3.56	2.41	2.71	3.01	2.03	3.53	1.93	1.60	2.50	2.80	2.50	2.60
13.....	9.56	2.46	2.71	2.96	2.03	2.98	3.61	1.60	2.45	2.60	2.60	2.60
14.....	5.96	3.01	2.76	2.96	2.03	2.73	2.40	1.60	2.75	2.50	2.55	2.70
15.....	4.56	3.46	2.86	3.16	2.03	2.58	2.20	1.60	6.80	3.35	2.45	3.25
16.....	3.71	3.16	2.76	2.91	2.03	2.38	2.10	1.60	5.60	3.20	2.45	4.35
17.....	3.21	2.96	2.76	2.81	2.03	2.58	1.90	1.60	3.00	3.10	2.45	3.65
18.....	3.06	2.86	2.76	2.76	1.98	6.88	1.85	1.60	2.80	4.05	3.85	3.25
19.....	2.96	2.76	2.96	2.81	1.98	3.58	1.80	1.55	2.80	3.50	3.35	2.95
20.....	2.76	2.71	3.36	3.26	1.98	2.98	1.70	1.55	2.80	3.20	3.00	2.90
21.....	2.76	2.66	3.26	3.11	1.93	2.78	1.70	1.50	2.90	2.95	2.90	2.95
22.....	2.66	2.61	3.16	3.16	1.93	2.58	1.70	1.50	3.40	2.80	2.85	2.95
23.....	2.56	2.61	3.06	3.21	1.88	2.43	1.70	1.45	2.95	2.70	2.75	2.90
24.....	2.51	2.61	3.01	3.01	2.28	2.33	1.70	1.40	2.60	2.60	2.70	3.00
25.....	2.41	2.66	2.96	2.91	2.18	2.28	1.70	1.50	2.50	2.55	2.65	3.00
26.....	2.81	2.76	2.91	2.81	2.08	2.78	1.70	1.60	2.40	2.50	2.60	3.00
27.....	3.06	3.16	2.86	2.71	1.98	3.18	1.70	1.75	2.30	2.40	2.60	4.40
28.....	3.11	3.16	2.86	2.61	1.88	3.13	1.70	1.80	6.50	2.30	2.55	3.50
29.....	3.51	.....	2.81	2.56	1.88	2.73	1.70	4.70	4.45	2.25	2.50	3.15
30.....	8.96	.....	2.76	2.51	2.28	2.48	1.70	4.30	3.30	2.20	2.50	2.95
31.....	4.96	.....	2.71	.....	2.08	.....	1.70	6.00	.....	2.20	.....	4.20

^a Maximum, 4.30 feet at 12.20 p. m.

NOTE.—The gage box was struck by a wagon about May 1, according to the observer; on July 13, 1911, the gage was checked with a wye level, found to be in error, and put in general condition to read correctly. Proper correction has been applied to observed gage heights May 1 to July 13, and values published above are correct.

MUSKINGUM RIVER BASIN.

MUSKINGUM RIVER AT ZANESVILLE, OHIO.

Location.—At lower pool at Lock No. 10, Zanesville, Ohio, and 4,000 feet below the mouth of Licking River.

Records available.—June 4, 1887, to December 31, 1911. The United States Geological Survey began making measurements at this station in March, 1905.

Drainage area.—5,820 square miles. (Revised since last report.)

77091°—wsp 303—13—3

Gage.—Staff gage in lower pool at Lock No. 10; datum probably unchanged since established.

Channel.—The crest of the dam at Lock No. 9, 9 miles below Lock No. 10, acts as a point of control for the gage. As the dams on the Muskingum are fixed dams, the relation between gage height and discharge should be permanent, and once determined, would apply indefinitely if conditions at the dams remained unchanged. See notes under *Accuracy*.

Discharge measurements.—Made from upstream side of Sixth Street Bridge, 1,000 feet above Lock No. 10.

Floods.—The maximum flood gage height, according to the United States Weather Bureau, was 36.8 feet-March 24, 1898.

Point of zero flow.—The crest of Dam No. 9 acts as a point of control except as the water may be drawn off by openings in the lock or leakage through the dam. The elevation of the crest is 7.0 feet, referred to gage datum.

Winter flow.—The relation of gage height to discharge is sometimes affected during the winter months by ice cover and occasionally by ice jams.

Artificial control.—The operation of two power plants at Dam No. 9 modifies the flow past the lower gage at Dam No. 10 to an unknown extent.

Accuracy.—Investigations and studies made during 1912 (before the preparation of this report) show that the records at this station are practically worthless as a means of making accurate determinations of discharge, because of leakage through Dam No. 9 prior to 1907 and the operation of the two power plants at Dam No. 9. All estimates of discharge previously published for this station should therefore be used with great caution, as they are in error an unknown amount; the lower the flow the greater the possible error.

Cooperation.—Gage readings are furnished by United States Army Engineers.

Daily gage height, in feet, of Muskingum River at Zanesville, Ohio, for 1911.

[Lower gage Lock No. 10.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	14.3	18.6	11.2	12.6	10.9	8.2	8.4	7.7	9.6	9.2	9.2	10.2
2.....	14.1	17.4	10.6	12.2	11.2	8.2	8.05	7.5	9.0	9.4	9.4	9.9
3.....	14.8	16.6	10.3	11.6	11.5	8.1	7.9	7.7	8.6	10.0	9.4	9.8
4.....	13.5	16.0	10.0	11.8	11.2	8.2	7.9	7.7	8.4	10.8	9.2	9.6
5.....	11.4	16.0	10.0	14.6	10.6	8.2	7.9	7.7	8.4	11.2	9.0	9.5
6.....	10.5	14.9	9.8	17.0	10.0	8.2	7.9	7.75	8.6	11.2	8.9	9.4
7.....	10.5	13.9	9.8	16.8	9.7	8.6	7.8	7.9	8.45	12.7	10.5	9.5
8.....	10.6	13.7	10.2	15.6	9.4	8.8	7.8	7.9	8.6	13.4	10.7	9.4
9.....	10.4	13.8	10.3	14.6	9.4	9.0	7.85	7.9	10.4	13.4	11.0	9.8
10.....	10.0	13.4	11.1	13.6	9.2	8.6	8.25	7.9	11.4	12.8	10.3	13.3
11.....	10.0	12.6	11.8	12.9	9.0	8.45	8.15	7.8	12.6	14.0	9.8	14.6
12.....	10.2	11.6	11.4	12.2	9.0	8.35	8.2	7.8	11.6	12.3	9.7	16.4
13.....	12.8	11.0	10.6	12.9	8.9	8.2	8.35	7.7	10.4	11.9	12.2	21.0
14.....	15.0	11.0	10.4	15.6	9.0	8.1	8.45	7.7	9.6	11.3	12.6	21.0
15.....	17.4	12.2	10.2	16.6	8.9	8.0	8.1	7.8	9.8	10.8	12.2	22.2
16.....	18.0	14.0	10.0	15.5	8.8	8.0	7.85	8.4	17.1	10.4	11.5	21.9
17.....	17.4	13.8	9.8	14.5	8.7	8.1	7.8	8.5	18.0	10.7	11.2	20.8
18.....	16.0	13.1	9.7	13.0	8.6	8.6	7.75	8.5	18.2	15.7	12.8	19.7
19.....	12.5	13.0	10.4	12.0	8.5	8.0	7.7	8.35	17.9	15.8	14.4	18.5
20.....	11.4	13.2	11.4	14.9	8.5	8.05	7.7	8.0	15.2	15.6	14.4	15.4
21.....	10.6	12.4	11.0	16.2	8.5	8.2	7.8	7.9	12.2	14.8	13.6	13.3
22.....	10.4	11.8	10.6	16.3	8.5	8.05	7.7	7.8	10.9	13.4	12.2	12.2
23.....	10.4	11.2	10.1	15.2	8.5	8.0	7.7	7.7	10.2	11.9	11.5	12.2
24.....	10.2	10.9	10.0	14.3	8.5	8.0	7.7	7.7	9.6	11.0	11.1	12.5
25.....	9.7	10.9	9.8	13.2	8.5	8.0	7.7	8.1	9.3	10.4	11.4	12.7
26.....	9.4	11.4	9.6	12.3	8.45	8.0	7.7	9.0	9.0	10.0	11.6	12.4
27.....	11.4	12.0	9.5	11.4	8.3	8.0	7.7	8.9	9.0	9.8	11.2	14.0
28.....	16.0	11.9	9.6	10.8	8.3	8.5	7.7	8.9	8.9	9.4	10.8	14.5
29.....	16.9	.....	10.1	10.4	8.2	8.35	7.7	9.2	9.6	9.2	10.7	13.9
30.....	22.6	.....	10.8	10.2	8.1	8.15	7.7	9.5	9.0	9.2	10.5	12.9
31.....	20.4	.....	11.8	.....	8.2	.....	7.7	10.0	.....	9.1	.....	14.1

NOTE.—Daily gage heights are means of two readings per day furnished by United States Engineer Corps and therefore differ from those published by the United States Weather Bureau, which represent one reading each day.

MOHICAN RIVER BASIN.

MOHICAN RIVER AT POMERENE, OHIO.

Location.—At highway bridge at Pomerene, Ohio, 4 miles from Walhonding, Ohio, and 5 miles below the mouth of Owl Creek.

Records available.—December 1, 1910, to December 31, 1911.

Drainage area.—Not measured.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Coarse gravel; apparently permanent.

Discharge measurements.—Made from upstream side of bridge.

Winter flow.—The relation of gage height to discharge is sometimes affected by ice cover and ice gorges during the winter months.

Diversions.—A feeder for the Ohio Canal formerly took water from the river at Cavallo, some distance above Pomerene, but this feeder has not been in use for some time.

Accuracy.—Sufficient data have not been obtained to permit estimates of discharge to be made.

Cooperation.—The gage reader's salary for part of the year was paid from the funds of the Ohio Agricultural Experiment Station.

Discharge measurements of Mohican River at Pomerene, Ohio, in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Apr. 22	P. S. Monk	<i>Feet.</i> 7.11	<i>Sec.-feet.</i> 4,940
24	do	6.05	3,300

Daily gage height, in feet, of Mohican River at Pomerene, Ohio, for 1911.

[F. L. Rodehaver, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	6.43	7.76	4.50	5.53	5.51	3.27	3.19	2.66	3.66	3.31	3.33	3.94
2.....	7.34	7.20	4.36	5.15	5.37	3.26	3.18	2.61	3.52	4.32	3.82	3.84
3.....	7.70	7.10	4.24	5.13	5.48	3.31	3.13	2.92	3.43	4.43	3.80	3.76
4.....	6.30	6.81	4.21	5.70	5.12	3.30	3.02	2.94	3.26	3.94	3.77	4.05
5.....	5.65	6.20	4.10	8.52	4.90	3.48	2.92	2.91	3.27	3.87	3.76	4.21
6.....	4.80	5.90	3.94	7.92	4.51	4.64	2.89	2.88	3.93	3.33	3.75	4.14
7.....	8.45	5.10	3.93	7.22	4.26	4.55	2.82	2.98	3.95	4.91	4.90	3.94
8.....	7.30	5.69	3.87	6.15	4.12	3.94	2.91	2.95	3.91	5.47	4.42	3.85
9.....	7.74	5.30	4.03	5.66	4.05	3.61	2.99	2.89	3.98	5.47	4.21	4.12
10.....	8.87	4.60	4.43	5.10	3.96	3.53	2.95	2.83	4.94	5.67	4.10	8.09
11.....	7.22	4.00	4.52	4.81	3.89	3.49	3.58	2.75	4.81	5.90	3.87	7.74
12.....	4.70	4.60	4.44	4.54	4.68	3.47	3.75	2.70	4.08	5.43	3.92	8.42
13.....	7.08	4.84	4.35	5.26	4.50	3.46	3.34	2.67	3.74	5.36	7.04	11.82
14.....	8.45	5.84	4.10	6.74	4.24	3.45	3.37	2.63	3.64	5.34	6.11	10.31
15.....	9.98	7.69	3.94	6.64	4.05	3.41	3.05	3.51	6.35	4.76	5.26	10.42
16.....	8.41	7.32	3.64	5.93	4.03	3.34	2.78	3.57	7.22	4.47	4.55	9.14
17.....	6.90	6.61	3.41	5.71	3.93	3.20	2.77	3.45	6.53	4.84	4.21	8.41
18.....	6.50	6.10	3.74	5.21	3.87	3.10	2.82	3.41	6.39	8.72	7.18	7.67
19.....	5.35	6.50	4.74	4.98	3.59	3.25	2.83	3.15	6.35	8.20	7.55	7.12
20.....	4.71	5.30	4.97	8.26	3.55	3.37	2.81	2.86	6.16	7.77	7.01	6.76
21.....	4.49	4.74	4.87	8.00	3.52	3.34	2.82	2.86	4.80	7.34	6.65	5.74
22.....	4.30	4.30	4.83	7.10	3.49	3.29	2.87	2.87	3.61	6.91	6.05	5.35
23.....	4.10	4.35	4.66	6.67	3.47	3.22	2.88	2.84	3.65	6.65	5.14	4.91
24.....	3.85	4.78	4.30	6.03	3.57	3.15	3.20	2.81	3.61	6.61	4.64	4.87
25.....	3.88	4.90	3.98	5.52	3.55	3.10	3.34	4.36	3.58	6.47	4.12	5.36
26.....	3.84	5.50	3.81	5.05	3.49	3.27	3.24	3.88	3.55	6.43	5.06	5.10
27.....	4.52	5.82	4.29	4.65	3.42	3.35	3.20	3.66	3.53	5.90	4.85	5.92
28.....	7.75	5.18	4.73	4.49	3.29	3.32	3.14	3.66	3.71	5.00	4.73	5.02
29.....	6.30	.....	4.50	4.47	3.26	3.27	2.90	4.78	3.55	4.20	4.44	4.51
30.....	8.10	.....	5.30	4.78	3.29	3.21	2.66	4.74	3.40	3.84	4.11	4.11
31.....	8.20	.....	5.98	.....	3.26	.....	2.72	3.90	.....	3.85	.....	4.32

NOTE.—Jan. 7 to 12 river gorged with slush ice; Jan. 8 to 11, readings to top of slush ice gorge.

KANAWHA RIVER BASIN.

SOUTH FORK OF NEW RIVER NEAR CRUMPLER, N. C.

Location.—About 2 miles above the confluence of North and South forks of New River and about 4 miles from Crumpler, N. C.

Records available.—August 12, 1908, to December 31, 1911.

Drainage area.—325 square miles.

Gage.—Standard chain gage attached to trees on left bank; datum unchanged since established.

Channel.—Practically permanent

Discharge measurements.—Made from a boat at a section about one-half mile below the gage or by wading at a section about 500 feet below the gage.

Winter flow.—Ice rarely forms in sufficient quantity to affect gage readings.

Accuracy.—The gage-height record is considered very reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by Horton and Bailey:

July 24, 1911: Gage height, 0.94 feet; discharge, 232 second-feet. The measurement was made by wading at a section about 500 feet below the gage.

Daily gage height, in feet, of South Fork of New River near Crumpler, N. C., for 1911.

[John J. Garvey, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	1.73	1.40	1.29	1.55	1.72	1.40	1.03	1.14	1.87	1.04	1.20	1.26
2.....	2.05	1.39	1.30	1.52	1.70	1.39	1.00	1.02	1.47	1.07	1.18	1.28
3.....	2.48	1.38	1.29	1.48	1.61	1.36	1.00	1.29	1.36	1.10	1.15	1.28
4.....	2.61	1.38	1.27	1.56	1.58	1.32	.98	1.47	1.20	1.14	1.14	1.21
5.....	2.07	1.38	1.24	2.62	1.54	1.32	1.16	1.39	1.12	1.20	1.14	1.18
6.....	1.83	1.36	1.52	2.70	1.52	1.42	1.26	1.44	1.15	1.14	1.34	1.22
7.....	1.69	1.38	2.02	2.18	1.48	1.40	1.16	1.42	1.16	1.08	1.66	1.25
8.....	1.62	1.48	2.02	2.28	1.46	1.42	1.42	1.26	1.10	1.08	1.54	1.21
9.....	1.50	1.82	2.26	2.10	1.50	1.33	1.26	1.24	1.08	1.06	1.50	1.19
10.....	1.42	1.84	2.04	1.93	1.48	1.28	1.22	1.06	1.18	1.10	1.48	1.17
11.....	1.48	1.68	1.84	1.78	1.46	1.28	1.22	1.00	1.20	1.20	1.40	1.22
12.....	1.48	1.56	1.76	1.91	1.46	1.26	1.16	.96	1.26	1.26	1.38	1.24
13.....	1.42	1.52	1.60	2.46	1.54	1.22	1.16	.98	1.14	1.18	1.54	1.25
14.....	1.42	1.50	1.58	2.88	1.72	1.20	1.12	1.09	1.04	1.10	1.50	1.24
15.....	1.41	1.45	1.54	2.52	1.62	1.16	1.40	1.13	1.02	1.16	1.44	1.32
16.....	1.36	1.44	1.46	2.36	1.50	1.12	1.17	1.00	1.00	1.04	1.38	1.56
17.....	1.31	1.40	1.42	2.11	1.42	1.12	1.65	.97	1.00	1.54	1.36	1.68
18.....	1.40	1.38	1.42	1.96	1.40	1.12	1.05	.96	1.00	3.71	1.38	1.48
19.....	1.36	1.37	1.45	2.00	1.40	1.15	1.00	.96	.99	2.29	1.41	1.36
20.....	1.36	1.45	1.50	2.09	1.40	1.26	.98	.96	.98	1.81	1.38	1.32
21.....	1.37	1.41	1.46	1.94	1.40	1.20	1.06	.92	2.29	1.56	1.36	1.54
22.....	1.44	1.38	1.40	1.84	1.39	1.18	1.02	.87	1.89	1.52	1.32	2.09
23.....	1.49	1.34	1.41	1.76	1.40	1.14	.97	.87	1.63	1.54	1.30	2.35
24.....	1.44	1.28	1.36	1.71	1.40	1.20	.96	.87	1.49	1.48	1.34	2.08
25.....	1.39	1.28	1.36	1.68	1.36	1.20	.95	.87	1.42	1.36	1.32	1.96
26.....	1.38	1.28	1.38	1.66	1.32	1.14	.91	.92	1.32	1.28	1.30	1.80
27.....	1.36	1.30	1.96	1.61	1.30	1.32	.86	1.26	1.26	1.29	1.30	1.83
28.....	1.34	1.29	1.88	1.60	1.30	1.13	.88	1.18	1.17	1.28	1.30	1.76
29.....	1.34	.....	1.70	1.62	1.30	1.11	.89	1.35	1.11	1.26	1.30	1.66
30.....	1.54	.....	1.61	1.67	1.28	1.10	.90	1.60	1.08	1.23	1.29	1.54
31.....	1.52	.....	1.59	.....	1.32	.....	.92	1.94	.....	1.21	.....	1.71

NOTE.—Slush ice reported Feb. 23. Relation of gage height to discharge probably not affected by ice during 1911.

NEW RIVER NEAR GRAYSON, VA.

Location.—At Norfolk & Western Railway bridge at Fries Junction, 1 mile from Grayson, Va., immediately above the mouth of Chestnut Creek.

Records available.—August 7, 1908, to December 31, 1911.

Drainage area.—1,160 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Irregular but practically permanent. The river at the measuring section is wide, with an irregular, rocky bottom; current rough and rapid.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Gage heights are little, if at all, affected by ice.

Artificial control.—The operation of a large cotton mill, run by water power, about 4 miles above the gage affects the flow of the river during low water.

Accuracy.—The characteristics noted under "channel" make this a rather poor station, but with careful work accurate discharge measurements can be made. Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by C. T. Bailey:

July 21, 1911: Gage height, 3.69 feet; discharge, 872 second-feet. These results were obtained by subtracting the inflow (Chestnut and Brush creeks) between sections at Fries Junction and Grayson (20 second-feet, measured by means of floats) from the discharge measured at Grayson, W. Va. See "Miscellaneous measurements," page 105.

Daily gage height, in feet, of New River near Grayson, Va., for 1911.

[Oscar Williams, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	4.31	4.70	3.88	4.24	4.50	4.00	3.65	3.46	4.42	3.59	3.70	3.83
2.....	5.31	4.44	3.88	4.18	4.52	3.89	3.62	3.59	4.09	3.44	3.68	3.79
3.....	5.92	4.26	3.89	4.16	4.37	3.86	3.58	3.55	4.81	3.60	3.69	3.79
4.....	6.16	4.17	3.86	4.18	4.27	3.80	3.59	3.74	3.66	3.58	3.64	3.78
5.....	5.24	4.20	3.80	5.74	4.22	3.80	3.72	3.94	3.60	3.59	3.66	3.73
6.....	4.70	4.10	3.87	6.69	4.18	4.26	4.08	3.86	3.60	3.64	3.74	3.74
7.....	4.40	4.09	4.46	5.68	4.15	4.12	3.78	3.82	3.61	3.58	4.18	3.78
8.....	4.37	4.12	4.90	5.61	4.14	4.06	3.89	3.80	3.63	3.55	4.25	3.73
9.....	4.22	4.84	5.49	5.29	4.10	3.84	3.82	3.68	3.54	3.56	4.10	3.72
10.....	4.11	5.26	5.42	4.95	4.09	3.87	3.78	3.60	3.60	3.58	4.09	3.70
11.....	3.98	4.94	5.18	4.82	4.06	3.82	3.78	3.62	3.61	3.62	4.06	3.70
12.....	4.09	4.63	4.62	4.78	4.05	3.79	3.79	3.48	3.84	3.72	4.00	3.72
13.....	4.06	4.47	4.50	4.96	4.24	3.78	3.82	3.65	3.78	3.70	4.06	3.74
14.....	4.00	4.37	4.44	5.39	4.89	3.74	3.82	3.56	3.67	3.63	4.05	3.72
15.....	4.00	4.24	4.38	5.68	4.48	3.69	3.82	3.62	3.55	3.60	3.98	3.79
16.....	4.04	4.16	4.28	5.57	4.25	3.68	3.70	3.55	3.56	3.68	3.90	4.00
17.....	3.98	4.10	4.16	5.18	4.13	3.67	3.66	3.54	3.51	4.00	3.86	4.20
18.....	3.95	4.06	4.10	4.86	4.08	3.70	3.59	3.51	3.55	7.22	3.82	4.10
19.....	3.92	4.02	4.12	4.76	4.06	3.73	3.55	3.54	3.54	5.26	3.92	3.92
20.....	3.93	4.02	4.19	5.00	4.00	3.84	3.59	3.54	3.50	4.42	3.92	3.90
21.....	3.94	4.11	4.17	4.84	3.99	3.90	3.60	3.28	3.59	4.26	3.90	3.89
22.....	4.00	3.94	4.07	4.67	3.98	3.76	3.57	3.46	4.51	4.00	3.85	4.84
23.....	3.98	3.87	4.02	4.56	3.96	3.69	3.27	3.29	4.10	4.10	3.82	5.38
24.....	4.17	3.96	4.02	4.46	3.94	3.68	3.56	3.28	3.86	4.04	3.82	4.93
25.....	4.28	3.94	4.01	4.38	3.94	3.76	3.54	3.26	3.78	3.92	3.90	4.76
26.....	4.18	3.91	3.98	4.32	3.90	3.78	3.50	3.31	3.69	3.82	3.88	4.60
27.....	4.16	3.90	4.34	4.26	3.86	3.74	3.54	3.74	3.62	3.79	3.82	4.62
28.....	4.13	3.89	4.58	4.21	3.83	4.04	3.54	3.70	3.60	3.78	3.84	4.56
29.....	4.20	.....	4.43	4.24	3.81	3.90	3.41	3.74	3.58	3.75	3.84	4.31
30.....	4.25	.....	4.33	4.28	3.80	3.77	3.53	4.14	3.53	3.73	3.87	4.30
31.....	4.59	.....	4.32	.....	3.87	.....	3.56	4.17	.....	3.72	.....	4.29

NOTE.—No ice reported. Relation of gage height to discharge probably not affected by ice during 1911.

NEW RIVER AT RADFORD, VA.

Location.—At toll highway bridge near the Norfolk & Western Railway station at Radford, Va., $1\frac{1}{2}$ miles below Norfolk & Western Railway bridge and 6 miles below the mouth of Little River.

Records available.—August 1, 1898, to July 15, 1906; May 6, 1907, to December 31, 1911.

Drainage area.—2,720 square miles.

Gage.—Standard chain gage attached to bridge. The United States Weather Bureau gage was originally used at this point, but owing to its inaccessibility it was replaced by a wire gage referred to the same datum February 23, 1900. On December 1, 1903, the wire gage was replaced by a chain gage and the datum lowered 3.41 feet to avoid negative readings.

Channel.—Practically permanent.

Discharge measurements.—Made from the downstream side of the bridge.

Floods.—Maximum gage height, according to United States Weather Bureau, was 37.4 feet September 15, 1879.

Point of zero flow.—A determination by leveling July 17, 1911, indicates that there would be no flow past the gage if the river stage were to fall to $1.0 \text{ foot} \pm 0.3 \text{ foot}$.

Winter flow.—The relation of gage height to discharge is only occasionally affected by ice.

Artificial control.—Power plants 50 miles above station may affect flow to a small extent.

Accuracy.—A good discharge rating curve for this station has been obtained as a result of numerous discharge measurements, but the data in the following tables can not be considered good because of doubt as to the accuracy of the daily gage heights. Gage heights published in the following table represent the means of two readings per day as reported by the observer. During portions of September, October, and November, 1911, the gage was read by a substitute gage observer. A comparison of the readings on the United States Geological Survey and United States Weather Bureau gages at Radford and a gage at Newbern, about 10 or 12 miles above Radford, during this period, indicates that the substitute observer read the Geological Survey gage erroneously on September 24, September 27 to October 16, and October 24 to November 6, 1911. A correction of $+0.5 \text{ foot}$, as indicated by the comparison, has been applied to the observed gage heights on the days in question. As the basis for this correction is not absolute, the discharge values computed therefrom should be used with caution. Four discharge measurements between gage heights 6.0 and 11.0 feet made March 28–29, 1913 (before the preparation of this report) indicate a change in the regimen of the river such that the 1913 discharge rating curve above gage height 5.0 feet will give results about 6 per cent smaller than those given by the 1911 rating curve for corresponding gage heights. It is possible though not probable, that this change should apply during 1911, and published values of discharge should be used with caution until verified by discharge measurements below 6.0 feet.

The following discharge measurement was made by Horton and Bailey:
July 17, 1911: Gage height, 3.38 feet; discharge, 1,510 second-feet.

Daily gage height, in feet, of New River at Radford, Va., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.	4.5	5.05	3.6	4.25	4.2	3.8	3.5	3.15	4.63	3.28	3.25	3.02
2.	5.3	4.6	3.5	4.15	4.3	3.65	3.3	3.08	4.26	3.33	3.06	3.10
3.	6.3	4.3	3.5	4.05	4.2	3.45	3.25	3.08	3.91	3.75	3.11	3.63
4.	7.1	4.05	3.5	4.6	4.15	3.55	3.3	3.10	3.60	3.81	3.08	3.61
5.	5.4	4.0	3.6	5.9	4.0	3.6	3.4	3.69	3.41	3.51	2.99	3.53
6.	4.7	4.0	3.7	8.1	3.95	3.65	3.6	4.24	3.26	3.43	3.30	3.52
7.	4.5	3.9	4.1	6.85	4.0	4.2	3.5	3.68	3.00	3.34	3.39	3.62
8.	4.4	4.0	4.7	6.45	4.0	4.15	4.55	3.50	3.10	3.28	3.75	3.63
9.	3.9	4.95	5.2	6.2	4.0	3.95	3.75	3.41	3.05	3.44	3.77	3.60
10.	3.95	5.95	5.95	5.55	4.0	3.7	3.6	3.30	3.15	3.53	3.50	3.56
11.	3.85	5.2	5.7	5.2	3.85	3.6	3.75	3.20	3.15	3.63	3.29	3.60
12.	3.65	4.75	5.0	5.0	3.8	4.05	3.55	3.08	3.21	3.64	3.65	3.59
13.	3.7	4.45	4.75	5.05	3.95	3.6	3.5	3.38	3.11	3.53	3.75	3.60
14.	3.65	4.35	4.5	5.35	4.6	3.6	3.55	3.49	3.27	3.43	3.57	3.62
15.	3.7	3.9	4.6	5.85	4.85	3.35	3.55	3.29	3.17	3.44	3.53	4.00
16.	3.65	4.15	4.35	6.3	4.3	3.35	3.5	3.22	3.00	3.55	3.74	4.55
17.	3.5	3.95	4.15	5.55	4.05	3.3	3.35	3.17	2.96	3.41	3.75	4.53
18.	3.6	3.9	4.05	5.1	4.05	3.3	3.4	3.15	2.96	8.11	3.57	4.17
19.	3.6	4.0	4.1	4.9	4.0	3.35	3.3	3.12	3.05	6.06	3.44	3.93
20.	3.65	4.0	3.9	4.95	3.8	3.45	3.25	3.09	2.87	4.51	3.80	3.85
21.	3.65	3.95	4.0	5.15	3.75	3.6	3.25	3.05	2.92	3.96	3.73	3.83
22.	3.95	3.7	3.9	5.0	3.35	3.55	3.2	2.85	3.99	3.96	3.63	3.94
23.	4.8	3.6	3.85	4.7	3.7	3.45	3.1	2.96	4.25	4.11	3.63	5.63
24.	4.65	3.6	3.7	4.5	3.8	3.35	3.1	2.97	3.85	3.51	3.73	5.45
25.	4.35	3.6	3.8	4.35	3.8	3.45	3.15	2.88	3.29	3.43	3.63	5.22
26.	4.2	3.7	3.85	4.2	3.75	3.55	3.15	2.95	3.26	3.48	3.75	5.24
27.	3.95	3.75	4.0	4.2	3.55	3.5	3.06	3.30	3.55	3.31	3.72	5.26
28.	3.95	3.7	4.35	4.2	3.45	3.85	3.19	3.41	3.57	3.20	3.65	5.18
29.	4.05	4.35	4.15	3.45	4.0	3.11	4.56	3.34	3.32	3.04	4.94	4.90
30.	4.4	4.2	4.2	3.5	3.55	3.11	4.36	3.35	3.30	3.15	4.40	4.30
31.	5.4	4.2	4.2	3.55	3.55	3.13	4.62	3.22	3.22	3.22	4.33	4.33

NOTE.—Gage heights Sept. 24, Sept. 27 to Oct. 16, and Oct. 24 to Nov. 6 are 0.5 foot greater than the mean gage height for each day as reported by the gage observer. (See *Accuracy*.)

Observer made no notes relative to ice. Relation of gage height to discharge probably not affected by ice during 1911.

Daily discharge, in second-feet, of New River at Radford, Va., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.	4,930	6,980	2,080	4,060	3,890	2,630	1,820	1,060	5,400	1,320	1,260	816
2.	7,950	5,290	1,820	3,720	4,230	2,220	1,360	924	4,090	1,430	888	960
3.	12,100	4,230	1,820	3,400	3,890	1,700	1,260	924	2,960	2,490	979	2,160
4.	15,600	3,400	1,820	5,200	3,720	1,950	1,360	960	2,080	2,660	924	2,110
5.	8,350	3,240	2,080	10,400	3,240	2,080	1,580	2,320	1,600	1,850	764	1,900
6.	5,650	3,240	2,350	20,100	3,080	2,220	2,080	4,030	1,280	1,650	1,360	1,870
7.	4,930	2,930	3,560	14,400	3,240	3,890	1,820	2,300	780	1,450	1,560	2,130
8.	4,580	3,240	5,650	12,700	3,240	3,720	5,110	1,820	960	1,320	2,490	2,160
9.	2,930	6,590	7,560	11,600	3,240	3,080	2,490	1,600	870	1,680	2,550	2,080
10.	3,080	10,600	10,600	8,950	3,240	2,350	2,080	1,360	1,060	1,900	1,820	1,980
11.	2,780	7,560	9,560	7,560	2,780	2,080	2,490	1,150	1,060	2,160	1,340	2,080
12.	2,220	5,840	6,780	6,780	2,630	3,400	1,950	924	1,170	2,190	2,220	2,050
13.	2,350	4,760	5,840	6,980	3,080	2,080	1,820	1,540	979	1,900	2,490	2,080
14.	2,220	4,400	4,930	8,150	5,290	2,080	1,950	1,800	1,300	1,650	2,000	2,130
15.	2,350	2,930	5,290	10,200	6,210	1,470	1,950	1,340	1,090	1,680	1,900	3,240
16.	2,220	3,720	4,400	12,100	4,230	1,470	1,820	1,190	1,950	1,850	2,460	5,110
17.	1,820	3,080	3,720	8,950	3,400	1,360	1,470	1,090	716	1,600	2,490	5,040
18.	2,080	2,930	3,400	7,170	3,400	1,360	1,580	1,060	716	20,200	2,000	3,790
19.	2,080	3,240	3,560	6,400	3,240	1,470	1,360	998	870	11,100	1,680	3,020
20.	2,220	3,240	2,930	6,590	2,630	1,700	1,260	942	578	4,970	2,630	2,780
21.	2,220	3,080	3,240	7,360	2,490	2,080	1,260	870	652	3,120	2,430	2,720
22.	3,080	2,350	2,930	6,780	1,470	1,950	1,150	550	3,210	3,120	2,160	3,050
23.	6,020	2,080	2,780	5,650	2,350	1,700	960	716	4,060	3,590	2,160	9,270
24.	5,470	2,080	2,350	4,930	2,630	1,470	960	732	2,780	1,850	2,430	8,670
25.	4,400	2,080	2,630	4,400	2,630	1,700	1,060	592	1,340	1,650	2,160	7,640
26.	3,890	2,350	2,780	3,890	2,490	1,950	1,060	700	1,280	1,770	2,490	7,720
27.	3,080	2,490	3,240	3,890	1,950	1,820	888	1,360	1,950	1,380	2,410	7,790
28.	3,080	2,350	4,400	3,890	1,700	2,780	1,130	1,600	2,000	1,150	2,220	7,480
29.	3,400	4,400	3,720	1,700	3,240	1,700	979	5,150	1,450	1,400	852	6,550
30.	4,580	3,890	3,890	1,820	1,950	979	4,440	1,470	1,360	1,060	4,230	4,230
31.	8,350	3,890	3,890	1,950	1,950	1,110	5,360	1,190	1,190	1,190	4,340	4,340

NOTE.—Daily discharge computed from a rating curve well defined between 800 and 17,000 second-feet. (See *Accuracy*.)

Monthly discharge of New River at Radford, Va., for 1911.

[Drainage area, 2,720 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	15,600	1,820	4,520	1.66	1.91	B.
February.....	10,600	2,080	3,940	1.45	1.51	B.
March.....	10,600	1,820	4,070	1.50	1.73	B.
April.....	20,100	3,400	7,460	2.74	3.06	B.
May.....	6,210	1,470	3,070	1.13	1.30	B.
June.....	3,890	1,360	2,160	.794	.89	A.
July.....	5,110	888	1,620	.596	.69	A.
August.....	5,360	550	1,660	.610	.70	A.
September.....	5,400	578	1,680	.618	.69	B.
October.....	20,200	1,150	2,860	1.05	1.21	C.
November.....	2,630	764	1,870	.688	.77	B.
December.....	9,270	816	3,840	1.41	1.63	B.
The year.....	20,200	550	3,220	1.18	16.09	

NOTE.—See *Accuracy* in station description.

NEW RIVER AT FAYETTE, W. VA.

Location.—At highway bridge connecting Fayette and South Fayette, W. Va., 850 feet above the mouth of Wolf Creek.

Records available.—July 29, 1895, to May 22, 1901; August 11, 1902, to December 31, 1904; July 16, 1908, to December 31, 1911.

Drainage area.—6,800 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Rock bed strewn with large boulders which cause boils and eddies at high stages.

Discharge measurements.—Made from upstream side of bridge.

Floods.—The flood of 1878 reached a height of about 53 feet as referred to by the present gage datum.

Winter flow.—The relation of gage height to discharge is little if at all affected by ice.

Accuracy.—Errors have entered into many of the gage readings prior to 1908, particularly before the chain gage was installed, November 20, 1903, the original wire gage being frequently many tenths in error. Owing to this cause and to the difficulty in making accurate measurements, all estimates of discharge heretofore published are only fair. Estimates of discharge for 1911 are withheld from publication for the present.

Daily gage height, in feet, of New River at Fayette, W. Va., for 1911.

[A. E. Pierson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	8.15	13.55	3.76	6.93	5.45	2.37	1.85	0.09	3.05	0.65	2.08	3.45
2.....	12.50	11.23	3.90	6.78	5.72	2.42	1.50	.06	4.60	.85	1.82	3.28
3.....	14.75	9.45	3.78	8.00	5.55	2.57	1.23	.04	4.35	5.60	1.68	2.95
4.....	18.10	7.92	3.68	12.18	5.29	2.38	1.10	.02	3.55	4.90	1.35	2.82
5.....	14.40	7.82	3.48	14.20	4.82	2.34	1.24	.00	2.20	3.50	1.18	2.62
6.....	10.68	7.70	9.33	17.63	4.43	2.46	1.97	.12	1.72	2.60	3.02	2.42
7.....	7.60	6.70	13.78	16.42	4.17	2.68	1.73	1.52	1.48	2.05	6.20	2.25
8.....	6.15	5.48	10.86	14.62	3.95	2.58	1.97	2.55	1.30	2.15	9.72	2.24
9.....	5.45	6.88	10.06	14.52	3.72	3.20	2.53	1.95	.92	2.20	8.52	2.20
10.....	5.42	8.48	11.40	14.27	3.55	3.16	3.32	1.50	.78	3.75	5.78	2.05
11.....	5.15	11.78	13.60	10.97	3.52	2.66	2.93	1.28	1.38	3.40	4.88	2.02
12.....	4.42	9.26	11.83	9.22	3.39	2.21	2.73	1.05	1.72	3.50	4.58	2.00
13.....	3.52	8.13	10.18	8.19	3.29	2.06	2.23	.85	1.78	3.10	4.58	1.90
14.....	3.62	6.73	8.58	7.95	3.15	2.16	1.95	2.38	1.60	2.80	4.54	1.98
15.....	6.55	5.98	8.50	8.37	4.09	1.61	1.70	2.05	1.25	2.40	4.48	1.95
16.....	5.60	5.33	7.68	12.59	4.85	1.51	1.65	1.60	1.05	2.35	4.38	2.20
17.....	5.38	4.78	6.99	12.45	4.07	1.26	1.65	1.38	1.05	3.95	4.80	2.70
18.....	5.25	4.38	6.33	9.87	3.39	1.24	1.37	1.18	3.15	11.00	4.20	3.80
19.....	4.92	4.20	6.56	8.47	2.99	1.28	1.20	.90	2.50	18.05	4.65	4.75
20.....	4.68	5.78	7.53	8.37	2.77	1.44	.95	.55	1.85	10.65	6.00	4.45
21.....	4.82	6.03	7.40	9.97	2.55	1.61	.70	.38	1.20	7.50	5.23	3.38
22.....	5.70	5.58	6.90	9.92	2.42	1.84	.63	.15	1.00	6.65	4.60	3.05
23.....	6.65	5.06	6.63	8.92	2.31	1.78	.63	.05	.90	4.75	3.90	3.62
24.....	8.70	4.56	6.00	8.02	2.21	1.74	.40	.12	1.00	4.65	3.50	10.20
25.....	7.60	4.18	5.88	7.35	2.29	1.66	.42	.25	1.55	4.45	3.75	9.90
26.....	6.65	4.10	4.88	6.45	2.21	1.58	.27	.38	1.55	3.85	3.65	9.40
27.....	6.55	3.98	4.50	5.99	2.11	1.78	.23	.38	1.15	3.30	3.85	9.85
28.....	7.05	3.90	6.50	5.52	2.03	2.11	.15	.22	1.05	3.38	3.55	9.50
29.....	8.55	.....	7.42	5.35	1.81	2.04	.05	.30	.90	3.55	3.65	9.15
30.....	16.35	.....	7.08	5.35	2.07	2.51	.10	1.60	.65	2.18	3.55	8.20
31.....	19.58	.....	6.93	.....	2.18	.....	.03	1.85	.....	2.28	.....	7.30

NOTE.—No ice reported by the observer. Relation of gage height to discharge probably not affected by ice during 1911.

NORTH FORK OF NEW RIVER NEAR CRUMPLER, N. C.

Location.—Seven-eighths of a mile above the confluence of North and South Forks of New River, and about 2½ miles north of Crumpler, N. C.

Records available.—August 13, 1908, to December 31, 1911.

Drainage area.—279 square miles.

Gage.—Staff gage attached to posts on right bank. The chain gage in use from August 13, 1908, was replaced by the present staff gage July 23, 1911. The staff gage is at the same location and reads to same datum as former chain gage.

Channel.—Practically permanent.

Discharge measurements.—Made from a boat at a section one-eighth mile below the gage, or by wading. The boat cable section was formerly at a ford one-fourth mile above gage, but was moved July 23, 1911, to a point one-eighth mile below gage.

Winter flow.—Flow little if at all affected by ice.

Accuracy.—The gage height record is considered very reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by Horton and Bailey by wading near the old measuring-section about one-fourth mile above the gage:

July 23, 1911: Gage height, 1.42 feet; discharge, 159 second-feet.

Daily gage height, in feet, of North Fork of New River near Crumpler, N. C., for 1911.

[John J. Garvey, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	2.60	3.23	1.94	2.61	2.88	2.00	1.60	1.46	2.12	1.38	1.60	1.69
2.....	4.16	2.73	1.98	2.52	2.63	1.87	1.57	1.46	1.68	1.44	1.56	1.83
3.....	4.75	2.50	1.95	2.47	2.49	1.74	1.55	1.68	1.56	1.58	1.52	1.77
4.....	4.61	2.60	1.93	2.69	2.44	1.71	1.82	2.16	1.48	1.90	1.50	1.70
5.....	3.17	2.45	1.87	5.32	2.39	2.73	2.71	1.71	1.46	1.64	1.55	1.62
6.....	2.83	2.33	3.01	5.05	2.32	2.67	1.77	1.78	1.46	1.43	1.80	1.63
7.....	2.60	2.33	3.37	3.93	2.22	2.04	1.63	1.71	1.63	1.41	2.60	1.62
8.....	2.43	2.73	4.93	3.79	2.16	2.03	1.75	1.70	1.47	1.44	1.98	1.62
9.....	2.29	3.75	4.55	3.72	2.17	1.97	1.77	1.50	1.41	1.50	2.21	1.60
10.....	1.96	4.03	3.95	3.49	2.15	1.83	1.91	1.39	1.40	1.49	2.14	1.61
11.....	2.07	3.31	3.47	3.18	2.09	1.83	2.09	1.36	1.76	1.96	2.02	1.64
12.....	2.09	3.01	3.11	3.17	2.06	1.79	1.91	1.32	1.96	1.68	2.00	1.66
13.....	2.09	2.76	2.85	3.25	2.58	1.77	1.86	1.73	1.62	1.55	2.24	1.61
14.....	2.06	2.55	2.87	3.33	3.28	1.75	1.97	1.48	1.52	1.50	1.99	1.60
15.....	2.03	2.46	2.61	3.61	2.57	1.69	1.67	1.40	1.46	1.76	1.97	1.74
16.....	1.97	4.33	2.46	3.56	2.35	1.64	1.61	1.49	1.49	1.64	1.88	2.16
17.....	1.89	2.25	2.39	3.23	2.23	1.65	1.57	1.43	1.48	3.41	1.82	2.12
18.....	1.95	2.21	2.37	3.95	2.17	1.67	1.56	1.38	1.54	3.71	1.91	1.84
19.....	1.93	2.19	2.40	3.89	2.18	1.69	1.51	1.43	1.45	2.55	2.06	1.76
20.....	1.91	2.29	2.59	3.43	2.09	2.02	1.51	1.40	1.43	2.14	1.96	1.71
21.....	2.05	2.20	2.28	3.03	2.07	1.77	1.55	1.35	2.02	1.98	1.95	2.00
22.....	2.19	2.03	2.21	2.95	1.99	1.67	1.65	1.30	2.00	2.02	1.87	2.43
23.....	3.01	2.18	2.34	2.73	1.99	1.61	1.46	1.27	1.68	2.20	1.84	3.29
24.....	2.65	2.09	2.21	2.59	2.11	1.75	1.40	1.28	1.52	1.86	1.94	2.78
25.....	2.46	2.01	2.19	2.49	1.95	1.68	1.52	1.28	1.50	1.78	1.92	2.88
26.....	2.45	1.99	2.21	2.45	1.91	1.64	1.46	1.34	1.50	1.73	1.86	2.73
27.....	2.46	2.01	3.17	2.37	1.85	2.29	1.38	1.56	1.48	1.70	1.88	3.00
28.....	2.59	1.96	2.71	2.31	1.83	2.31	1.36	1.47	1.44	1.68	1.92	2.70
29.....	2.65	.....	2.65	2.35	1.79	1.94	1.35	1.66	1.46	1.66	1.92	2.51
30.....	4.05	.....	2.78	2.43	1.74	1.69	1.33	1.95	1.45	1.63	1.75	2.39
31.....	3.70	.....	2.66	.....	1.87	.....	1.36	3.09	.....	1.60	.....	2.64

NOTE.—Slush ice reported Feb. 23. Relation of gage height to discharge probably not affected by ice during 1911.

REED CREEK AT GRAHAMS FORGE, VA.

Location.—At highway bridge at Grahams Forge, Va.

Records available.—July 29, 1908, to December 31, 1911.

Drainage area.—247 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Practically permanent; bottom solid rock.

Discharge measurements.—Made from downstream side of bridge.

Point of zero flow.—A determination by leveling July 20, 1911, indicates that there would be no flow past the gage if the river stage were to fall to 0.6 foot ± 0.1 foot, by the gage datum. Point of control is permanent.

Winter flow.—Relation of gage height to discharge is sometimes affected by ice for short periods.

Artificial control.—There is a dam and grist mill just above the station. The storage is small and the miller states that water flows over the dam at all times. The flow is therefore little if at all modified by the operation of the dam.

Accuracy.—The gage height record is considered accurate and reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by Horton and Bailey July 20, 1911: Gage height, 2.16 feet; discharge, 106 second-feet.

Daily gage height, in feet, of Reed Creek at Grahams Forge, Va., for 1911.

[Munsey Runion and J. T. Black, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	2.42	3.20	2.43	2.72	2.65	2.32	2.12	2.04	2.65	2.00	2.30	2.19
2.....	3.38	3.97	2.42	2.72	2.60	2.26	2.13	2.04	2.31	2.23	2.23	2.16
3.....	3.71	2.84	2.40	2.74	2.55	2.24	2.08	2.00	2.26	2.96	2.25	2.20
4.....	3.42	2.74	2.40	3.60	2.52	2.21	2.09	2.08	2.16	2.43	2.18	2.22
5.....	2.83	2.72	2.38	4.14	2.51	2.20	2.08	2.36	2.12	2.28	2.13	2.18
6.....	2.62	2.64	2.39	4.08	2.48	2.24	2.15	2.20	2.18	2.16	2.35	2.10
7.....	2.52	2.58	3.26	3.64	2.46	2.20	2.12	2.16	2.16	2.14	2.64	2.25
8.....	2.48	2.60	3.20	3.46	2.44	2.28	2.14	2.20	2.14	2.14	2.50	2.14
9.....	2.41	3.88	3.31	3.57	2.44	2.20	2.18	2.20	2.16	2.12	2.57	2.12
10.....	2.30	4.20	3.82	3.50	2.42	2.21	2.18	2.16	2.12	2.19	2.71	2.10
11.....	2.30	3.40	3.55	3.30	2.44	2.18	2.16	2.08	2.18	2.26	2.60	2.24
12.....	2.30	3.32	3.18	3.08	2.39	2.16	2.42	2.02	2.16	2.28	2.56	2.11
13.....	2.30	2.94	3.02	3.02	2.38	2.18	2.24	2.52	2.16	2.24	2.52	2.20
14.....	2.30	2.84	2.86	3.04	2.59	2.18	2.22	2.32	2.13	2.22	2.50	2.17
15.....	2.28	2.76	2.84	3.37	2.50	2.15	2.17	2.22	2.06	2.14	2.45	2.28
16.....	2.28	2.69	2.80	3.55	2.46	2.16	2.14	2.16	2.00	2.14	2.40	2.22
17.....	2.26	2.61	2.72	3.24	2.43	2.16	2.14	2.18	2.14	2.32	2.38	2.32
18.....	2.26	2.57	2.68	3.07	2.42	2.18	2.10	2.20	2.03	4.66	2.39	2.32
19.....	2.26	2.59	2.68	2.98	2.38	2.19	2.10	2.12	1.99	3.10	2.40	2.30
20.....	2.12	2.66	2.72	3.14	2.34	2.32	2.11	2.10	2.14	2.76	2.40	2.31
21.....	2.26	2.70	2.70	3.20	2.32	2.28	1.88	2.06	2.04	2.60	2.37	2.33
22.....	2.62	2.65	2.66	3.06	2.31	2.18	2.04	2.05	2.26	2.52	2.36	2.38
23.....	3.54	2.66	2.64	2.94	2.28	2.20	2.04	2.00	2.28	2.50	2.34	3.56
24.....	3.24	2.58	2.58	2.83	2.28	2.16	2.02	2.05	2.16	2.46	2.34	3.05
25.....	2.80	2.54	2.55	2.76	2.26	2.14	2.02	2.14	2.12	2.43	2.33	3.10
26.....	2.68	2.50	2.50	2.72	2.26	2.16	2.03	2.20	2.12	2.38	2.29	2.99
27.....	2.60	2.48	2.76	2.66	2.26	2.16	2.02	2.42	2.04	2.36	2.29	3.00
28.....	2.59	2.46	2.86	2.62	2.24	2.18	2.03	2.24	2.03	2.30	2.26	2.92
29.....	2.67	.....	2.77	2.60	2.20	2.16	2.02	2.18	2.04	2.32	2.31	2.72
30.....	4.52	.....	2.77	2.61	2.23	2.16	2.05	2.30	1.99	2.29	2.22	2.68
31.....	3.62	.....	2.74	.....	2.22	.....	2.00	2.60	.....	2.30	.....	2.70

NOTE.—No ice reported. Relation of gage height to discharge probably not affected by ice.

BIG REED ISLAND CREEK NEAR ALLISONIA, VA.

Location.—Twelve hundred feet above a suspension footbridge at J. P. Thomas's farm, $1\frac{1}{2}$ miles from Allisonia, Va., and half a mile above mouth of Little Reed Island Creek.

Records available.—July 31, 1908, to December 31, 1911.

Drainage area.—291 square miles.

Gage.—Vertical staff gage fastened to a tree on right bank; datum unchanged since established.

Channel.—The channel is liable to change caused by deposits of silt from ore washing; the point of control below the gage is permanent and is unaffected by the silt.

Discharge measurements.—Made from downstream side of suspension footbridge 1,200 feet below gage, or by wading under bridge.

Point of zero flow.—A determination of leveling July 19, 1911, indicates that there would be no flow past the gage if the river stage were to fall to -0.7 foot ± 0.2 foot.

Winter flow.—The relation of gage height to discharge is sometimes, though not frequently, affected by ice in winter.

Accuracy.—Records of gage height are considered reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by Horton and Bailey:

July 19, 1911: Gage height, 0.40 foot; discharge, 172 second-feet.

Daily gage height, in feet, of Big Reed Island Creek near Allisonia, Va., for 1911.

[K. M. Thomas, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....		0.75	0.6	0.65	0.9	0.7	0.5	0.3	0.7	0.3	0.5	0.56
2.....	1.5	.65	.6	.6	.85	.6	.4	.3	.55	.4	.5	.54
3.....	1.6	.6	.6	.6	.7	.5	.4	.3	.55	.6	.4	.54
4.....	1.6	.6	.6	.65	.7	.5	.4	.3	.4	.5	.4	.52
5.....	.95	.6	.6	1.85	.65	.6	.95	.5	.4	.4	.4	.43
6.....	.8	.7	.65	1.75	.6	.65	.55	1.05	.35	.4	.55	.44
7.....	.8	.7	.8	1.1	.6	.75	.5	.55	.3	.4	.95	a.56
8.....	.7	.8	.8	1.65	.6	1.05	1.05	.4	.3	.5	.6	.48
9.....	.7	1.2	1.15	1.25	.6	.65	.65	.4	.4	.5	.6	.46
10.....	.7	1.2	1.0	1.05	.6	.55	.55	.35	.55	.4	.65	.47
11.....	c.7	.95	1.0	.9	.6	.5	.5	.3	.5	.5	.6	.48
12.....	.7	.8	.85	.95	.6	.5	.5	.4	.5	.5	.56	.50
13.....	.6	.7	.75	1.0	.75	.5	.6	.6	.4	.4	1.05	.48
14.....	.6	.7	.8	1.25	1.7	.5	.65	.55	.3	.4	.66	.48
15.....	.6	.7	.8	1.45	.95	.5	.55	.4	.3	.4	.53	.56
16.....	.6	.7	.7	1.4	.8	.5	.4	.4	.3	.4	.58	1.2
17.....	.6	.7	.6	1.05	.7	.5	.4	.35	.3	.5	.54	1.1
18.....	.6	.7	.65	.9	.7	.5	.4	.3	.35	b 2.4	.54	.76
19.....	.6	.7	.7	.95	.6	.5	.4	.3	.3	.85	.56	.66
20.....	.6	.7	.75	1.05	.6	.5	.4	.3	.3	.65	.60	.60
21.....	.6	c.7	.65	.9	.6	.5	.4	.3	.35	.6	.54	.66
22.....	.75	.7	.6	.8	.6	.4	.4	.3	.9	.55	.51	.94
23.....	.95	.6	.6	.8	.65	.4	.4	.3	.65	.85	.50	1.6
24.....	.75	.6	.6	.8	.6	.4	.3	.3	.5	.6	.54	.98
25.....	.7	.6	.6	.8	.6	.5	.35	.3	.4	.5	.62	1.2
26.....	.7	.6	.6	.7	.6	.5	.35	.65	.4	.5	.50	.94
27.....	.7	.6	.85	.7	.55	.6	.3	1.35	.4	.5	.50	1.0
28.....	.6	.6	.75	.7	.6	1.1	.3	.5	.4	.5	.52	.85
29.....	.6		.7	.7	.55	.7	.3	.55	.4	.5	.72	.80
30.....	1.0		.7	.8	.5	.55	.3	1.15	.35	.5	.66	.72
31.....	1.0		.7		.75		.3	.9		.5		

a Observer reported "backwater."

b Gage height 3.3 feet at 7 a. m. Oct. 18.

c Slush ice running.

LITTLE RIVER NEAR COPPER VALLEY, VA.

Location.—At highway bridge about 5 miles south of Childress and half a mile north of Copper Valley, Va., and 600 feet above the mouth of Indian Creek.

Records available.—July 25, 1908, to December 31, 1911.

Drainage area.—195 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Regular and practically permanent.

Discharge measurements.—Made from downstream side of bridge.

Point of zero flow.—A determination by leveling, July 18, 1911, indicates that there would be no flow past the gage if the river stage were to fall to 1.8 feet, ± 0.2 foot. Control probably permanent.

Winter flow.—The discharge is affected by ice for short periods in the winter.

Accuracy.—Records of gage height are considered reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by Horton and Bailey:

July 18, 1911: Gage height, 3.25 feet; discharge, 125 second-feet.

Daily gage height, in feet, of Little River near Copper Valley, Va., for 1911.

[T. A. DeHart, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	3.57	3.70	3.39	3.44	3.82	3.98	3.24	3.15	3.96	3.15	3.29	3.29
2.....	3.75	3.63	3.41	3.39	3.64	3.44	3.25	3.15	3.45	3.35	3.29	3.45
3.....	4.63	3.57	3.40	3.54	3.54	3.35	3.24	3.15	3.31	3.70	3.21	3.52
4.....	4.37	3.54	3.35	3.86	3.52	3.32	3.29	3.11	3.25	3.35	3.25	3.30
5.....	3.83	3.55	3.34	5.80	3.52	3.36	3.77	3.30	3.25	3.28	3.25	3.30
6.....	3.55	3.45	3.51	4.94	3.52	3.59	3.46	3.88	3.25	3.20	3.47	3.52
7.....	3.85	3.47	3.65	4.19	3.46	3.68	3.39	3.38	3.26	3.16	3.79	3.38
8.....	3.67	3.43	3.60	4.74	3.48	4.00	4.39	3.32	3.20	3.24	3.48	3.52
9.....	3.53	4.07	3.63	4.44	3.50	3.56	3.56	3.38	3.20	3.31	3.46	3.30
10.....	3.55	4.13	4.36	4.04	3.48	3.40	3.46	3.18	3.44	3.31	3.60	3.29
11.....	3.69	3.77	4.20	3.89	3.45	3.35	3.36	3.08	3.40	3.31	3.42	3.28
12.....	3.55	3.70	3.87	3.90	3.44	3.36	3.34	3.11	3.32	3.34	3.41	3.29
13.....	3.49	3.65	3.75	4.19	3.56	3.33	3.30	3.48	3.28	3.21	3.61	3.28
14.....	3.45	3.55	3.85	4.32	4.02	3.29	3.70	3.38	3.20	3.20	3.46	3.25
15.....	3.43	3.54	3.80	4.46	3.52	3.28	3.36	3.25	3.21	3.19	3.39	3.34
16.....	3.37	3.53	3.60	4.42	3.45	3.24	3.26	3.15	3.20	3.18	3.36	4.30
17.....	3.37	3.49	3.47	4.04	3.44	3.08	3.20	3.14	3.20	3.28	3.35	4.08
18.....	3.39	3.46	3.59	3.92	3.45	3.19	3.22	3.15	3.20	5.72	3.41	3.80
19.....	3.45	3.53	3.57	3.89	3.40	3.49	3.20	3.18	3.20	4.10	3.38	3.46
20.....	3.44	3.65	3.75	4.04	3.39	3.52	3.18	3.16	3.18	3.55	3.38	3.39
21.....	3.45	3.60	3.53	4.32	3.36	3.38	3.20	3.10	3.22	3.42	3.36	3.42
22.....	3.63	3.70	3.46	3.74	3.33	3.32	3.19	3.10	3.70	3.38	3.32	3.60
23.....	4.01	3.56	3.43	3.66	3.42	3.25	3.20	3.08	3.62	3.62	3.31	4.59
24.....	3.65	3.51	3.37	3.68	3.39	3.28	3.18	3.08	3.29	3.46	3.36	3.99
25.....	3.53	3.44	3.35	3.64	3.36	3.94	3.16	3.09	3.21	3.38	3.38	4.28
26.....	3.55	3.40	3.37	3.64	3.28	3.94	3.16	3.30	3.25	3.34	3.32	3.95
27.....	3.53	3.36	3.63	3.60	3.32	3.56	3.15	3.50	3.21	3.34	3.32	3.88
28.....	3.53	3.40	3.53	3.59	3.34	3.69	3.14	3.36	3.16	3.28	3.35	3.65
29.....	3.46	-----	3.43	3.66	3.33	3.50	3.16	3.30	3.18	3.25	3.45	3.38
30.....	4.37	-----	3.75	3.79	3.29	3.32	3.15	3.95	3.15	3.22	3.35	3.68
31.....	3.99	-----	3.51	-----	3.38	-----	3.14	3.98	-----	3.22	-----	3.75

NOTE.—Observer made no report concerning ice. Relation of gage height to discharge probably not affected by ice during 1911.

WALKER CREEK AT STAFFORDSVILLE, VA.

Location.—At highway bridge at Staffordsville, Va., 500 feet below the mouth of Whitley Creek.

Records available.—July 24, 1908, to December 31, 1911.

Drainage area.—277 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Rocky; practically permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Relation of gage height to discharge not affected by ice.

Artificial control.—A dam and power plant 300 feet above the station may affect the flow at low water.

Accuracy.—Gage height record is considered reliable. Sufficient data have not been collected to permit estimates of discharge to be made.

The following discharge measurement was made by Horton and Bailey:

July 16, 1911: Gage height, 3.34 feet; discharge, 136 second-feet.

Daily gage height, in feet, of Walker Creek at Staffordsville, Va., for 1911.

[J. F. Durham, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	3.90	4.98	3.51	4.16	3.90	3.54	3.22	2.90	3.54	2.80	3.30	3.24
2.....	5.76	4.60	3.52	4.06	3.84	3.42	3.13	2.86	3.38	3.06	3.22	3.24
3.....	6.62	4.36	3.48	4.14	3.72	3.28	3.07	2.88	3.22	4.27	3.20	3.26
4.....	5.82	4.18	3.44	5.65	3.68.	3.19	3.22	2.89	3.10	3.72	3.20	3.21
5.....	4.70	4.05	3.40	6.24	3.60	3.20	3.26	3.19	3.02	3.43	3.20	3.20
6.....	4.26	3.90	3.92	6.10	3.60	3.16	3.22	3.17	3.10	3.28	3.35	3.15
7.....	3.95	3.84	5.38	5.52	3.54	3.16	3.20	3.02	3.08	3.20	3.92	3.18
8.....	3.92	3.94	4.95	5.70	3.54	3.18	3.56	3.10	3.06	3.20	3.86	3.16
9.....	3.70	5.62	5.30	5.85	3.55	3.20	3.22	2.98	3.00	3.18	3.94	3.16
10.....	3.52	6.35	6.90	5.46	3.53	3.12	3.12	2.94	2.96	3.26	4.06	3.17
11.....	3.46	5.22	6.38	5.07	3.50	3.05	3.34	2.88	3.00	3.56	3.93	3.19
12.....	3.49	4.76	5.36	4.90	3.50	3.04	3.30	2.88	3.02	3.57	3.82	3.13
13.....	3.40	4.42	5.05	4.82	3.44	3.00	3.38	3.12	3.07	3.44	3.82	3.18
14.....	3.42	4.28	5.37	5.06	3.42	3.00	3.48	3.52	2.99	3.32	3.80	3.14
15.....	3.38	4.10	5.07	5.45	3.40	3.00	3.48	3.20	2.96	3.24	3.78	3.18
16.....	3.30	3.95	4.71	5.62	3.36	2.98	3.30	3.08	2.98	3.20	3.70	3.32
17.....	3.32	3.82	4.42	5.22	3.34	2.94	3.24	2.95	2.94	3.98	3.65	3.42
18.....	3.34	3.74	4.26	4.85	3.32	3.03	3.14	2.94	2.96	7.95	3.59	3.40
19.....	3.30	3.74	4.22	4.64	3.32	3.10	3.10	2.92	2.95	5.44	3.68	3.32
20.....	3.26	3.88	4.30	4.76	3.30	3.58	3.04	2.85	2.93	4.52	3.64	3.30
21.....	3.32	3.98	4.21	4.80	3.25	3.68	3.00	2.90	2.90	4.12	3.61	3.30
22.....	3.56	3.82	4.08	4.70	3.26	3.28	3.06	2.85	2.96	3.94	3.58	3.45
23.....	4.90	3.88	4.01	4.50	3.22	3.18	2.95	2.78	3.10	3.90	3.51	5.92
24.....	4.46	3.77	3.90	4.30	3.22	3.19	2.90	2.84	3.10	3.76	3.50	4.96
25.....	4.15	3.72	3.81	4.16	3.20	3.16	2.84	2.86	2.99	3.61	3.46	5.01
26.....	4.02	3.68	3.74	4.04	3.16	3.26	2.84	2.90	2.94	3.55	3.42	4.73
27.....	4.00	3.63	4.73	3.94	3.16	3.19	2.82	2.87	2.92	3.50	3.40	4.70
28.....	3.93	3.58	4.73	3.89	3.18	3.27	2.82	3.26	2.88	3.47	3.39	4.48
29.....	3.92	.....	4.50	3.84	3.13	3.60	2.92	3.08	2.90	3.40	3.30	4.25
30.....	6.06	.....	4.48	3.84	3.09	3.36	2.82	3.20	2.91	3.36	3.29	4.10
31.....	5.75	.....	4.31	.....	3.14	.....	2.78	3.56	.....	3.33	.....	4.11

NOTE.—Relation of gage height to discharge probably not affected by ice during 1911.

WOLF CREEK NEAR NARROWS, VA.**Location.**—At highway bridge 3 miles above Narrows, Va., 1,500 feet below the New River, Holston & Western Railroad bridge, and 2½ miles above mouth of Mill Creek.**Records available.**—July 22, 1908, to December 31, 1911.**Drainage area.**—223 square miles.**Gage.**—Standard chain gage attached to bridge; datum unchanged since established.**Channel.**—Rocky, practically permanent.**Discharge measurements.**—Made from downstream side of bridge.**Point of zero flow.**—A determination of leveling July 15, 1911, indicates that there would be no flow past the gage if the river stage were to fall to 1.1 feet to ± 0.2 foot.**Winter flow.**—Relation of gage height to discharge not affected by ice except for short periods during extremely cold weather.**Accuracy.**—Records of gage height are considered reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by Horton and Bailey:

July 15, 1911: Gage height, 2.69 feet; discharge, 71 second-feet.

Daily gage height, in feet, of Wolf Creek near Narrows, Va., for 1911.

[J. A. Hale, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.78	4.65	3.19	3.69	3.48	2.88	2.74	2.44	2.64	2.48	2.89	3.04
2	5.40	4.28	3.17	3.63	3.40	2.84	2.62	2.45	2.62	3.18	2.84	3.02
3	5.53	4.02	3.13	3.68	3.31	2.75	2.62	2.45	2.56	4.86	2.80	3.00
4	5.05	4.94	3.08	5.14	3.25	2.70	2.68	2.48	2.52	3.72	2.79	3.00
5	4.26	3.83	3.03	5.67	3.22	2.70	2.69	2.64	2.54	3.36	2.78	2.94
6	3.92	3.68	3.79	5.60	3.20	2.70	2.65	2.66	2.59	3.08	2.86	2.90
7	3.62	3.60	4.96	5.02	3.18	2.72	2.62	2.54	2.63	3.04	3.29	2.90
8	3.52	3.76	4.86	5.00	3.15	2.69	2.64	2.58	2.63	3.03	3.28	2.88
9	3.41	5.35	4.70	5.10	3.13	2.64	2.68	2.56	2.58	3.00	3.22	2.86
10	3.28	5.90	6.52	4.86	3.12	2.62	2.92	2.50	2.52	2.96	3.20	2.81
11	3.15	4.95	5.30	4.48	3.09	2.60	2.86	2.46	2.51	3.34	3.18	2.80
12	3.10	4.40	4.66	4.31	3.06	2.60	2.83	2.44	2.66	3.38	3.16	2.80
13	3.09	4.04	4.32	4.15	3.01	2.60	2.86	2.60	2.68	3.22	3.38	2.79
14	3.04	3.88	4.32	4.02	3.00	2.60	2.75	2.79	2.60	3.12	3.37	2.80
15	3.01	3.70	4.10	4.30	2.98	2.56	2.71	2.64	2.56	3.03	3.34	2.80
16	2.95	3.56	3.95	4.61	2.96	2.59	2.66	2.58	2.54	3.00	3.26	2.86
17	2.95	3.42	3.80	4.40	2.93	2.58	2.62	2.54	2.61	3.12	3.18	2.92
18	2.99	3.36	3.71	4.16	2.92	2.61	2.59	2.56	2.60	6.88	3.32	2.91
19	2.96	3.37	3.65	4.03	2.91	2.66	2.56	2.66	2.56	4.68	3.32	2.87
20	2.94	3.60	3.82	4.28	2.89	3.16	2.51	2.55	2.54	4.06	3.66	2.84
21	2.99	3.63	3.75	4.53	2.86	2.81	2.53	2.54	2.54	3.72	3.52	2.84
22	3.31	3.51	3.72	4.39	2.82	2.70	2.51	2.50	2.60	3.51	3.38	2.92
23	3.78	3.52	3.72	4.16	2.80	2.62	2.50	2.44	2.97	3.46	3.28	4.68
24	3.70	3.42	3.54	3.95	2.83	2.58	2.48	2.45	2.78	3.33	3.20	4.19
25	3.56	3.38	3.44	3.80	2.79	2.74	2.47	2.44	2.68	3.22	3.28	4.32
26	3.49	3.34	3.41	3.68	2.74	2.72	2.46	2.50	2.62	3.13	3.20	4.16
27	3.60	3.29	3.98	3.59	2.76	2.66	2.46	2.48	2.59	3.08	3.16	4.19
28	3.62	3.23	3.98	3.49	2.71	3.16	2.45	2.54	2.58	3.04	3.18	4.04
29	3.68	-----	3.92	3.43	2.69	3.06	2.44	2.50	2.54	2.99	3.16	3.82
30	5.85	-----	3.87	3.41	2.64	2.85	2.46	2.58	2.51	2.96	3.12	3.71
31	5.40	-----	3.76	-----	2.70	-----	2.46	2.64	-----	2.92	-----	3.72

NOTE.—Relation of gage height to discharge probably not affected by ice during 1911.

BLUESTONE RIVER AT LILLY, W. VA.

Location.—At Lilly, W. Va., 2,000 feet below the mouth of Little Bluestone River.

Records available.—August 22, 1908, to December 31, 1911.

Drainage area.—454 square miles.

Gage.—Vertical staff gage in two sections; datum unchanged since established.

Channel.—Practically permanent.

Discharge measurements.—Made from a boat 150 feet above gage, or by wading.

Point of zero flow.—Levels taken August 24, 1910, indicate that there would be no flow past the gage if the river stage were to fall to 0.0 ± 0.2 feet.

Winter flow.—During portions of December, January, and February, the flow is at times affected by ice.

Accuracy.—See footnotes to table of daily gage height.

Discharge measurements of Bluestone River at Lilly, W. Va., in 1911.

Date.	Hydrographer.	Gage height.	Dis-charge.
		<i>Feet.</i>	<i>Sec.-feet.</i>
July 13	Horton and Bailey	1.92	218
Oct. 18	Bailey and Perwien	5.90	4,460
20	do.	2.98	786

NOTE.—Measurements not made at the regular measuring section.

Daily gage height, in feet, of Bluestone River at Lilly, W. Va., for 1911.

[W. H. Lilly, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.	3.15	4.65	2.04	2.62	2.85	1.32	1.42	0.99	1.22	0.97	1.56	2.20
2.	5.50	4.20	2.05	2.66	2.68	1.40	1.41	.94	1.18	2.60	1.49	2.25
3.	4.90	3.12	2.22	4.00	2.66	1.44	1.39	.89	1.15	5.20	1.39	2.00
4.	4.20	2.85	2.28	5.55	2.64	1.36	1.44	.92	1.11	4.20	1.32	2.00
5.	3.75	2.68	2.35	5.00	2.66	1.45	2.15	.98	1.08	2.40	1.22	1.80
6.	2.70	2.65	2.45	4.95	2.45	1.38	1.95	.99	1.02	3.55	2.50	1.75
7.	2.40	2.59	6.35	4.50	2.29	1.46	2.20	.96	.92	2.90	3.75	1.70
8.	2.25	2.88	6.20	4.20	2.00	1.52	2.55	.97	.95	2.25	3.58	1.72
9.	2.12	4.45	5.65	5.05	1.99	1.46	2.15	.94	1.06	2.42	3.45	1.64
10.	1.95	5.55	4.80	4.85	1.96	1.42	2.12	.96	1.10	2.55	3.34	1.61
11.	1.82	3.95	4.55	3.62	1.92	1.32	2.04	1.02	1.06	2.30	2.35	1.60
12.	1.92	3.10	3.85	2.95	1.79	1.18	1.89	1.01	1.02	2.80	2.14	1.60
13.	1.88	2.84	3.20	2.85	1.62	1.07	1.86	1.09	.96	2.85	2.20	1.65
14.	1.90	2.62	2.95	3.10	1.60	1.06	1.57	1.02	.89	2.60	2.25	1.64
15.	1.85	2.48	2.82	3.90	1.64	1.01	1.42	.96	.89	2.20	2.12	1.63
16.	1.82	2.25	2.60	4.32	1.52	1.02	1.40	.94	1.02	2.02	2.12	1.83
17.	1.92	2.20	2.42	4.10	1.44	1.04	1.32	.90	.96	2.39	2.19	1.83
18.	1.86	2.35	2.55	3.85	1.40	1.09	1.22	.94	1.02	5.70	2.16	1.86
19.	1.78	3.00	3.25	3.72	1.40	1.18	1.19	.95	1.22	3.95	3.70	1.85
20.	1.82	3.15	3.90	3.95	1.42	1.09	1.12	.96	1.22	2.79	3.95	1.80
21.	1.95	3.05	3.45	4.20	1.44	1.16	1.15	.92	1.12	2.48	3.25	1.80
22.	2.45	2.99	3.25	3.70	1.49	1.20	1.14	.92	1.18	2.30	2.37	1.82
23.	2.82	2.87	2.95	3.05	1.54	1.26	1.09	.96	1.05	2.22	2.32	4.55
24.	2.68	2.25	2.75	2.98	1.52	1.25	1.00	.99	1.02	2.16	3.34	3.66
25.	2.45	2.32	2.70	2.78	1.42	1.65	.96	.95	.92	2.10	3.36	3.66
26.	2.35	2.32	2.58	2.65	1.49	1.85	.97	.93	.96	2.06	3.05	3.45
27.	2.44	2.30	2.42	2.48	1.51	1.59	.97	.89	.91	2.00	2.32	3.40
28.	2.40	2.45	2.52	2.42	1.42	1.52	.96	.93	.92	1.86	2.19	3.00
29.	2.55	.....	2.55	2.34	1.25	1.56	.94	1.10	.96	1.79	2.25	2.80
30.	6.55	.....	2.66	2.85	1.30	1.49	.96	1.25	.94	1.72	2.27	3.00
31.	5.05	.....	2.62	.....	1.45	.....	.96	1.32	.....	1.55	.....	2.90

NOTE.—From a hydrograph comparison between the gage heights observed at Lilly and True, it is believed that the observer at Lilly recorded his observations 1 foot too high Nov. 8 (p. m.) to Nov. 10 (p. m.), Nov. 20 (a. m.) to Nov. 21 (p. m.), and Nov. 24 (a. m.) to Nov. 26 (a. m.). Daily gage heights published above are the means of two observations each day as originally recorded and are believed to be $\frac{1}{2}$ foot too high Nov. 8 and 26, and 1 foot too high Nov. 9, 10, 20, 21, 24, and 25. In computing daily discharge for dates noted above, corrections to gage heights will be applied before entering the discharge rating table, as indicated by the hydrograph comparison.

Observer made no report concerning ice. Relation of gage height to discharge probably affected by ice during January and February, but not during December.

BLUESTONE RIVER NEAR TRUE, W. VA.

Location.—At Barker's ford, 1 mile above the mouth of the river and three-fourths of a mile above True post office.

Records available.—October 17, 1911, to December 31, 1911.

Gage.—Staff gage in two sections, on right side of river.

Channel.—Practically permanent.

Discharge measurements.—Made from a boat 20 feet below gage or by wading.

Winter flow.—The relation of gage height to discharge may be affected by ice for short periods during December, January, and February.

Accuracy.—Gage-height record is considered reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

Discharge measurements of Bluestone River near True, W. Va., in 1911.

Date.	Hydrographer.	Gage height.	Dis-charge.
Oct. 19	Bailey and Perwien.....	<i>Feet.</i> 4.45	<i>Sec.-feet.</i> 2,240
20	do.....	2.90	693

NOTE.—Measurements made at gage, 20 feet above regular gaging section.

Daily gage height, in feet, of Bluestone River near True, W. Va., for 1911.

[Arthur Barker, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1.....		1.88	2.20	11.....		2.06	1.90	21.....	2.50	2.65	1.96
2.....		1.82	2.16	12.....		2.08	1.89	22.....	2.40	2.41	2.13
3.....		1.80	2.12	13.....		2.15	1.86	23.....	2.40	2.28	4.74
4.....		1.80	2.08	14.....		2.48	1.88	24.....	2.30	2.27	3.78
5.....		1.79	2.05	15.....		2.28	1.92	25.....	2.17	2.34	3.78
6.....		2.62	1.94	16.....			1.94	26.....	2.10	2.44	3.65
7.....		3.60	1.97	17.....	5.00	2.16	1.99	27.....	2.02	2.44	4.05
8.....		2.99	1.99	18.....	5.88	2.21	2.04	28.....	2.01	2.40	3.50
9.....		2.52	1.95	19.....	4.17	3.92	2.01	29.....	1.97	2.42	4.02
10.....		2.32	1.91	20.....	3.02	3.08	1.99	30.....	1.90	2.31	3.20
								31.....	1.87	.....	2.84

NOTE.—Observer made no report concerning ice. Relation of gage height to discharge probably not affected by ice during 1911.

GREENBRIER RIVER NEAR MARLINTON, W. VA.

Location.—At Chesapeake & Ohio Railway bridge on the switch that runs to Campbell's lumber mill, $1\frac{1}{2}$ miles above Marlinton, W. Va., and immediately below the mouth of Stoney Creek.

Records available.—July 9, 1908, to December 31, 1911.

Drainage area.—408 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Coarse gravel, practically permanent.

Discharge measurements.—Made from downstream side of bridge.

Point of zero flow.—A determination by leveling August 22, 1910, indicates that there would be no flow past the gage if the river stage were to fall to 2.25 feet \pm 0.2 foot.

Winter flow.—Relation of gage height to discharge may be affected by ice for short periods during December, January, and February.

Accuracy.—Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by Bailey and Perwien:

November 3, 1911: Gage height, 3.75 feet; discharge, 210 second-feet.

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Daily gage height, in feet, of Greenbrier River near Marlinton, W. Va., for 1911.

[P. G. Johnston, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	5.28	6.98	4.31	4.78	4.24	4.20	3.50	3.20	4.92	4.70	3.82	.....
2.....	6.76	6.39	4.39	4.65	4.16	3.92	3.46	3.19	4.45	4.66	3.73	.....
3.....	9.07	5.81	4.32	4.50	4.10	3.68	3.43	3.24	4.11	4.64	3.64	.....
4.....	7.91	5.30	4.22	6.06	4.04	3.57	3.39	3.24	3.82	4.60	3.54	.....
5.....	6.40	4.97	4.14	7.63	3.97	3.82	3.36	3.38	3.66	4.55	3.46	.....
6.....	5.52	4.83	4.06	7.02	3.92	4.23	3.68	3.47	3.56	4.50	3.80	.....
7.....	4.88	4.72	4.36	5.96	3.88	4.16	3.98	3.42	3.50	4.84	5.08	.....
8.....	4.55	4.62	4.78	5.50	3.85	4.72	3.94	3.94	3.44	5.24	5.17	.....
9.....	4.34	4.57	4.76	5.22	3.81	4.33	3.91	3.30	3.37	5.33	4.97	.....
10.....	4.20	4.66	5.55	4.98	3.78	4.10	3.88	3.26	3.43	5.18	4.76	.....
11.....	5.68	4.60	5.86	4.80	3.72	3.97	3.83	3.24	3.42	5.02	4.62	.....
12.....	6.90	4.51	5.72	4.64	3.66	4.05	3.73	3.23	3.38	4.88	.....	.....
13.....	7.36	4.44	5.66	5.30	3.60	4.10	3.61	3.22	3.33	4.60	.....	.....
14.....	6.90	4.36	5.60	6.58	3.58	3.97	3.51	3.21	3.26	4.34	.....	.....
15.....	5.96	4.29	5.54	6.47	3.57	3.81	3.44	3.20	3.62	4.36	.....	.....
16.....	5.58	4.22	5.64	6.18	3.56	3.72	3.36	3.20	5.76	5.04	.....	.....
17.....	5.20	4.15	5.76	5.96	3.56	3.63	3.37	3.19	5.72	5.95	.....	5.60
18.....	4.88	4.10	5.92	5.79	3.54	3.60	3.38	3.18	5.63	8.14	.....	5.78
19.....	4.60	4.04	6.12	5.57	3.53	3.86	3.38	3.17	5.54	6.88	4.83	6.20
20.....	4.37	3.95	6.04	5.36	3.52	3.76	3.37	3.17	5.42	5.64	4.76	5.97
21.....	4.32	4.00	5.64	5.18	3.50	3.86	3.37	3.16	5.30	5.21	4.70	5.76
22.....	5.42	4.28	5.22	5.04	3.48	3.82	3.36	3.16	5.18	5.03	4.60	5.67
23.....	5.96	4.46	5.66	4.94	3.48	3.76	3.35	3.15	5.06	4.86	4.49	5.93
24.....	5.86	4.42	4.94	4.85	3.47	3.73	3.34	3.15	4.94	4.66	4.41	5.78
25.....	5.60	4.36	4.81	4.74	3.46	3.69	3.36	3.14	4.83	4.48	4.34	5.61
26.....	5.72	4.32	4.76	4.62	3.58	3.66	3.35	3.14	4.76	4.38	.....	5.44
27.....	6.66	4.23	5.21	4.50	4.50	3.64	3.32	3.26	4.69	4.27	.....	5.28
28.....	6.91	4.16	5.42	4.44	4.52	3.60	3.28	3.98	4.64	4.17	.....	5.13
29.....	6.46	.....	5.20	4.39	4.90	3.55	3.25	4.92	4.58	4.08	.....	5.30
30.....	11.62	.....	5.07	4.31	4.67	3.52	3.22	5.42	4.53	4.00	.....	5.70
31.....	9.10	.....	4.93	.....	4.44	.....	3.20	5.43	.....	3.91	.....	6.67

NOTE.—Observer made no report concerning ice. Relation of gage height to discharge probably not affected by ice during 1911.

GREENBRIER RIVER AT ALDERSON, W. VA.

Location.—At highway bridge at Alderson, W. Va., half a mile above the mouth of Muddy Creek.

Records available.—August 1, 1895, to July 15, 1906; May 10, 1907, to December 31, 1911.

Drainage area.—1,340 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Permanent or nearly so; wide and shallow.

Discharge measurements.—Made from downstream side of bridge.

Floods.—No record of floods previous to installation of the gage. Maximum gage height since establishment of gage was 18.2 feet, November 26, 1900.

Winter flow.—The records are affected little if any by ice.

The following discharge measurement was made by Bailey and Perwein:

November 4, 1911: Gage height, 2.22 feet; discharge, 513 second-feet.

Daily gage height, in feet, of Greenbrier River at Alderson, W. Va., for 1911.

[W. J. Hancock, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	4.65	5.75	3.18	3.92	3.00	2.48	1.92	1.60	3.65	2.00	2.38	2.88
2.....	6.60	5.10	3.10	3.75	3.00	2.38	1.88	1.55	3.20	2.30	2.30	2.80
3.....	9.80	4.52	3.02	4.05	2.88	2.30	2.08	1.55	2.62	2.30	2.25	2.74
4.....	9.90	4.18	2.88	5.18	2.78	2.22	2.08	1.58	2.42	2.68	2.20	2.70
5.....	6.15	3.95	2.75	8.40	2.68	2.22	1.98	2.08	2.32	2.70	2.12	2.55
6.....	4.25	3.65	4.62	7.95	2.60	2.50	1.95	1.75	2.22	2.55	2.40	2.49
7.....	3.70	3.50	5.58	5.80	2.50	2.32	1.90	1.70	2.08	2.42	6.15	2.46
8.....	3.30	3.42	4.65	5.00	2.50	2.35	2.12	1.80	2.00	2.30	5.00	2.44
9.....	3.05	4.00	4.10	5.82	2.50	2.58	2.00	2.02	1.90	3.90	3.85	2.44
10.....	2.85	4.65	4.95	5.50	2.50	2.55	1.95	2.00	2.55	3.30	3.44	2.40
11.....	2.70	4.10	5.90	4.62	2.48	2.35	2.18	1.80	2.48	2.98	3.15	2.40
12.....	2.82	3.65	5.20	4.10	2.45	2.25	2.10	1.80	2.40	2.98	2.98	2.40
13.....	2.95	3.45	4.40	3.78	2.40	2.20	2.00	2.12	2.92	2.98	3.22	2.39
14.....	5.55	3.22	4.55	3.70	2.32	2.15	1.98	2.15	2.55	2.85	3.22	2.40
15.....	4.70	3.08	4.45	6.05	2.28	2.28	1.92	2.10	2.35	2.72	3.08	2.41
16.....	4.20	2.95	4.05	5.65	2.25	2.18	1.88	2.05	2.50	3.98	2.99	2.47
17.....	3.82	2.82	3.82	4.70	2.22	2.15	1.88	1.95	3.90	3.85	2.88	2.72
18.....	3.45	2.78	3.60	4.10	2.08	2.10	1.80	1.85	3.40	8.50	2.88	3.06
19.....	3.20	2.70	3.55	3.75	2.18	2.10	1.75	1.80	2.90	6.25	3.82	3.02
20.....	3.00	2.98	4.85	4.32	2.18	2.00	1.72	1.70	2.62	4.35	3.92	2.90
21.....	3.08	3.00	4.95	4.60	2.10	2.05	1.70	1.70	2.45	3.50	3.45	2.79
22.....	3.60	2.85	4.30	4.50	2.10	2.05	1.70	1.65	2.32	3.08	3.18	2.78
23.....	5.65	2.75	3.85	4.08	2.15	2.20	1.70	1.60	2.28	3.28	2.95	4.53
24.....	4.70	2.68	3.65	3.90	2.20	2.10	1.72	1.62	2.20	3.60	2.89	5.18
25.....	3.95	2.75	3.42	3.65	2.10	2.00	1.70	1.62	2.15	3.22	2.90	4.60
26.....	3.65	2.80	3.22	3.50	2.02	2.00	1.62	1.62	2.02	3.00	2.98	4.32
27.....	3.92	2.90	3.45	3.32	2.05	2.05	1.60	1.68	1.95	2.85	2.90	4.60
28.....	4.60	3.00	4.40	3.15	2.00	2.15	1.60	1.60	2.00	2.72	2.88	5.01
29.....	5.05	.....	4.05	3.02	2.22	2.10	1.65	1.65	2.00	2.58	2.86	4.22
30.....	12.90	.....	3.90	3.00	2.50	2.00	1.65	1.68	2.08	2.48	2.90	3.76
31.....	8.85	.....	4.00	.....	2.60	.....	1.60	1.85	.....	2.40	.....	3.85

NOTE.—No ice reported by observer. Relation of gage height to discharge probably not affected by ice.

Daily discharge, in second-feet, of Greenbrier River at Alderson, W. Va., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	5,690	9,100	2,140	3,850	1,720	828	260	101	3,220	315	696	1,480
2.....	11,600	7,080	1,920	3,480	1,720	696	234	86	2,140	598	598	1,330
3.....	23,000	5,420	1,720	4,100	1,480	598	380	86	1,030	598	544	1,280
4.....	4,420	4,620	1,480	7,360	1,300	512	380	95	747	1,130	490	1,160
5.....	10,300	3,980	1,240	17,800	1,130	512	301	380	622	1,160	415	928
6.....	4,620	3,220	5,690	16,400	1,000	855	280	164	512	928	720	842
7.....	3,350	2,860	8,520	9,100	855	622	246	140	380	747	10,300	801
8.....	2,380	2,620	5,690	6,800	855	659	415	188	315	598	6,800	774
9.....	1,820	4,100	4,360	9,100	855	971	315	331	246	3,850	3,720	774
10.....	1,420	5,690	6,800	8,230	855	928	280	315	928	2,380	2,740	720
11.....	1,160	4,360	9,400	5,690	828	659	471	188	828	1,680	2,040	720
12.....	1,370	3,220	7,360	4,690	788	544	396	188	720	1,680	1,680	720
13.....	1,620	2,740	5,150	3,600	720	490	315	415	1,560	1,680	2,140	708
14.....	8,520	2,140	5,690	3,550	622	443	301	443	928	1,420	2,140	720
15.....	5,960	1,920	5,150	9,700	576	576	260	396	659	1,190	1,920	734
16.....	4,620	1,620	4,100	8,520	544	471	234	356	855	4,100	1,700	814
17.....	3,600	1,370	3,600	5,960	512	443	234	280	3,850	3,720	1,480	1,190
18.....	2,740	1,300	3,100	4,360	380	396	188	217	2,620	18,200	1,480	1,820
19.....	2,140	1,160	2,980	3,480	471	396	164	188	1,520	10,300	3,600	1,720
20.....	1,720	1,680	6,240	4,880	471	315	150	140	1,030	5,150	3,850	1,520
21.....	1,920	1,720	6,800	5,690	396	356	140	140	788	2,860	2,620	1,310
22.....	3,100	1,420	4,880	5,420	396	356	140	120	622	1,920	2,140	1,300
23.....	8,520	1,240	3,720	4,360	443	490	140	101	576	2,380	1,620	5,420
24.....	5,960	1,130	3,220	3,550	490	396	150	109	490	3,100	1,500	4,620
25.....	3,980	1,240	2,620	3,220	396	315	140	109	443	2,140	1,520	5,690
26.....	3,220	1,330	2,140	2,860	331	315	109	109	331	1,720	1,680	4,880
27.....	3,850	1,520	2,740	2,380	356	356	101	132	280	1,420	1,520	5,690
28.....	5,690	1,720	5,150	2,040	315	443	101	101	315	1,190	1,480	6,800
29.....	6,800	.....	4,100	1,720	512	396	120	120	315	971	1,440	4,620
30.....	35,100	.....	3,850	1,720	855	315	120	132	380	828	1,520	3,480
31.....	19,300	.....	4,100	.....	1,000	.....	101	217	.....	720	.....	3,720

Monthly discharge of Greenbrier River at Alderson, W. Va., for 1911.

[Drainage area, 1,340 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	35,100	1,160	7,040	5.25	6.05	A.
February.....	9,100	1,130	2,910	2.17	2.26	A.
March.....	9,400	1,240	4,380	3.27	3.77	A.
April.....	17,800	1,720	5,780	4.31	4.81	A.
May.....	1,720	315	747	.557	.64	A.
June.....	971	315	522	.390	.44	A.
July.....	471	101	231	.172	.20	B.
August.....	443	86	196	.146	.17	B.
September.....	3,850	246	975	.728	.81	A.
October.....	18,200	315	2,600	1.94	2.24	A.
November.....	10,300	415	2,200	1.64	1.83	A.
December.....	6,800	708	2,200	1.64	1.89	A.
The year.....	35,100	86	2,480	1.85	25.11	

GAULEY RIVER AT ALLINGDALE, W. VA.

Location.—At Baltimore & Ohio Railroad bridge, one-fourth mile south of depot at Allingdale, W. Va., and immediately below the mouth of Rock Creek.

Records available.—July 3, 1908, to December 31, 1911.

Drainage area.—248 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Rough and irregular, but probably permanent.

Discharge measurements.—Made from upstream side of bridge or from wooden bridge near depot. The bottom of the stream is rough and irregular, but with extreme care accurate measurements can be made. The measuring section at the railroad bridge is a poor one, and measurements are made at the wooden bridge near the railroad depot whenever possible.

Point of zero flow.—Levels taken August 15, 1910, indicate that there would be no flow past the gage if the river stage were to fall to 3.33 feet ± 0.2 foot.

Winter flow.—Ice may affect the relation of gage height to discharge for short periods during December, January, and February.

Accuracy.—Gage-height record considered only fair. Sufficient data have not been obtained to permit estimates of discharge to be made.

Discharge measurements of Gauley River at Allingdale, W. Va., in 1911.

Date.	Hydrographer.	Gage height.	Dis- charge.
Oct. 24	Bailey & Perwien.....	<i>Feet.</i> 5.82	<i>Sec.-feet.</i> 599
24	do.....	5.80	<i>a</i> 586
27	do.....	5.40	380

a Measurement made at wooden bridge above regular section.

Daily gage height, in feet, of Gauley River at Allingdale, W. Va., for 1911.

[J. L. Cogar, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	7.43	7.64	5.71	5.78	5.93	4.63	5.41	4.05	5.28	4.39	5.02	5.65
2.....	9.34	7.45	5.63	5.84	6.23	4.65	5.04	4.05	5.18	4.44	4.98	5.54
3.....	9.61	7.00	5.43	5.88	5.98	4.63	4.61	4.07	4.28	4.51	4.92	5.45
4.....	8.13	6.85	5.51	6.75	5.93	4.61	4.53	4.06	4.26	5.13	4.90	5.46
5.....	6.93	6.23	5.57	6.90	5.74	4.60	4.52	4.03	4.26	5.08	4.85	5.50
6.....	6.61	6.08	6.38	8.40	5.68	4.60	4.50	4.03	4.23	5.03	4.90	5.52
7.....	6.28	5.99	8.01	7.13	5.44	4.58	6.33	4.07	4.21	5.58	7.69	5.49
8.....	6.18	5.93	6.98	6.73	5.25	4.51	5.98	5.13	4.24	9.18	6.60	5.46
9.....	5.75	6.13	6.59	6.33	5.12	4.45	5.28	4.83	6.55	8.43	6.35	5.38
10.....	5.48	5.95	6.44	6.01	5.11	4.40	5.13	4.51	5.33	8.05	6.21	5.35
11.....	5.53	5.83	6.72	5.93	5.08	4.38	5.41	4.43	5.13	7.83	5.94	5.34
12.....	5.59	5.75	6.75	5.90	5.03	4.93	5.43	4.34	5.11	7.33	5.53	5.34
13.....	10.58	5.70	6.83	6.23	5.02	5.11	5.28	4.28	5.13	6.45	5.51	5.35
14.....	9.38	5.63	6.98	6.84	4.93	5.12	4.88	4.24	5.17	6.28	5.43	5.30
15.....	9.05	5.53	6.65	7.73	4.85	5.55	4.73	4.21	5.18	6.83	5.33	5.32
16.....	8.40	5.45	6.23	6.24	4.48	4.58	4.63	4.45	7.65	6.68	5.41	5.40
17.....	7.18	5.23	6.15	5.28	4.35	4.53	4.53	4.48	6.78	7.28	5.50	6.10
18.....	6.53	5.18	6.08	5.24	4.28	4.59	4.44	4.43	6.28	9.18	5.82	6.04
19.....	6.13	5.29	6.59	6.05	4.28	4.63	4.43	4.34	6.18	7.58	6.79	6.00
20.....	5.90	5.53	8.32	6.93	4.30	4.59	4.43	4.18	5.33	7.08	6.32	5.90
21.....	5.83	5.42	7.39	7.13	4.43	4.47	4.41	4.18	5.23	6.13	5.89	5.91
22.....	7.48	5.39	6.33	6.93	4.53	4.40	4.43	4.16	5.08	6.08	5.81	6.02
23.....	7.18	5.42	6.38	6.89	4.58	4.38	4.43	4.14	5.04	6.04	5.65	6.01
24.....	6.43	5.63	6.33	6.88	4.58	4.35	4.42	4.13	5.01	5.93	5.58	6.12
25.....	6.25	5.53	6.25	6.35	4.56	4.48	4.40	4.11	4.28	5.81	5.53	6.45
26.....	6.68	5.52	6.13	6.18	4.54	5.08	4.35	4.09	4.24	5.82	5.56	6.55
27.....	7.62	5.51	5.98	5.98	4.53	5.28	4.33	4.07	4.23	5.80	5.79	6.80
28.....	8.23	5.73	5.92	5.62	4.53	5.53	4.31	4.07	4.22	5.31	5.71	6.69
29.....	9.18	.....	5.92	5.59	4.50	5.41	4.30	4.13	4.28	5.19	5.70	6.63
30.....	16.08	.....	5.94	5.73	4.48	5.28	4.18	5.23	4.34	5.15	5.68	5.95
31.....	8.44	.....	6.05	.....	4.47	.....	4.08	6.08	.....	5.09	.....	6.30

NOTE.—Observer made no report concerning ice. Relation of gage height to discharge probably not affected by ice during 1911.

GAULEY RIVER NEAR SUMMERSVILLE, W. VA.

Location.—At highway bridge known at Brock's Bridge, 2½ miles southeast of Summersville, W. Va., and one-eighth mile below mouth of Muddlety Creek.

Records available.—July 6, 1908, to December 31, 1911.

Drainage area.—686 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Relation of gage height to discharge may be affected by ice for a week or two at a time during December, January, and February.

Accuracy.—Gage-height records are considered reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by C. T. Bailey:

July 28, 1911: Gage height, 4.10 feet; discharge, 114 second-feet.

Daily gage height, in feet, of Gauley River near Summersville, W. Va., for 1911.

[J. W. Dermody, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	9.60	9.30	6.10	6.95	5.70	5.40	4.15	3.65	5.75	5.15	4.95	6.95
2	13.00	9.30	5.45	6.75	6.10	5.10	3.70	3.65	5.25	6.6	4.9	6.5
3	13.50	8.60	5.30	6.90	5.75	4.55	4.00	3.65	4.55	8.9	4.85	5.95
4	10.50	8.15	5.75	8.95	5.85	4.15	4.30	3.30	3.90	7.1	4.65	5.85
5	8.90	7.45	5.15	10.85	5.50	4.10	4.05	3.50	4.65	6.5	4.4	5.5
6	7.35	7.15	8.65	10.05	5.50	5.25	3.50	3.90	5.00	6.15	5.1	5.3
7	7.10	6.60	10.40	8.70	4.85	4.95	3.90	4.10	5.00	5.45	9.95	5.3
8	6.70	6.20	9.35	8.45	4.75	4.65	5.30	4.65	4.30	9.8	8.35	5.1
9	6.15	7.10	8.05	9.60	4.80	4.35	5.15	4.45	4.90	8.1	7.55	5.45
10	5.65	6.85	8.20	9.20	4.70	4.10	3.90	4.10	5.80	7.2	6.9	5.35
11	5.85	6.72	8.30	8.10	4.80	3.55	4.10	3.75	5.75	7.65	6.4	5.3
12	5.75	6.48	7.75	7.35	4.75	4.25	5.05	3.90	7.15	8.0	5.9	5.75
13	12.60	6.20	8.40	7.35	4.55	5.35	5.05	3.60	6.15	7.55	7.1	5.6
14	12.10	6.00	8.50	7.30	4.75	4.95	4.55	3.35	5.95	6.8	7.05	5.55
15	11.20	5.85	8.00	10.10	4.65	4.40	4.40	3.95	5.30	7.1	6.75	5.15
16	10.70	5.30	7.20	8.85	4.60	4.55	3.90	3.70	9.65	9.3	6.45	6.15
17	9.10	5.05	7.05	7.50	4.40	3.80	3.90	4.60	7.70	8.15	6.1	6.8
18	7.75	4.95	7.05	7.25	4.30	3.95	3.85	4.15	6.70	13.0	6.7	6.95
19	7.20	5.35	6.90	6.70	4.35	4.80	3.95	3.80	6.05	9.85	8.45	6.5
20	6.75	5.75	10.00	8.80	4.25	4.90	3.65	3.70	5.65	8.85	7.15	6.25
21	6.70	5.70	8.80	9.35	4.10	4.30	3.35	4.05	5.35	7.55	7.0	5.95
22	9.80	5.12	8.00	9.00	3.75	4.35	4.15	3.75	5.30	6.6	6.45	5.75
23	9.20	5.50	8.10	9.25	4.15	4.05	3.45	3.75	5.40	7.2	6.05	7.15
24	7.95	5.35	7.60	8.75	4.45	4.15	3.65	3.55	4.95	6.8	5.8	8.0
25	7.25	5.50	7.25	7.90	4.80	3.25	3.95	3.25	4.75	6.3	6.1	7.65
26	7.90	5.15	6.80	7.40	4.35	4.20	4.05	3.55	4.60	6.05	6.65	7.3
27	10.85	7.30	7.20	7.00	4.35	4.55	4.10	4.05	4.65	5.8	6.35	7.75
28	10.20	5.70	7.20	6.40	4.10	5.55	3.50	4.20	4.50	5.6	6.6	7.55
29	9.45	-----	6.40	6.45	4.05	5.45	3.60	4.05	4.75	5.6	7.25	7.35
30	16.65	-----	7.00	6.05	3.90	4.90	4.20	4.00	5.15	5.3	7.3	7.15
31	10.85	-----	6.90	-----	4.35	-----	3.70	5.05	-----	5.3	-----	7.55

NOTE.—Observer made no report concerning ice. Relation of gage height to discharge probably not affected by ice during 1911.

GAULEY RIVER NEAR BELVA, W. VA.

Location.—Three-fourths mile below Chesapeake & Ohio Railway bridge at Belva, W. Va., one-fourth mile below the mouth of Twentymile Creek, and about 5½ miles above mouth of river at Gauley Bridge.

Records available.—August 25, 1908, to December 31, 1911.

Drainage area.—1,420 square miles.

Gage.—Vertical staff gage fastened to tree on right bank; datum unchanged since established.

Channel.—Coarse gravel; practically permanent.

Discharge measurements.—Made from a boat 1,000 feet above gage or by wading.

Floods.—No records of floods previous to installation of gage are available. Maximum gage height since installation of gage was approximately 19 feet January 30, 1911.

Winter flow.—Relation of gage height to discharge may be affected by ice at intervals during December, January, and February.

Accuracy.—Records of gage height are accurate and reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

Discharge measurements of Gauley River near Belva, W. Va., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Oct. 15	Bailey and Perwien	Feet. 4.37	Sec.-ft. 2,830
16	do.	6.50	6,730

Daily gage height, in feet, of Gauley River near Belva, W. Va., for 1911.

[C. L. Davis, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	7.25	8.25	3.80	4.92	3.80	2.10	2.34	1.48	2.66	2.45	2.65	4.30
2.....	9.95	7.78	3.68	4.78	3.70	2.92	2.12	1.38	2.92	2.68	2.55	3.98
3.....	10.95	6.78	3.58	4.78	3.70	2.68	1.96	1.31	2.52	5.42	2.49	3.75
4.....	9.10	6.02	3.35	6.62	3.60	2.38	1.88	1.22	2.25	4.58	2.36	3.55
5.....	7.10	5.45	3.35	8.95	3.45	2.25	2.10	1.18	2.62	3.89	2.31	3.22
6.....	5.72	4.95	6.10	9.30	3.20	2.42	2.00	1.09	2.42	3.42	2.84	3.00
7.....	5.01	4.62	10.00	7.41	3.12	2.58	1.90	1.04	2.42	3.12	6.18	3.02
8.....	4.48	4.35	8.42	6.35	3.02	2.40	1.92	1.12	2.32	4.88	6.20	3.00
9.....	4.12	4.60	6.70	7.08	2.98	2.24	2.88	1.76	2.20	4.30	5.12	2.95
10.....	3.75	5.22	6.05	7.05	2.92	2.08	2.41	2.05	3.30	3.30	4.45	2.92
11.....	3.55	4.96	6.00	6.22	2.86	1.98	2.30	1.98	3.12	4.42	3.95	3.01
12.....	3.65	4.61	5.70	5.51	2.82	1.88	2.60	1.75	3.58	5.00	3.65	3.05
13.....	7.28	4.36	5.39	5.08	2.72	1.88	2.70	1.65	3.38	4.68	4.08	3.10
14.....	9.68	4.05	5.95	4.92	2.58	2.70	2.58	1.58	3.08	4.15	4.45	3.10
15.....	7.76	3.72	5.82	7.00	2.49	2.50	2.28	1.50	2.82	4.20	4.22	3.05
16.....	8.65	3.58	5.08	6.55	2.42	2.34	2.08	1.52	4.60	6.39	4.00	3.30
17.....	6.95	3.38	4.62	5.82	2.35	2.20	1.95	1.68	4.80	5.28	3.70	4.08
18.....	5.80	3.28	4.00	5.38	2.34	2.20	1.82	1.85	4.00	9.55	3.85	4.38
19.....	5.00	3.33	4.31	4.68	2.30	2.18	1.72	1.92	3.34	7.88	5.38	4.02
20.....	4.56	3.90	6.30	5.42	2.24	2.34	1.70	1.78	3.04	6.05	5.18	3.75
21.....	4.50	4.34	5.85	6.85	2.19	2.40	1.70	1.65	2.90	5.00	4.61	3.55
22.....	7.32	4.10	5.75	6.72	2.14	2.28	1.70	1.56	3.12	4.25	4.14	3.50
23.....	7.28	3.90	5.50	7.28	2.09	2.12	1.62	1.45	3.08	4.02	3.78	3.92
24.....	6.12	3.72	5.15	6.58	2.02	2.00	1.68	1.34	2.88	4.30	3.65	5.42
25.....	5.42	3.52	4.62	5.72	2.15	1.88	1.68	1.28	2.62	3.88	4.05	5.35
26.....	5.38	3.50	4.35	5.15	2.25	2.04	1.65	1.18	2.40	3.56	4.25	5.25
27.....	8.48	3.50	4.25	4.66	2.12	2.25	1.78	1.14	2.28	3.35	4.15	5.75
28.....	7.72	3.58	4.72	4.24	2.02	2.30	1.80	1.11	2.19	3.17	4.18	6.35
29.....	7.80	.....	4.42	4.00	1.99	2.65	1.72	1.08	2.25	2.96	4.54	5.72
30.....	16.00	.....	4.40	3.85	2.18	2.55	1.62	1.18	2.48	2.86	4.68	4.92
31.....	10.55	.....	4.88	.....	2.15	.....	1.54	1.58	.....	2.76	.....	4.70

NOTE.—Observer made no notes concerning ice. Relation of gage height to discharge probably not affected by ice during 1911.

CHERRY RIVER AT RICHWOOD, W. VA.

Location.—At the highway bridge at Richwood, W. Va., half a mile below junction of North and South Forks.

Records available.—July 3, 1908, to December 31, 1911.

Drainage area.—Not measured.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Coarse gravel; practically permanent, but at different times stones and boulders have been taken from the river bed in the vicinity of the point of control and the relation of gage height to discharge has thereby been affected. The first stones were removed during August, 1909; additional stones were removed during May, June, July, and August, 1911.

Discharge measurements.—Made from downstream side of bridge.

Point of zero flow.—A determination by leveling August 16, 1910, indicates that there would be no flow past the gage if the river stage were to fall to 1.3 feet \pm 0.2 foot.

Winter flow.—The relation of gage height to discharge is at times affected by ice during December, January, and February.

Accuracy.—See discussion under "Channel." Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by Bailey and Perwien:

October 25, 1911: Gage height, 2.74 feet; discharge, 205 second-feet.

Daily gage height, in feet, of Cherry River at Richwood, W. Va., for 1911.

[Floyd Artrip, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.	3.85	3.70	2.60	2.73	2.65	3.15	2.22	2.00	2.47	2.35	2.35	2.80
2.	5.15	3.60	2.60	2.72	2.65	2.62	2.15	1.93	2.23	3.58	2.30	2.72
3.	4.95	3.30	2.55	3.20	2.60	2.42	2.45	1.87	2.15	3.43	2.28	2.62
4.	4.02	3.18	2.60	3.78	2.52	2.30	2.15	1.85	2.20	3.08	2.25	2.62
5.	3.45	3.02	2.50	4.93	2.45	2.90	2.10	2.15	2.60	2.85	2.25	2.45
6.	3.25	2.88	4.00	3.95	2.40	2.75	2.20	2.30	2.50	2.67	2.95	2.45
7.	3.00	2.80	3.75	3.50	2.40	2.58	2.42	2.07	2.40	2.95	3.42	2.42
8.	2.90	2.85	3.82	3.40	2.40	2.50	2.52	2.37	2.25	3.37	3.00	2.42
9.	2.80	3.00	3.10	3.62	2.40	2.33	2.25	2.13	3.80	3.05	2.82	2.42
10.	2.75	2.95	3.12	3.27	2.33	2.25	2.15	2.08	2.92	2.85	2.72	2.50
11.	2.70	2.88	3.30	3.10	2.27	2.28	2.45	2.00	2.83	3.17	2.62	2.52
12.	3.65	2.80	3.20	3.12	2.30	2.70	2.38	1.95	2.80	3.25	2.70	2.60
13.	5.88	2.72	3.40	3.32	2.28	2.55	2.23	2.03	2.67	3.05	2.98	2.52
14.	4.55	2.65	3.30	3.60	2.25	2.43	2.13	2.05	2.60	2.90	2.80	2.50
15.	4.90	2.62	3.12	3.85	2.20	2.37	2.05	2.10	3.15	3.70	2.78	2.52
16.	4.20	2.58	3.00	3.30	2.17	2.35	2.08	2.70	3.75	3.47	2.70	2.82
17.	3.50	2.50	2.90	3.15	2.20	2.30	2.18	2.25	3.13	3.55	2.60	2.90
18.	3.25	2.55	2.85	3.00	2.20	2.40	2.17	2.10	2.80	4.75	3.18	2.78
19.	3.05	2.70	3.12	2.95	2.20	2.40	2.07	2.03	2.70	3.72	3.15	2.65
20.	2.90	2.62	3.65	3.65	2.15	2.40	2.00	2.00	2.65	3.30	2.95	2.60
21.	3.05	2.50	3.25	3.47	2.10	2.30	2.02	2.00	2.53	2.97	2.88	2.60
22.	3.62	2.60	3.10	3.50	2.10	2.22	2.10	1.93	2.57	2.92	2.75	2.62
23.	3.42	2.60	3.25	3.52	2.10	2.20	2.05	1.90	2.40	3.00	2.62	3.30
24.	3.20	2.50	2.98	3.25	2.85	2.17	2.10	1.85	2.25	2.88	2.70	3.10
25.	3.02	2.50	2.88	3.17	2.40	2.27	2.30	1.90	2.28	2.67	2.78	3.10
26.	3.50	2.50	2.75	3.00	2.27	2.30	2.20	2.00	2.23	2.62	2.65	3.10
27.	3.70	2.65	3.23	2.92	2.28	2.40	2.10	1.93	2.17	2.52	2.62	3.50
28.	3.85	2.75	2.98	2.82	2.20	2.62	2.03	1.87	2.57	2.48	2.72	3.28
29.	3.98	.....	2.90	2.80	2.18	2.33	2.00	2.07	2.58	2.45	3.05	3.05
30.	5.95	.....	3.00	2.67	2.17	2.23	1.95	2.25	2.48	2.40	2.88	2.90
31.	3.85	.....	2.83	.....	2.70	.....	2.00	2.65	.....	2.38	.....	3.35

NOTE.—Feb. 22 observer reported "Ice in shoals." Relation of gage height to discharge probably not materially affected by ice during 1911.

MEADOW RIVER NEAR RUSSELLVILLE, W. VA.

Location.—At Bays Ferry, 3 miles below Russellville, W. Va., one-fourth mile below mouth of Youngs Creek.

Records available.—July 17, 1908, to December 31, 1911.

Drainage area.—297 square miles.

Gage.—Standard chain gage attached to trees on left bank just above the ferry, datum unchanged since established.

Channel.—Permanent.

Discharge measurements.—Made from a boat or by wading.

Winter flow.—Relation of gage height to discharge is at times affected by ice gorges.

Accuracy.—Gage-height records are considered very reliable. In the fall backwater is sometimes caused at the gage by leaves lodging at the riffle below. Sufficient data have not been collected to permit estimates of discharge to be made.

The following discharge measurement was made by C. T. Bailey by wading at section above regular measuring section:

July 29, 1911: Gage height, 3.03 feet; discharge, 15.2 second-feet.

Daily gage height, in feet, of Meadow River near Russellville, W. Va., for 1911.

[J. R. Bays, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.	8.44	9.19	4.96	5.85	5.07	4.41	3.32	2.90	3.76	3.17	3.98	5.34
2.	10.09	8.57	4.98	5.76	5.20	4.53	3.20	2.87	4.04	3.32	3.89	5.16
3.	11.04	7.62	4.84	6.26	5.42	4.10	3.13	2.84	3.72	3.76	3.81	4.96
4.	9.74	6.93	4.79	8.34	5.35	3.84	3.22	2.80	3.46	4.28	3.74	4.73
5.	7.97	6.51	4.67	9.98	5.18	3.76	3.58	2.75	3.26	4.22	3.69	4.80
6.	6.84	6.02	8.19	9.52	4.96	3.72	3.42	2.72	3.22	4.11	3.94	4.60
7.	6.14	5.74	9.24	8.43	4.80	3.89	3.98	2.95	3.20	3.94	7.33	4.42
8.	5.78	5.58	8.59	7.64	4.68	3.66	3.72	3.44	3.16	4.33	7.02	4.30
9.	5.30	6.50	7.31	8.00	4.60	3.52	3.58	3.42	3.03	4.43	6.36	4.34
10.	5.80	6.90	7.28	7.88	4.52	3.40	3.37	3.19	2.98	4.32	5.86	4.30
11.	5.04	6.69	7.70	7.26	4.44	3.37	3.38	3.25	3.03	4.60	5.38	4.32
12.	4.91	6.32	7.30	6.65	4.31	3.36	4.10	3.26	3.28	5.10	4.98	4.38
13.	5.80	5.90	6.80	6.51	4.23	3.64	3.98	3.14	3.36	4.78	5.18	4.40
14.	7.22	5.53	6.34	6.42	4.13	3.98	3.69	3.01	3.34	4.55	5.29	4.40
15.	7.18	5.26	6.02	7.52	4.05	3.83	3.45	2.94	3.32	5.15	5.28	4.36
16.	7.53	4.95	5.78	7.72	3.99	3.67	3.26	2.94	3.41	5.40	5.16	4.49
17.	6.94	4.76	5.52	7.15	3.94	3.56	3.20	2.90	3.95	5.12	4.93	4.68
18.	6.22	4.70	5.42	6.49	3.92	3.56	3.18	2.90	3.78	9.00	5.62	5.04
19.	5.77	4.82	5.36	5.98	3.88	3.58	3.10	3.01	3.56	7.72	6.30	5.02
20.	5.48	5.38	7.22	6.93	3.81	3.72	3.06	3.00	3.41	6.58	5.88	4.94
21.	5.60	5.58	7.08	7.46	3.75	3.66	3.03	2.98	3.32	5.88	5.52	4.78
22.	7.24	5.54	6.52	7.40	3.67	3.58	3.11	2.91	3.84	5.24	5.24	4.74
23.	7.17	5.28	6.16	7.63	3.62	3.44	3.08	2.85	3.88	5.14	4.99	5.24
24.	6.81	5.73	5.70	6.98	3.57	3.34	3.12	2.82	3.82	5.24	5.01	6.30
25.	6.35	5.10	5.35	6.40	3.58	3.28	3.14	2.78	3.63	4.96	5.42	6.39
26.	6.22	5.03	5.18	5.92	3.68	3.24	3.10	2.76	3.48	4.71	5.42	6.57
27.	7.06	5.00	5.40	5.54	3.62	3.54	3.04	2.74	3.31	4.52	5.35	7.28
28.	7.18	4.96	5.84	5.28	3.56	3.55	3.03	2.72	3.28	4.37	5.41	7.80
29.	8.06	.....	5.76	5.12	4.52	3.44	3.02	2.90	3.24	4.24	5.68	6.72
30.	13.02	.....	5.84	5.04	4.28	3.40	3.00	3.00	3.19	4.14	5.55	6.20
31.	11.06	.....	5.94	.....	3.88	.....	2.94	3.12	.....	4.03	.....	6.11

NOTE.—Observer reported ice as follows: Jan. 10 and Feb. 22, ice gorged; Feb. 24 and Dec. 5, backwater from ice.

ELK RIVER AT WEBSTER SPRINGS, W. VA.

Location.—At suspension bridge on the grounds of the Webster Springs Hotel at Webster Springs, W. Va., one-fourth mile above the mouth of Back Fork Creek.

Records available.—July 1, 1908, to December 31, 1911.

Drainage area.—168 square miles.

Gage.—Vertical staff attached to right abutment of bridge; datum unchanged since established.

Channel.—Coarse gravel; practically permanent.

Discharge measurements.—Made from upstream side of bridge or by wading.

Point of zero flow.—Levels taken August 13, 1910, indicate that there would be no flow past the gage at a stage of 0.95 foot ± 0.2 foot.

Winter flow.—Relation of gage height to discharge is sometimes affected by ice.

Accuracy.—Gage-height records are considered reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by Bailey and Perwien:

October 26, 1911: Gage height, 2.62 feet; discharge, 218 second-feet.

Daily gage height, in feet, of Elk River at Webster Springs, W. Va., for 1911.

[Cherry Woodzell, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	4.10	4.00	3.00	2.92	2.60	2.04	2.06	1.57	2.65	2.60	2.30	2.98
2.....	5.20	3.89	2.92	2.87	2.72	1.97	1.98	1.61	2.35	3.10	2.22	2.85
3.....	5.20	3.55	2.78	3.05	2.62	1.86	1.92	1.59	2.10	3.50	2.16	2.72
4.....	4.40	3.45	2.70	3.75	2.58	1.78	1.91	1.54	1.92	3.18	2.14	2.68
5.....	3.75	3.20	2.65	5.15	2.50	1.95	1.88	1.50	1.82	3.30	2.11	2.58
6.....	3.32	3.02	4.05	4.30	2.46	2.08	1.82	1.50	1.79	2.90	2.45	2.54
7.....	3.05	2.92	4.25	3.90	2.42	2.06	1.88	1.80	1.76	3.60	4.25	2.50
8.....	2.88	2.88	3.75	3.60	2.36	2.08	1.84	1.76	1.74	4.55	3.62	2.44
9.....	2.80	2.78	3.38	4.25	2.30	2.02	1.90	2.10	1.71	3.68	3.15	2.50
10.....	2.65	2.65	3.70	3.72	2.30	1.92	1.82	1.90	2.45	3.25	2.95	2.56
11.....	2.50	2.99	3.80	3.35	2.27	1.82	1.80	1.72	2.75	3.35	2.75	2.60
12.....	3.05	2.92	3.45	3.15	2.22	2.32	1.82	1.62	3.05	3.45	2.75	2.60
13.....	5.80	2.82	3.90	2.98	2.16	2.70	1.86	1.52	2.95	3.15	3.00	2.60
14.....	4.75	2.68	3.85	3.35	2.11	2.40	1.81	1.50	2.35	3.00	3.00	2.60
15.....	4.90	2.58	3.65	4.20	2.06	2.25	1.72	1.50	2.20	4.00	2.92	2.60
16.....	4.60	2.54	3.48	3.70	2.01	2.08	1.62	1.50	3.40	3.80	2.80	2.85
17.....	3.35	2.50	3.25	3.35	2.00	1.99	1.60	1.50	3.30	3.50	2.80	3.15
18.....	3.40	2.48	3.12	3.15	2.00	2.12	1.58	1.50	2.95	5.40	2.95	3.00
19.....	3.08	2.52	3.35	3.00	1.99	2.70	1.58	1.50	2.58	4.18	3.62	2.96
20.....	2.90	2.58	4.28	4.45	2.00	2.60	1.56	1.48	2.42	3.52	3.25	2.88
21.....	3.00	2.52	3.72	3.90	1.96	2.35	1.52	1.42	2.25	3.15	2.98	2.82
22.....	4.05	2.49	3.42	3.70	1.91	2.15	1.65	1.40	2.50	2.92	2.85	2.72
23.....	3.72	2.45	3.80	3.75	1.90	2.02	1.70	1.38	2.45	2.95	2.72	3.50
24.....	3.38	2.48	3.45	3.50	1.89	2.22	1.72	1.36	2.25	2.85	2.78	3.48
25.....	3.15	2.50	3.20	3.35	1.88	2.30	1.69	1.31	2.22	2.78	3.00	3.38
26.....	4.65	2.58	2.98	3.22	1.84	2.21	1.65	1.38	2.28	2.68	3.00	3.40
27.....	4.60	2.88	3.48	3.05	1.79	2.28	1.61	1.75	2.18	2.56	3.00	3.85
28.....	4.85	3.10	3.20	2.95	1.74	2.58	1.54	1.80	2.15	2.51	3.00	3.65
29.....	4.50	-----	3.00	2.82	1.71	2.38	1.50	1.78	2.75	2.46	3.10	3.25
30.....	7.40	-----	3.08	2.68	1.70	2.22	1.50	2.48	2.92	2.38	3.08	3.11
31.....	4.40	-----	3.02	-----	1.70	-----	1.50	2.80	-----	2.30	-----	3.10

NOTE.—Relation of gage height to discharge probably not affected by ice during 1911.

ELK RIVER AT GASSAWAY, W. VA.

Location.—At the Coal & Coke Railroad bridge in the northeastern part of Gassaway, W. Va., immediately below the mouth of Little Otter Creek.

Records available.—July 1, 1908, to December 31, 1911.

Drainage area.—578 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Coarse gravel; point of control is probably permanent.

Discharge measurements.—Made from upstream side of bridge or by wading.

Point of zero flow.—A determination by leveling August 12, 1910, indicates that there would be no flow past the gage if the stage were to fall to 0.5 foot, ± 0.2 foot.

Winter flow.—Ice may affect the relation of gage height to discharge for short periods.

Accuracy.—Gage-height record not considered better than "good." Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by C. T. Bailey:

October 6, 1911: Gage height, 3.42 feet; discharge, 888 second-feet.

Daily gage height, in feet, of Elk River at Gassaway, W. Va., for 1911.

[H. A. Hays, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	7.46	8.98	4.36	4.26	3.22	1.58	2.07	1.31	3.15	4.07	2.20	3.94
2.....	9.51	6.94	3.91	4.02	3.26	1.61	1.91	1.27	2.68	4.98	2.17	3.82
3.....	9.64	6.10	3.57	3.95	3.17	1.72	1.81	1.25	2.45	7.16	2.12	3.76
4.....	7.56	5.34	3.26	4.59	3.02	1.70	1.85	1.23	1.92	5.16	2.48	3.44
5.....	5.15	4.90	3.12	8.75	2.90	1.67	1.90	1.25	1.83	4.11	2.30	2.86
6.....	4.96	4.27	3.93	8.73	2.82	1.71	1.71	1.33	1.78	3.43	3.41	2.63
7.....	4.08	4.08	7.91	7.23	2.68	1.90	1.67	1.25	1.72	3.62	7.84	2.54
8.....	3.76	3.85	9.03	6.27	2.62	2.04	1.65	1.34	1.66	11.82	6.19	2.43
9.....	3.31	3.96	6.46	6.53	2.52	2.16	1.75	1.44	1.66	6.84	4.87	2.39
10.....	3.08	3.87	5.87	7.53	2.47	2.11	1.73	1.28	1.72	5.65	3.98	2.32
11.....	2.66	3.81	5.75	6.00	2.39	2.05	1.73	1.24	3.68	5.08	3.46	2.38
12.....	2.68	3.70	5.35	5.00	2.34	1.94	2.07	1.24	5.13	6.31	3.38	2.47
13.....	6.65	3.57	5.05	4.18	2.28	2.12	1.89	1.29	3.42	5.09	3.83	2.44
14.....	12.16	3.51	5.87	4.06	2.20	2.63	1.73	1.28	3.33	4.32	4.44	2.53
15.....	10.03	3.46	5.57	5.47	2.07	2.31	1.60	1.33	2.92	7.48	4.15	2.91
16.....	8.28	3.42	5.17	5.37	2.04	2.06	1.59	1.26	3.80	7.37	3.76	3.08
17.....	7.03	3.41	4.54	5.11	2.02	1.96	1.55	1.22	6.74	6.02	3.47	3.02
18.....	5.35	3.37	4.29	4.42	2.00	2.19	1.44	1.24	4.78	11.38	3.70	2.85
19.....	4.31	3.44	4.97	4.10	1.97	2.27	1.35	1.23	3.02	8.40	5.12	2.62
20.....	3.90	3.61	5.85	4.84	1.92	2.85	1.30	1.21	2.80	5.86	5.01	2.50
21.....	3.82	3.67	6.37	7.30	1.90	2.63	1.35	1.16	2.59	4.82	4.36	2.60
22.....	8.78	3.60	5.42	6.60	1.90	2.27	1.33	1.08	2.86	4.24	3.75	2.90
23.....	7.32	3.59	4.99	6.54	1.84	2.07	1.29	1.06	3.48	3.69	3.35	3.74
24.....	5.90	4.19	5.05	6.34	1.82	2.01	1.27	1.04	3.38	3.60	3.44	3.76
25.....	5.00	4.71	4.51	5.63	1.95	1.97	1.26	1.05	3.08	3.36	3.78	3.72
26.....	6.08	3.94	4.18	4.98	1.84	2.19	1.31	1.13	2.32	3.06	3.88	3.67
27.....	11.88	3.75	3.89	4.34	1.77	2.18	1.51	1.10	2.36	2.88	3.71	3.58
28.....	8.96	4.19	4.21	3.82	1.70	2.70	1.51	1.08	2.74	2.69	3.98	3.52
29.....	11.02	.....	3.68	3.55	1.64	2.17	1.52	1.20	3.07	2.57	4.46	3.48
30.....	26.22	.....	3.75	3.44	1.58	2.13	1.44	1.68	3.70	2.42	4.30	4.44
31.....	.....	.....	4.20	.....	1.56	.....	1.37	4.26	.....	2.29	.....	5.47

NOTE.—Relation of gage height to discharge probably not affected by ice during 1911.

ELK RIVER AT CLENDENNIN, W. VA.

Location.—At highway bridge in town of Clendennin, W. Va., immediately above mouth of Big Sandy Creek.

Records available.—June 27, 1908, to December 31, 1911.

Drainage area.—Not measured.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Practically permanent; point of control is probably permanent.

Discharge measurements.—Made from downstream side of bridge or by wading.

Point of zero flow.—Levels taken August 11, 1910, indicate that there would be no flow past the gage if the stage were to fall to 1.0 foot ± 0.2 foot.

Winter flow.—Ice may affect the relation of gage height to discharge at times during the winter months.

Accuracy.—High water in Big Sandy Creek alone may produce backwater at the gage. This will not occur often, however, as the Big Sandy is a small stream. The gage reader has been instructed to note effect of backwater. Sufficient data have not been obtained to permit estimates of discharge to be made.

Discharge measurements of Elk River at Clendennin, W. Va., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Mar. 8	C. T. Bailey.....	Feet.	Sec.-feet.
Aug. 4	.....do.....	11.98	11,200
		1.98	a 48.6

a Measurement made by wading.

Daily gage height, in feet, of Elk River at Clendennin, W. Va., for 1911.

[J. W. Riley, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.	7.38	9.25	4.92	4.81	4.30	2.56	2.55	1.97	4.59	4.18	3.10	5.04
2.	8.43	8.60	4.81	4.82	4.18	2.42	2.79	2.23	3.92	5.56	2.98	4.76
3.	9.54	7.15	4.55	4.75	4.20	2.30	2.61	2.32	3.42	7.08	2.91	4.43
4.	10.49	6.66	4.25	4.98	4.04	2.21	2.51	1.95	3.38	6.37	2.80	4.21
5.	7.68	6.11	4.02	6.94	3.82	2.62	2.41	1.92	3.02	5.12	2.74	4.06
6.	6.00	5.59	5.79	9.22	3.74	2.86	2.60	1.92	2.84	4.49	4.32	3.82
7.	5.27	5.23	8.19	8.03	3.70	2.71	2.67	1.94	2.79	4.47	7.36	3.58
8.	4.82	5.43	11.85	7.48	3.57	2.40	2.45	1.90	2.58	8.31	7.78	3.50
9.	4.60	5.15	8.65	8.10	3.47	2.38	2.36	1.82	2.43	8.49	6.00	3.46
10.	4.28	5.10	6.90	8.54	3.48	2.52	2.33	1.82	2.46	5.82	5.16	3.42
11.	4.42	5.13	6.30	7.24	3.40	2.60	2.29	1.83	3.52	6.20	4.57	3.62
12.	3.90	4.83	5.82	6.48	3.33	2.62	2.69	1.86	6.75	6.30	4.44	3.48
13.	8.30	4.60	5.40	5.55	3.18	2.55	3.28	1.90	4.94	5.98	5.32	3.48
14.	12.49	4.43	6.01	5.58	3.08	2.52	2.78	1.80	4.08	5.16	5.50	3.55
15.	9.92	4.21	6.40	6.32	3.28	2.81	2.53	1.76	3.76	4.76	5.26	3.69
16.	9.01	3.99	5.84	6.84	2.93	3.00	2.43	1.71	4.32	6.68	4.88	4.84
17.	9.16	3.83	5.34	6.14	2.86	2.80	2.38	1.66	5.12	6.72	4.50	6.30
18.	7.17	3.74	5.00	5.54	2.82	2.92	2.33	1.92	5.83	9.76	4.80	5.92
19.	5.64	3.57	4.85	5.20	2.70	3.49	2.29	2.16	4.58	10.60	5.77	5.36
20.	5.14	5.77	5.36	5.58	2.71	3.13	2.13	1.92	4.44	7.16	6.06	4.82
21.	5.57	6.41	7.04	6.42	2.66	3.28	2.57	1.88	3.80	5.54	5.42	4.52
22.	9.76	5.59	6.14	7.22	2.62	3.32	2.72	1.86	4.54	4.92	4.88	4.30
23.	9.86	5.35	5.71	7.28	2.57	3.04	2.37	1.80	4.14	4.72	4.48	5.12
24.	7.50	4.80	5.52	7.07	2.53	2.77	2.52	1.68	4.50	4.28	4.28	5.80
25.	6.37	4.72	5.32	6.41	2.46	2.65	2.37	1.68	3.78	4.22	4.45	6.44
26.	7.82	4.69	4.88	5.76	2.35	2.52	1.95	1.76	3.42	3.93	4.80	6.26
27.	12.97	4.63	4.68	5.26	2.38	2.53	1.91	1.71	3.28	3.72	4.84	8.12
28.	9.94	5.12	4.55	4.86	2.38	2.72	1.85	1.74	3.72	3.54	4.84	7.00
29.	9.62	-----	4.58	4.52	2.36	2.69	1.83	1.72	3.83	3.38	4.65	6.12
30.	21.62	-----	4.46	4.40	2.46	2.63	1.85	2.78	4.24	3.24	5.24	5.50
31.	18.16	-----	4.62	-----	2.42	-----	1.81	3.48	-----	3.16	-----	5.82

NOTE.—Relation of gage height to discharge probably not affected by ice during 1911.

COAL RIVER AT BRUSHTON, W. VA.

Location.—At Chesapeake & Ohio Railway bridge at Brushton, W. Va., 500 feet above the mouth of Brush Creek.

Records available.—June 23, 1908, to December 31, 1911.

Drainage area.—379 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Practically permanent.

Discharge measurements.—Made from downstream side of bridge or by wading.

Winter flow.—The relation of gage height to discharge is little, if at all, affected by ice.

Accuracy.—Gage-height records are considered reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

Discharge measurements of Coal River at Brushton, W. Va., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Oct. 4	C. T. Bailey	Feet.	Sec.-feet.
4	.....do.....	2.75	468
		2.54	356

Daily gage height, in feet, of Coal River at Brushton, W. Va., for 1911.

[G. W. Fitzpatrick, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	3.35	5.5	2.35	2.9	3.2	1.7	1.35	0.95	1.25	1.14	1.60	2.52
2.....	4.95	5.1	2.3	3.0	3.65	1.65	1.25	.95	1.1	1.79	1.54	2.40
3.....	5.5	4.15	2.25	3.8	3.65	1.5	1.15	.95	1.0	3.94	1.52	2.28
4.....	4.8	4.2	2.25	6.7	3.3	1.45	1.15	.95	1.0	2.66	1.52	2.23
5.....	3.55	4.1	2.2	8.1	3.0	1.5	1.15	.95	1.15	2.17	1.49	2.12
6.....	3.05	3.8	7.05	6.7	2.8	1.5	1.05	1.0	1.8	1.89	1.83	1.99
7.....	2.75	3.45	7.75	5.5	2.6	1.55	1.05	1.0	1.6	1.84	2.62	1.94
8.....	2.55	3.25	7.3	4.45	2.55	1.5	1.75	.9	1.4	2.38	2.95	1.90
9.....	2.35	3.15	5.25	5.55	2.45	1.45	1.8	.85	1.3	1.98	2.60	1.88
10.....	2.25	3.35	4.3	5.25	2.4	1.35	1.4	1.5	1.35	2.06	2.36	1.84
11.....	2.2	3.25	3.65	4.25	2.3	1.3	1.45	1.35	1.45	2.90	2.18	1.89
12.....	2.2	3.15	3.3	3.65	2.2	1.25	1.8	1.25	1.3	2.84	2.15	1.82
13.....	2.2	2.9	3.15	3.2	2.15	1.25	2.0	1.1	1.25	2.42	2.52	1.82
14.....	2.15	2.75	3.1	3.05	2.05	1.25	1.75	1.1	1.2	2.17	2.72	1.83
15.....	2.2	2.6	3.0	3.2	1.95	1.15	1.55	1.05	1.35	2.16	2.59	1.86
16.....	2.4	2.45	2.85	3.5	1.9	1.15	1.4	1.1	1.5	2.32	2.42	2.24
17.....	2.65	2.4	2.75	3.45	1.85	1.15	1.5	1.25	1.3	2.59	2.24	2.43
18.....	2.65	2.4	2.65	3.25	1.8	1.3	1.6	1.05	1.25	5.61	2.31	2.60
19.....	2.55	2.35	2.65	3.05	1.75	1.45	1.55	1.0	1.3	3.80	3.82	2.32
20.....	2.55	3.9	2.95	2.7	1.7	1.35	1.45	.9	1.4	2.88	2.69	2.23
21.....	3.25	4.7	3.35	3.5	1.65	1.3	1.35	1.0	1.4	2.45	2.76	2.24
22.....	6.0	3.9	3.25	3.95	1.65	1.25	1.25	1.0	1.75	2.22	2.52	2.24
23.....	5.0	3.45	3.1	4.55	1.6	1.15	1.25	.8	1.65	2.12	2.34	2.54
24.....	3.85	3.1	2.9	4.0	1.55	1.15	1.35	.8	1.55	2.10	2.42	2.99
25.....	3.35	2.9	2.75	3.6	1.45	1.15	1.3	.8	1.55	2.02	2.68	3.30
26.....	3.25	2.7	2.65	3.2	1.4	1.15	1.15	.9	1.4	1.94	2.85	3.40
27.....	3.7	2.6	2.65	3.0	1.35	1.2	1.05	.9	1.25	1.84	2.80	5.71
28.....	3.65	2.5	2.55	2.85	1.3	1.25	1.0	1.25	1.2	1.79	2.74	5.20
29.....	3.9	.....	2.6	2.65	1.25	1.45	.95	1.0	1.2	1.71	2.70	3.81
30.....	11.35	.....	2.6	2.7	1.25	1.5	.95	1.1	1.2	1.66	2.64	3.33
31.....	6.1	.....	2.7	.....	1.35	.....	.95	1.4	.....	1.61	.....	3.19

NOTE.—Observer made no report relative to ice. Relation of gage height to discharge probably not affected by ice during 1911.

COAL RIVER AT FUQUA, W. VA.

Location.—At W. C. Hoy's passenger ferry half a mile below Fuqua railroad station and 1 mile below the mouth of Fuqua Creek.

Records available.—October 12, to December 31, 1911.

Drainage area.—Not measured.

Gage.—Staff gage in two sections on right bank.

Channel.—Firm sand.

Discharge measurements.—Made from boat 300 feet above gage or by wading.

Winter flow.—The relation of gage height to discharge may be affected by ice for short periods.

Accuracy.—Gage-height record is considered reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by Bailey and Perwien:

October 13, 1911: Gage height, 2.85 feet; discharge, 700 second-feet.

Daily gage height, in feet, of Coal River at Fuqua, W. Va., for 1911.

[W. C. Hoy, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1.....	1.40	2.95	11.....	.....	2.34	1.80	21.....	2.95	3.48	2.69
2.....	1.30	2.78	12.....	3.60	2.39	1.78	22.....	2.50	3.01	2.60
3.....	1.30	2.62	13.....	2.85	2.80	1.78	23.....	2.25	2.70	3.48
4.....	1.20	2.50	14.....	2.30	3.38	1.79	24.....	2.10	2.72	3.94
5.....	1.20	2.32	15.....	2.10	3.18	1.95	25.....	1.95	3.50	4.38
6.....	2.65	2.12	16.....	2.30	2.86	3.25	26.....	1.85	3.49	4.64
7.....	3.50	2.02	17.....	3.88	2.53	3.67	27.....	1.70	3.52	7.72
8.....	3.60	1.96	18.....	9.25	2.80	3.32	28.....	1.60	3.40	9.80
9.....	3.08	1.89	19.....	6.10	5.32	3.04	29.....	1.55	3.30	6.15
10.....	2.64	1.84	20.....	3.85	4.30	2.85	30.....	1.50	3.12	4.74
								31.....	1.40	.....	4.55

NOTE.—Relation of gage height to discharge probably not affected by ice during 1911.

COAL RIVER AT TORNADO, W. VA.

Location.—At highway bridge at Upper Falls railroad station, one-fourth mile above Tornado, W. Va., and 1 mile above mouth of Smith Creek.

Records available.—June 24, 1908, to December 31, 1911.

Drainage area.—Not measured.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Practically permanent; strewn with large bowlders.

Discharge measurements.—Made from downstream side of bridge or by wading.

Point of zero flow.—Determined August 8, 1910, as approximately 1.2 feet. The control is a rough log dam and point of zero flow changes.

Winter flow.—The relation between gage height and discharge is affected by ice cover and gorges from one to two weeks at a time during December, January, and February.

Artificial control.—There is a low dam and water-power plant about 1,000 feet below the station.

Accuracy.—The low-water gage heights at this station are affected by the operation of the power plant below the station. Another gaging station has been established above the influence of this dam, by means of which the effect of the power plant upon the lower gage will be observed, after which this station will be discontinued and the upper station will be continued.

Discharge measurements of Coal River at Tornado, W. Va., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
		<i>Feet.</i>	<i>Sec.-feet.</i>
Mar. 9	C. T. Bailey.....	6.09	5,730
Oct. 3	.....do.....	4.46	3,010

Daily gage height, in feet, of Coal River at Tornado, W. Va., for 1911.

[G. C. Hoy, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	3.96	5.56	2.67	2.90	3.35	2.76	1.56	1.40	2.07	1.52	1.78	2.95
2.....	4.46	5.19	2.61	2.91	3.80	2.20	1.54	1.40	1.88	2.75	1.76	2.83
3.....	4.76	4.69	2.57	3.32	3.70	1.93	1.50	1.40	1.62	4.19	1.62	2.75
4.....	4.96	4.25	2.48	7.90	3.45	1.88	1.49	1.41	1.57	3.10	1.70	2.68
5.....	3.81	4.46	2.44	8.60	3.24	1.76	1.48	1.41	1.50	2.65	1.70	2.58
6.....	3.33	4.07	5.48	8.41	3.05	1.71	1.45	1.40	1.53	2.25	1.85	2.45
7.....	3.08	3.72	9.45	5.74	2.92	1.78	1.44	1.40	1.86	2.20	3.22	2.30
8.....	2.90	3.42	10.12	4.62	2.84	1.77	1.45	1.40	1.81	2.82	3.25	2.26
9.....	2.86	3.37	6.07	5.82	2.71	1.70	1.98	1.51	1.72	2.54	2.96	2.21
10.....	2.73	3.43	4.36	5.44	2.61	1.66	1.95	1.45	1.70	3.00	2.78	2.20
11.....	2.62	3.38	3.74	4.35	2.60	1.60	1.69	1.68	1.76	3.32	2.57	2.09
12.....	2.68	3.37	3.50	3.80	2.49	1.61	1.61	1.56	1.85	3.42	2.68	2.08
13.....	2.76	3.15	3.29	3.48	2.35	1.70	2.08	1.49	1.82	2.94	3.08	2.18
14.....	2.68	2.99	3.22	3.25	2.28	1.60	2.15	1.48	1.75	2.63	3.15	2.16
15.....	2.75	2.82	3.12	3.44	2.18	1.58	1.81	1.45	1.88	2.61	3.02	2.34
16.....	2.76	2.55	3.10	3.50	2.00	1.52	1.72	1.45	2.40	2.60	2.88	3.20
17.....	2.85	2.63	2.90	3.64	2.00	1.50	1.65	1.46	1.90	3.45	2.68	3.42
18.....	2.96	2.61	2.85	3.38	1.94	1.70	1.61	1.42	1.80	5.70	2.72	3.19
19.....	2.90	2.59	2.84	3.28	1.88	1.96	1.82	1.42	1.75	4.18	4.02	2.75
20.....	2.89	3.64	2.95	3.35	1.86	1.82	1.78	1.40	1.78	3.30	3.60	2.88
21.....	3.35	4.76	3.15	3.58	1.78	1.70	1.68	1.37	1.72	2.85	3.25	2.83
22.....	6.59	4.12	3.20	3.90	1.72	1.61	1.58	1.33	1.85	2.59	3.02	2.80
23.....	5.19	3.12	3.16	4.50	1.80	1.60	1.52	1.38	1.88	2.43	2.82	3.12
24.....	4.06	3.37	3.02	4.08	1.69	1.59	1.50	1.38	1.81	2.25	2.90	3.54
25.....	3.62	3.21	2.86	3.70	1.65	1.54	1.50	1.38	1.76	2.15	3.12	3.72
26.....	3.73	3.05	2.82	3.45	1.68	1.50	1.51	1.39	1.72	2.85	3.28	3.85
27.....	3.52	2.89	2.79	3.22	1.61	1.50	1.50	1.37	1.68	2.00	3.23	4.85
28.....	3.61	2.75	2.70	3.02	1.58	1.52	1.42	1.37	1.60	1.92	3.18	5.95
29.....	4.39	.....	2.70	2.94	1.53	1.55	1.40	2.25	1.56	1.87	3.14	4.45
30.....	13.07	.....	2.82	2.92	1.64	1.58	1.41	3.02	1.55	1.82	3.04	3.65
31.....	8.02	.....	2.89	.....	2.10	.....	1.40	2.66	.....	1.80	.....	3.60

NOTE.—Relation of gage height to discharge probably not affected by ice during 1911.

POCOTALIGO RIVER AT SISSONVILLE, W. VA.

Location.—At the highway bridge at the post office at Sissonville, W. Va., one-fourth mile below the mouth of Grapevine Creek.

Records available.—June 26, 1908, to December 31, 1911.

Drainage area.—Not measured.

Gage.—Standard chain gage attached to bridge; datum unchanged since established.

Channel.—Practically permanent.

Discharge measurements.—Made from downstream side of bridge or by wading.

Floods.—The flood of June 27, 1910, reached a height of 33.0 feet by the gage datum.

Some of the flood water passed around the gage.

Point of zero flow.—Levels taken August 10, 1910, indicate that there would be no flow past the gage if the stage were to fall to 1.2 feet, ± 0.2 foot.

Winter flow.—The relation between gage height to discharge may be affected by ice for short periods in December, January, and February.

Artificial control.—A dam and small power plant above the station modifies the low-water flow.

Accuracy.—Sufficient data have not been obtained to permit estimates of discharge to be made.

The following discharge measurement was made by wading by C. T. Bailey:

August 1, 1911: Gage height, 1.46 feet; discharge, 1.1 second-feet.

Daily gage height, in feet, of Pocotaligo River at Sissonville, W. Va., for 1911.

[B. N. Sisson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	4.30	5.24	3.06	3.26	2.80	1.59	1.79	1.45	4.55	2.25	2.18	3.18
2.....	6.08	4.80	2.96	2.96	3.66	1.65	1.72	1.44	3.20	5.00	1.90	3.05
3.....	6.00	3.80	2.86	2.94	3.03	1.72	1.69	1.45	3.65	5.60	1.95	2.94
4.....	4.70	6.25	2.78	3.88	2.80	1.59	1.79	1.44	2.85	3.88	1.84	2.80
5.....	3.52	4.86	2.56	6.78	2.74	3.89	1.98	1.40	2.00	2.95	1.89	2.62
6.....	3.35	4.40	8.18	5.98	2.53	2.79	1.63	1.41	1.80	2.52	6.26	2.52
7.....	3.32	4.53	8.99	5.00	2.39	2.32	1.62	1.38	2.05	4.42	8.62	2.42
8.....	3.38	3.96	8.74	5.30	2.26	2.02	1.59	1.30	2.26	7.18	4.18	2.38
9.....	3.68	3.98	4.93	6.77	2.20	1.85	1.53	1.34	1.82	4.18	3.35	2.32
10.....	3.21	3.64	3.98	4.88	2.17	1.89	1.58	1.40	2.32	5.15	3.08	2.26
11.....	2.90	3.23	3.38	3.83	2.09	1.67	1.62	1.42	5.32	7.72	2.85	2.28
12.....	2.89	3.10	3.16	3.73	1.92	1.77	1.59	1.45	5.60	4.56	3.89	2.31
13.....	9.40	2.94	4.18	4.00	1.87	1.62	1.72	1.67	3.45	3.60	5.24	2.32
14.....	6.15	2.88	4.73	5.28	1.89	1.61	1.65	1.50	2.85	3.18	3.78	2.42
15.....	6.82	2.78	3.90	8.68	1.87	1.87	1.63	1.48	2.62	3.02	3.40	3.05
16.....	5.90	2.70	3.36	4.94	1.62	1.59	1.65	1.48	5.76	2.82	3.18	8.96
17.....	4.00	2.57	3.12	3.86	1.69	1.52	1.73	1.48	5.18	4.05	2.95	6.22
18.....	3.52	2.50	3.03	3.86	1.62	2.19	1.61	1.48	3.68	12.45	4.75	4.00
19.....	3.30	3.30	2.83	3.17	1.61	2.57	1.65	1.44	3.05	5.40	4.75	3.40
20.....	3.45	8.50	3.50	4.13	1.59	3.42	1.73	1.42	4.44	4.28	3.58	3.15
21.....	5.60	5.82	3.34	3.73	1.57	2.82	1.61	1.42	3.55	3.30	3.22	3.04
22.....	9.95	4.28	3.10	3.82	1.55	2.35	1.57	1.42	4.55	3.08	2.95	2.94
23.....	5.20	3.73	3.02	3.98	1.48	2.05	1.43	1.40	3.55	2.98	2.72	4.50
24.....	4.00	3.76	2.86	3.46	1.65	1.92	1.50	1.40	2.95	2.84	3.90	4.65
25.....	3.58	3.93	2.66	3.18	1.62	1.49	1.50	1.39	2.62	2.56	4.60	4.80
26.....	5.50	3.70	2.66	2.96	1.61	1.87	1.47	1.40	2.45	2.32	4.04	5.08
27.....	6.10	3.36	2.70	2.82	1.60	1.85	1.45	1.39	2.19	2.30	3.68	11.25
28.....	4.80	3.23	2.62	2.71	1.52	1.85	1.49	1.41	2.20	2.18	3.62	5.52
29.....	6.05	.....	2.62	2.66	1.53	1.77	1.49	1.40	3.60	2.14	3.72	3.88
30.....	17.87	.....	2.88	2.64	1.49	1.93	1.48	9.80	3.00	2.12	3.42	3.52
31.....	5.57	.....	3.38	.....	1.53	.....	1.47	15.50	.....	2.02	.....	6.80

NOTE.—Relation of gage height to discharge probably not affected by ice during 1911.

MIAMI RIVER BASIN.

MIAMI RIVER AT HAMILTON, OHIO.

Location.—At single-span highway bridge on High Street, Hamilton, Ohio.

Records available.—February 28, 1910, to December 31, 1911. Flood stages only, November 16, 1904, reported by the United States Weather Bureau.

Drainage area.—3,580 square miles.

Gage.—Vertical staff gage in two sections fastened to the retaining wall on the left side of the river about 100 feet above the bridge; upper section, placed by Weather Bureau in November, 1904, reads from 2.5 to 25.0 feet; lower section, placed by the United States Geological Survey, extends from 0.5 to 4.0 feet. Gage datum has not been changed.

Channel.—The section at the bridge shifts to some extent in floods on account of the high velocity; but the point of control a short distance below is apparently permanent.

Discharge measurements.—Made from upstream side of bridge.

Floods.—The maximum gage height was 21.2 feet March 24, 1898, according to the records of the United States Weather Bureau.

Winter flow.—Relation of gage height to discharge is at times affected by ice during very severe weather, but for short periods only, as factory wastes probably keep the temperature of the water above the freezing point.

Artificial control.—There are several power plants above the station, but all the water is returned to the river above the gage; there is little if any regulation of the flow from this source. The Miami & Erie Canal is fed by water taken from Miami River at Middletown and Miamisburg, Ohio. The amount of the diversion is not known.

Accuracy.—See note under "Artificial control." Records are considered reliable.

Discharge measurements of Miami River at Hamilton, Ohio, in 1911.

Date.	Hydrographer.	Gage height.	dis-charge.
May 2	Horton & Bailey.....	<i>Feet.</i> 6.50	<i>Sec.-feet.</i> 16,300
June 9	C. T. Bailey.....	1.64	987
	.....do.....	1.62	936

^a Measurement made at lower bridge, not regular section.

Daily gage height, in feet, of Miami River at Hamilton, Ohio, for 1911.

[C. A. Huber, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	4.15	5.25	2.52	2.95	7.65	1.70	1.70	1.00	1.00	1.40	2.00	2.75
2.....	3.80	4.40	2.48	2.75	6.30	1.70	1.62	1.95	1.00	1.40	2.00	2.55
3.....	4.40	4.22	2.45	2.70	4.70	1.70	1.52	1.60	1.00	1.90	1.95	2.40
4.....	3.75	4.12	2.38	3.90	3.90	1.70	1.50	1.10	1.00	1.95	1.90	2.30
5.....	2.90	4.60	2.25	9.25	3.45	1.90	1.50	1.75	1.10	1.85	1.90	2.28
6.....	2.50	4.20	2.25	7.35	3.10	1.85	1.50	1.40	1.30	1.70	2.35	2.18
7.....	2.75	3.95	3.75	5.50	2.85	1.80	2.00	1.40	1.30	3.40	2.45	2.08
8.....	2.80	3.70	4.15	4.55	2.65	1.78	1.80	1.25	1.30	7.00	2.32	2.02
9.....	2.40	3.45	3.42	5.80	2.55	1.70	1.55	1.10	1.50	4.55	2.22	2.00
10.....	2.30	3.20	3.38	3.40	2.45	1.70	1.42	1.00	1.40	3.60	2.12	2.90
11.....	2.30	2.95	3.30	3.08	2.40	1.65	1.40	1.00	1.85	3.45	2.02	3.65
12.....	2.30	2.75	3.05	3.45	2.35	1.62	1.95	1.00	1.80	2.95	.....	5.15
13.....	3.35	2.58	2.82	4.50	2.30	1.60	1.80	0.90	1.55	2.65	2.95	7.05
14.....	5.95	2.52	2.65	5.80	2.25	1.55	1.70	1.05	1.90	2.35	2.90	6.10
15.....	6.00	3.00	2.60	4.80	2.20	1.52	1.60	1.65	2.25	2.20	2.55	5.85
16.....	5.20	3.55	2.40	4.15	2.20	1.50	1.55	1.50	3.30	2.20	2.38	5.40
17.....	4.10	3.28	2.25	3.52	2.10	1.50	1.50	1.40	3.05	3.35	2.30	4.75
18.....	3.40	3.02	2.40	3.15	2.08	1.50	1.50	1.40	2.70	5.10	3.20	4.05
19.....	3.00	3.08	2.50	3.02	2.00	1.80	1.50	1.30	2.45	4.10	5.00	3.60
20.....	2.75	3.35	2.50	3.20	2.00	1.70	1.45	1.20	2.15	3.25	3.90	3.25
21.....	3.60	3.05	2.50	3.35	1.95	1.70	1.40	1.10	1.95	2.70	3.35	3.05
22.....	3.50	2.90	2.45	3.22	1.92	1.70	1.32	1.00	1.78	2.65	2.80	3.00
23.....	3.25	2.80	2.25	3.05	1.90	1.65	1.28	1.00	1.70	2.60	2.65	3.20
24.....	3.00	2.78	2.15	2.85	1.90	1.60	1.25	1.00	1.58	2.50	2.65	3.00
25.....	2.75	2.75	2.18	2.68	1.90	1.55	1.25	1.00	1.50	2.25	3.50	3.00
26.....	4.35	2.90	2.15	2.52	1.82	1.68	1.25	1.00	1.40	2.18	3.50	2.98
27.....	5.40	2.82	2.45	2.48	1.80	1.75	1.20	1.00	1.30	2.08	2.75	3.35
28.....	7.15	2.65	2.55	2.40	1.80	1.90	1.18	1.20	1.30	2.00	2.80	3.50
29.....	7.35	.....	2.50	3.00	1.80	1.80	1.15	1.10	1.32	1.92	2.95	3.10
30.....	7.75	.....	2.80	3.80	1.75	1.75	1.10	1.00	1.40	1.90	3.05	2.90
31.....	7.00	.....	2.95	.....	1.72	.....	1.00	1.00	.....	1.90	.....	3.80

NOTE.—Observer made no report concerning ice. Relation of gage height to discharge probably not affected by ice during 1911.

Daily discharge, in second-feet, of Miami River at Hamilton, Ohio, for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7,640	11,200	2,850	4,000	16,800	1,070	1,070	400	400	700	1,660	3,440
2	6,540	8,440	2,750	3,440	14,900	1,070	950	1,560	400	700	1,660	2,920
3	8,440	7,860	2,680	3,310	9,410	1,070	824	920	400	1,450	1,560	2,560
4	6,380	7,540	2,510	6,850	6,850	1,070	800	460	400	1,560	1,450	2,330
5	3,860	9,080	2,220	26,200	5,480	1,450	800	1,160	460	1,350	1,450	2,280
6	2,800	7,800	2,220	18,700	4,440	1,350	800	700	610	1,070	2,440	2,060
7	3,440	7,000	6,380	12,100	3,720	1,250	1,660	700	610	5,330	2,680	1,840
8	3,580	6,230	7,640	8,920	3,180	1,210	1,250	570	610	17,400	2,380	1,700
9	2,560	5,480	5,390	6,540	2,920	1,070	860	460	800	8,920	2,150	1,660
10	2,330	4,730	5,270	5,330	2,680	1,070	720	400	700	5,930	1,920	3,860
11	2,330	4,000	5,030	4,380	2,560	995	700	400	1,350	5,480	1,700	6,080
12	2,330	3,440	4,300	5,480	2,440	950	1,560	400	1,250	4,000	2,850	10,900
13	5,180	3,000	3,640	8,760	2,330	920	1,250	340	860	3,180	4,000	17,600
14	13,600	2,850	3,180	13,100	2,220	860	1,070	430	1,450	2,440	3,860	14,200
15	13,800	4,150	2,800	9,740	2,100	824	920	995	2,220	2,100	2,920	13,300
16	11,100	5,780	2,560	7,640	2,100	800	860	800	5,030	2,100	2,510	11,700
17	7,430	4,970	2,220	5,690	1,880	800	800	700	4,300	5,180	2,330	9,580
18	5,330	4,210	2,560	4,580	1,840	800	800	700	3,310	10,700	4,730	7,320
19	4,150	4,380	2,800	4,210	1,660	1,250	800	610	2,680	7,480	10,400	5,930
20	3,440	5,180	2,800	4,730	1,660	1,070	750	530	1,990	4,880	6,860	4,880
21	5,930	4,300	2,800	5,180	1,560	1,070	700	460	1,560	3,310	5,180	4,300
22	5,630	3,860	2,680	4,790	1,490	1,070	628	400	1,210	3,180	3,580	4,150
23	4,880	3,580	2,220	4,300	1,450	995	594	400	1,070	3,050	3,180	4,730
24	4,150	3,530	1,990	3,720	1,450	920	570	400	896	2,800	3,180	4,150
25	3,440	3,440	1,990	3,260	1,450	860	570	400	800	2,220	5,630	4,150
26	8,280	3,860	1,990	2,850	1,290	1,040	570	400	700	2,060	5,630	4,090
27	11,700	3,640	2,750	1,250	1,160	530	400	610	1,210	3,180	3,440	5,180
28	18,000	3,180	2,920	2,560	1,250	516	530	610	1,660	3,580	5,630	
29	18,700	.....	2,800	4,150	1,250	495	460	628	1,490	4,000	4,440	
30	20,200	.....	3,580	6,540	1,160	1,160	460	400	700	1,450	4,300	3,860
31	17,400	.....	4,000	.....	1,110	.....	400	400	.....	1,450	.....	6,540

α Interpolated.

NOTE.—Daily discharge determined by means of a discharge rating curve that is fairly well defined below 210 second-feet (gage height 0.6 foot); well defined between 250 and 66,500 second-feet (gage heights, 0.7 and 17.5 feet); and is a tangent above 62,600 second-feet (gage height, 16.8 feet), and extended as such above 66,500 second-feet (gage height, 17.5 feet).

Monthly discharge of Miami River at Hamilton, Ohio, for 1911.

[Drainage area, 3,580 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	20,200	2,330	7,570	2.11	2.43	B.
February	11,200	2,850	5,240	1.46	1.52	A.
March	7,640	1,990	3,270	.913	1.05	A.
April	26,200	2,560	6,790	1.90	2.12	B.
May	16,800	1,110	3,420	.955	1.10	A.
June	1,450	800	1,060	.296	.33	A.
July	1,660	400	815	.228	.26	A.
August	1,560	340	577	.161	.19	B.
September	5,030	400	1,290	.360	.40	A.
October	17,400	700	3,760	1.05	1.21	A.
November	10,400	1,450	3,440	.961	1.07	A.
December	17,600	1,660	5,720	1.60	1.84	B.
The year	26,200	340	3,570	.997	13.52	

NOTE.—See footnotes to tables of daily gage height and daily discharge.

DIX RIVER BASIN.

DIX RIVER NEAR BURGIN, KY.

Location.—At highway bridge on Burgin-Buena Vista pike, 4 miles from Burgin, Ky.

Records available.—July 2, 1910, to July 16, 1911, and October 1 to December 31, 1911.

Drainage area.—416 square miles.

Gage.—Staff gage attached to abutment of bridge.

Channel.—Probably permanent.

Discharge measurements.—Made by representatives of the Kentucky Geological Survey and the Madison Electric & Power Co., of Richmond, Ky.

Winter flow.—Relation of gage height to discharge ordinarily not affected by ice.

Accuracy.—This station has not been visited by United States Geological Survey engineers, but the computations of daily and monthly discharge were made by the Survey. No discharge measurements were made during 1911. The station was last visited September 20, 1910, and the accuracy of the data published in the following tables depends upon the permanency of the gage and of the conditions of flow since that date.

Cooperation.—The station was established and measurements made by representatives of the Kentucky Geological Survey and the Madison Electric & Power Co., of Richmond, Ky. The gage reader's salary is paid by the Madison Electric & Power Co., and by the State Geological Survey of Kentucky.

Daily gage height, in feet, of Dix River near Burgin, Ky., for 1911.

[C. P. Kennedy, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	6.5	8.95	5.05	4.3	17.35	3.65	3.3	.....	.....	3.35	3.4	4.85
2.....	9.2	7.3	4.95	4.2	9.95	3.65	3.2	.....	.....	3.4	3.3	4.7
3.....	8.1	6.85	4.8	4.35	7.85	3.6	3.1	.....	.....	3.35	3.3	4.3
4.....	7.3	14.05	4.75	8.7	7.4	3.45	3.0	.....	.....	3.5	3.3	4.15
5.....	7.1	10.4	4.7	7.6	6.05	3.35	3.0	.....	.....	3.9	3.35	4.1
6.....	6.9	9.5	4.75	6.5	5.6	3.8	3.0	.....	.....	3.6	5.35	4.05
7.....	6.6	8.65	4.9	6.95	5.3	3.85	3.0	.....	.....	3.55	10.85	3.85
8.....	5.75	7.75	5.35	8.35	4.95	3.65	2.95	.....	.....	3.5	6.85	3.8
9.....	5.8	7.9	5.45	7.3	4.7	3.5	2.9	.....	.....	3.4	5.55	3.7
10.....	5.7	7.15	5.3	6.65	4.55	3.45	3.2	.....	.....	3.55	5.35	3.7
11.....	5.65	6.85	5.1	6.5	4.4	3.4	3.3	.....	.....	3.55	5.1	3.8
12.....	5.45	6.45	4.95	6.8	4.3	3.2	3.55	.....	.....	3.5	10.1	4.55
13.....	5.35	6.1	4.8	8.7	4.25	3.1	4.4	.....	.....	5.05	6.65	9.7
14.....	5.3	5.8	4.6	8.25	4.15	3.05	4.1	.....	.....	4.9	6.35	11.6
15.....	5.3	5.65	4.6	10.55	4.05	3.0	4.7	.....	.....	5.05	5.75	15.95
16.....	5.2	5.3	4.55	8.5	3.95	3.0	4.2	.....	.....	5.05	5.6	13.9
17.....	5.1	5.0	4.5	6.65	3.9	3.0	.....	.....	.....	5.1	5.55	10.85
18.....	4.95	4.85	4.5	6.05	3.85	3.0	.....	.....	.....	6.0	9.5	7.7
19.....	4.95	5.6	4.45	5.95	3.8	3.05	.....	.....	.....	5.55	8.75	6.7
20.....	4.85	12.55	4.5	5.65	3.8	4.75	.....	.....	.....	5.15	6.8	6.6
21.....	4.8	10.5	4.4	5.55	3.75	4.6	.....	.....	.....	4.9	6.4	6.95
22.....	8.45	8.25	4.35	5.45	4.4	3.9	.....	.....	.....	4.75	6.1	7.0
23.....	8.5	7.55	4.35	5.35	4.6	3.45	.....	.....	.....	4.5	5.8	7.1
24.....	6.9	6.45	4.25	5.2	4.0	3.35	.....	.....	.....	4.15	5.55	7.65
25.....	6.55	6.0	4.2	5.0	3.95	3.3	.....	.....	.....	4.1	6.35	9.25
26.....	6.65	5.8	4.15	4.75	3.85	3.3	.....	.....	.....	3.85	5.0	8.8
27.....	7.15	5.5	4.3	4.6	3.75	3.3	.....	.....	.....	3.8	4.9	22.65
28.....	7.9	5.35	4.3	4.65	3.65	3.9	.....	.....	.....	3.75	4.75	11.25
29.....	8.1	.....	4.25	4.9	3.6	3.9	.....	.....	.....	3.7	4.7	8.25
30.....	11.45	.....	4.3	5.4	3.85	3.55	.....	.....	.....	3.6	5.05	8.0
31.....	9.15	.....	4.3	.....	3.75	.....	.....	.....	.....	3.45	.....	14.75

NOTE.—Relations of gage height to discharge probably not affected by ice during 1911.

Daily discharge, in second-feet, of Dix River near Burgin, Ky., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.	1,030	2,720	436	219	11,800	92	50			55	60	372
2.	2,940	1,480	404	195	3,650	92	41			60	50	327
3.	2,020	1,220	357	232	1,840	84	33			55	50	219
4.	1,480	8,040	342	2,500	1,540	66	26			71	50	184
5.	1,360	4,100	327	1,660	808	55	26			132	55	172
6.	1,240	3,220	342	1,030	627	115	26			84	536	162
7.	1,080	2,460	388	1,270	519	124	26			78	4,560	124
8.	684	1,760	536	2,220	404	92	23			71	1,220	115
9.	704	1,880	572	1,480	327	71	20			60	608	99
10.	665	1,390	519	1,110	284	66	41			78	536	99
11.	646	1,220	452	1,030	244	60	50			78	452	115
12.	572	1,000	404	1,190	219	41	78			71	3,800	284
13.	536	830	357	2,500	207	33	244			436	1,110	3,410
14.	519	704	298	2,140	184	30	172			388	952	5,350
15.	519	646	298	4,250	162	26	327			436	684	10,200
16.	485	519	284	2,340	142	26	195			436	627	7,870
17.	452	420	270	1,110	132	26				452	608	4,560
18.	404	372	270	808	124	26				786	3,220	1,730
19.	404	627	257	765	115	30				608	2,540	1,140
20.	372	6,380	270	646	115	342				468	1,190	1,080
21.	357	4,200	244	608	107	298				388	978	1,270
22.	2,300	2,140	232	572	244	132				342	830	1,300
23.	2,340	1,630	232	536	298	66				270	704	1,360
24.	1,240	1,000	207	485	151	55				184	608	1,700
25.	1,060	786	195	420	142	50				172	952	2,980
26.	1,110	704	184	342	124	50				124	420	2,580
27.	1,390	590	219	298	107	50				115	388	17,900
28.	1,880	536	219	312	92	132				107	342	4,980
29.	2,020		207	388	84	132				99	327	2,140
30.	5,190		219	554	124	78				84	436	1,950
31.	2,900		219		107					66		8,800

NOTE.—Daily discharge determined by means of a discharge rating curve fairly well defined between 50 and 6,550 second-feet (gage heights 0.3 and 12.7 feet). Above 6,550 second-feet the rating curve is simply an extension and discharge values above that point should therefore be used with caution.

Monthly discharge of Dix River near Burgin, Ky., for 1911.

[Drainage area, 416 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	5,190	357	1,290	3.10	3.57	C.
February.....	8,040	372	1,880	4.52	4.71	C.
March.....	572	184	315	.757	.87	B.
April.....	4,250	195	1,110	2.67	2.98	B.
May.....	11,800	84	807	1.94	2.24	B.
June.....	342	26	84.7	.204	.23	C.
July 1-16.....	327	20	86.1	.207	.12	C.
August.....						
September.....						
October.....	786	55	221	.531	.61	B.
November.....	4,560	50	963	2.31	2.58	B.
December.....	17,900	99	2,730	6.56	7.56	C.

WABASH RIVER BASIN.

WABASH RIVER AT MOUNT CARMEL, ILL.

Location.—At Southern Railway bridge at Mount Carmel, Ill., $1\frac{1}{2}$ miles below mouth of White River and immediately below mouth of Patoka River.

Records available.—June 16, 1884, to November, 1904, United States Army Engineers; November, 1904, to December 31, 1911, United States Weather Bureau.

Drainage area.—Published by the United States Weather Bureau as 26,300 square miles.

Gage.—Staff gage attached to pivot pier of drawspan; datum unchanged since gage was established in 1884.

Channel.—Slightly shifting.

Discharge measurements.—Made from downstream side of bridge. There are numerous overflow openings in the railroad embankment east of the railroad bridge.

Floods.—Maximum stage published by United States Weather Bureau as 28.3 feet August 7, 1875.

Winter flow.—The relation of gage height to discharge may be affected by ice for a week or so at a time during December, January, and February.

Accuracy.—No discharge measurements were made during 1911. Sufficient data have not been obtained to enable estimates of discharge to be made.

Cooperation.—Gage heights furnished by United States Weather Bureau.

Daily gage height, in feet, of Wabash River at Mount Carmel, Ill., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	10.2	15.3	9.7	6.9	10.8	3.4	2.7	0.8	1.0	12.2	4.1	7.5
2.....	11.6	16.1	9.3	6.9	11.3	3.3	3.0	.8	1.0	12.2	4.0	7.3
3.....	13.0	16.4	8.8	6.9	11.4	3.2	3.2	.8	1.0	13.5	3.8	7.1
4.....	14.0	16.7	8.0	6.8	11.6	3.1	3.0	.8	1.0	14.2	3.6	7.0
5.....	13.6	16.6	7.1	9.4	11.8	3.0	2.7	.8	1.0	14.6	3.5	7.0
6.....	12.0	15.7	6.6	12.3	11.3	3.0	2.5	.8	1.7	14.6	3.5	6.8
7.....	10.4	13.4	6.2	13.6	10.6	3.1	2.4	.8	2.2	14.5	3.6	6.2
8.....	8.6	11.5	6.1	14.4	10.0	3.2	2.2	1.0	2.2	13.7	4.2	5.4
9.....	7.6	10.7	10.6	15.2	9.2	3.3	2.1	1.3	1.8	12.4	4.8	5.0
10.....	6.6	10.2	11.9	15.7	8.0	3.3	2.0	1.5	1.7	11.2	5.0	4.8
11.....	6.0	9.7	12.2	16.1	7.6	3.4	1.9	1.4	1.7	9.8	5.0	4.8
12.....	5.6	8.8	12.4	16.0	6.8	3.5	1.9	1.4	2.6	9.0	5.0	7.2
13.....	6.3	7.9	12.3	15.2	5.9	3.4	1.9	1.4	3.1	8.2	5.0	9.5
14.....	7.2	7.2	11.6	15.4	5.5	3.3	1.8	1.3	3.4	7.2	5.9	11.0
15.....	10.0	6.8	10.7	16.4	5.2	3.1	1.7	1.3	4.4	6.2	6.4	11.8
16.....	12.1	6.5	10.0	17.3	4.8	2.8	1.6	1.3	4.6	5.3	7.3	12.4
17.....	13.4	6.7	9.0	17.9	4.5	2.6	1.5	1.3	5.7	4.9	7.7	13.7
18.....	14.3	8.1	7.9	18.3	4.3	2.4	1.4	1.3	6.2	4.5	7.7	14.0
19.....	14.6	10.6	6.6	18.5	4.1	2.4	1.4	1.2	7.9	4.4	9.0	13.7
20.....	14.2	12.3	6.0	18.8	3.9	3.5	1.4	1.2	9.0	4.8	9.6	12.8
21.....	12.8	13.3	5.9	19.3	3.9	4.6	1.4	1.2	9.5	5.0	10.2	12.2
22.....	10.8	13.4	5.7	19.6	3.9	4.2	1.4	1.2	8.0	5.8	11.1	11.8
23.....	9.6	13.5	5.5	19.4	4.0	3.8	1.3	1.5	6.2	6.1	11.4	10.0
24.....	9.3	13.1	5.4	18.9	4.2	3.3	1.3	1.6	4.9	5.5	11.6	9.6
25.....	9.4	12.3	5.3	18.4	4.5	3.0	1.3	1.6	4.4	5.2	11.3	9.3
26.....	9.4	11.3	5.1	16.8	4.8	3.0	1.2	1.4	4.3	5.5	9.8	9.0
27.....	9.0	10.7	4.9	14.7	4.6	3.1	1.1	1.3	4.3	5.5	8.5	8.6
28.....	9.3	10.2	4.8	12.4	4.3	3.2	1.0	1.2	4.4	4.9	8.0	8.3
29.....	11.0	.....	5.0	10.5	4.0	3.0	.9	1.1	5.4	4.7	7.7	7.9
30.....	13.0	.....	5.8	9.8	3.7	2.7	.9	1.0	9.0	4.5	7.6	7.6
31.....	14.2	.....	6.6	.....	3.5	.....	.8	1.0	.....	4.3	.....	7.7

NOTE.—No report concerning ice. Relation of gage height to discharge probably not affected by ice during 1911.

EMBARRASS RIVER NEAR OAKLAND, ILL.

Location.—At highway bridge about 2 miles northwest of Oakland, Ill., on the county line road to Hindsboro and Arcola, in the northeastern part of T. 14 N., R. 10 E., about 5 miles below the mouth of Brush Creek.

Records available.—October 23, 1909, to December 31, 1911.

Drainage area.—535 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged.

Channel.—The section is at a pool; measurements to date indicate that the control has not changed.

Discharge measurements.—Made from downstream side of bridge.

Floods.—The flood of 1897 reached a height of about 24 feet by the present gage datum.

Point of zero flow.—Not determined. There was no flow past the bridge during a portion of the summer of 1908.

Winter flow.—Ice may affect the relation of gage height to discharge during portions of December, January, and February.

The following discharge measurement was made by Monk and Brown:

October 6, 1911: Gage height, 9.37 feet; discharge, 1,360 second-feet.

Daily gage height, in feet, of Embarrass River near Oakland, Ill., for 1911.

[A. J. McDanel, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	2.9	11.0	5.1	5.0	5.4	2.75	2.9	1.7	1.7	14.75	6.5	5.8
2.....	3.2	10.9	4.8	4.9	5.35	2.7	2.2	1.75	1.7	13.9	5.5	5.7
3.....	3.6	10.5	4.5	5.5	5.3	2.7	2.2	1.8	1.7	12.6	5.1	5.4
4.....	a 3.4	10.4	4.3	5.0	5.0	4.4	2.2	1.85	1.85	11.45	4.9	5.2
5.....	a 3.2	9.7	4.1	7.0	4.8	6.65	2.1	1.85	1.85	10.6	4.5	5.0
6.....	a 2.9	9.4	4.1	8.8	4.4	6.3	2.1	1.8	1.95	9.75	4.6	4.9
7.....	a 2.8	9.0	4.4	10.4	4.0	5.9	2.1	1.8	2.4	10.8	5.0	4.9
8.....	2.8	8.6	4.8	9.8	4.0	4.5	2.1	1.75	2.8	10.95	5.3	5.7
9.....	2.75	8.0	4.8	8.2	4.0	4.6	2.1	1.75	2.7	9.8	5.5	5.8
10.....	2.75	7.4	4.9	7.1	3.9	3.9	2.1	1.7	2.8	9.4	5.5	5.8
11.....	2.7	6.1	5.1	7.0	3.6	3.6	2.0	1.7	2.9	8.9	6.0	5.9
12.....	2.9	5.1	5.2	7.0	3.4	3.1	2.0	1.65	3.2	8.2	7.0	5.9
13.....	3.4	5.5	5.2	9.7	3.2	2.95	2.0	1.65	3.7	7.5	8.3	5.8
14.....	3.9	5.9	5.1	13.5	3.1	2.95	1.9	1.6	4.1	7.0	9.0	5.6
15.....	4.0	6.1	4.9	13.4	3.0	2.9	1.9	1.6	4.9	6.2	8.3	5.4
16.....	4.5	6.3	4.8	13.0	2.9	2.8	1.9	1.6	5.5	5.3	8.0	5.3
17.....	4.7	6.8	4.7	12.4	2.9	2.7	1.9	1.6	5.8	5.5	7.8	5.4
18.....	5.6	7.4	4.6	11.8	2.8	2.6	1.9	1.6	6.4	5.6	8.0	5.6
19.....	5.8	7.8	4.5	9.2	2.9	2.6	1.9	1.55	6.2	6.7	8.4	5.6
20.....	5.85	7.6	4.4	8.4	2.9	2.5	1.8	1.55	6.0	8.3	7.8	6.0
21.....	5.8	7.4	4.3	8.0	3.2	2.5	1.8	1.5	5.9	9.7	7.6	6.4
22.....	5.7	7.1	4.2	7.1	3.5	2.6	1.8	1.6	5.8	10.0	8.3	6.6
23.....	5.9	6.4	4.15	7.0	3.4	2.6	1.8	1.6	5.7	10.7	9.0	6.5
24.....	6.9	6.1	4.1	6.8	3.4	2.65	1.8	1.7	4.95	11.2	8.3	6.4
25.....	8.8	5.9	4.0	6.7	3.3	2.75	1.7	1.75	5.4	10.3	7.3	6.4
26.....	9.0	5.8	4.3	6.3	3.1	2.75	1.7	1.8	8.6	9.4	6.0	6.2
27.....	9.5	5.5	4.6	6.0	3.0	2.9	1.75	1.8	10.9	8.0	5.7	6.4
28.....	10.5	5.3	4.8	5.9	3.0	3.1	1.75	1.85	13.6	7.3	5.9	6.0
29.....	11.1	.....	5.2	5.6	2.9	3.1	1.7	1.8	.....	7.0	5.9	5.8
30.....	11.2	.....	5.1	5.4	2.8	3.0	1.7	1.8	15.2	7.5	5.8	5.8
31.....	11.1	.....	5.1	.....	2.75	.....	1.7	1.75	.....	7.3	.....	5.9

a Gage heights to top of ice Jan. 4 to 7.

NOTE.—Relation of gage height to discharge affected by ice Jan. 3 to 7. Observer reported no ice on river Jan. 8 to 14.

Daily discharge, in second-feet, of Embarrass River near Oakland, Ill., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	55	1,930	356	336	416	46	55	5	5	3,460	649	498
2.....	76	1,890	297	316	406	43	17	5.5	5	3,090	436	477
3.....	65	1,750	243	436	396	43	17	6	5	2,540	356	416
4.....	60	1,720	210	336	336	226	17	7	7	2,090	316	376
5.....	60	1,480	179	760	297	682	13	7	7	1,790	243	336
6.....	52	1,390	179	1,210	226	605	13	6	9	1,500	260	316
7.....	49	1,270	226	1,720	165	519	13	6	27	1,860	336	316
8.....	49	1,160	297	1,510	165	243	13	5.5	49	1,910	396	477
9.....	46	1,000	297	1,050	165	260	13	5.5	43	1,510	436	498
10.....	46	854	316	783	152	152	13	5	49	1,390	436	498
11.....	43	561	356	760	116	116	10	5	55	1,240	540	519
12.....	55	356	376	760	95	68	10	4.5	76	1,050	760	519
13.....	95	436	376	1,480	76	58	10	4.5	128	878	1,080	498
14.....	152	519	356	2,920	68	58	8	4	179	760	1,270	456
15.....	165	561	316	2,880	61	55	8	4	316	583	1,080	416
16.....	243	605	297	2,710	55	49	8	4	436	396	1,000	396
17.....	278	715	278	2,460	55	43	8	4	498	436	950	416
18.....	456	854	260	2,220	49	37	8	4	627	456	1,000	456
19.....	498	950	243	1,330	55	37	8	3.5	583	693	1,100	456
20.....	508	902	226	1,100	55	32	6	3.5	540	1,080	950	540
21.....	498	854	210	1,000	76	32	6	3	519	1,480	902	627
22.....	477	783	194	783	105	37	6	4	498	1,580	1,080	671
23.....	519	627	186	760	95	37	6	4	477	1,820	1,270	649
24.....	737	561	179	715	95	40	6	5	326	2,000	1,080	627
25.....	1,210	519	165	693	85	46	5	5.5	416	1,680	830	627
26.....	1,270	498	210	605	68	46	5	6	1,160	1,390	540	583
27.....	1,420	436	260	540	61	55	5.5	6	1,890	1,000	477	627
28.....	1,750	396	297	519	61	68	5.5	7	2,960	830	519	540
29.....	1,970	.....	376	456	55	68	5	6	3,300	760	519	498
30.....	2,000	.....	356	416	49	61	5	6	3,650	878	498	498
31.....	1,970	.....	356	.....	46	.....	5	5.5	.....	830	.....	519

a Sept. 29, discharge interpolated.

NOTE.—Daily discharge determined by means of a discharge rating curve well defined between 22 and 1,450 second-feet (gage heights 2.3 and 9.6 feet). Daily discharge Jan. 3 to 7 estimated, because of ice, from climatologic records and run-off in adjacent drainage areas.

Monthly discharge of Embarrass River near Oakland, Ill., for 1911.

[Drainage area, 535 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	2,000	43	544	1.02	1.18	A.
February.....	1,930	356	913	1.71	1.78	A.
March.....	376	165	273	.510	.59	A.
April.....	2,920	316	1,120	2.09	2.33	A.
May.....	416	46	136	.254	.29	A.
June.....	682	32	129	.241	.27	A.
July.....	55	5	10.6	.020	.02	C.
August.....	7	3	5.08	.0095	.01	C.
September.....	3,650	5	628	1.17	1.30	A.
October.....	3,460	396	1,390	2.60	3.00	A.
November.....	1,270	243	710	1.33	1.48	A.
December.....	671	316	495	.925	1.07	A.
The year.....	3,650	3	525	.981	13.32	

EMBARRASS RIVER AT STE. MARIE, ILL.

Location—At highway bridge at the north end of Main Street, Ste. Marie, Ill., about 150 yards downstream from the Cincinnati, Hamilton & Dayton Railway bridge and 2½ miles upstream from the mouth of Hickory (or North Fork) Creek.

Records available.—October 20, 1909, to December 31, 1911.

Drainage area.—1,540 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged.

Channel.—Shifting; section is at a pool and measurements to date indicate that the point of control has remained unchanged.

Discharge measurements.—Made from downstream side of highway bridge at ordinary stages, and during high water made also from the downstream side of five wooden trestles on the Cincinnati, Hamilton & Dayton Railway, northwest of the highway bridge.

Floods.—The flood of the spring of 1908 reached a height of 22.5 feet, referred to the present gage datum.

Winter flow.—Relation of gage height to discharge may be affected by ice during portions of December, January, and February.

Discharge measurements of Embarrass River at Ste. Marie, Ill., in 1911.

Date.	Hydrographer.	Gage height.	Dis-charge.
Mar. 4	P. S. Monk	<i>Feet.</i> 6.50	<i>Sec.-feet.</i> 974
Oct. 31	Monk and Brown	6.84	1,100

Daily gage height, in feet, of Embarrass River at Ste. Marie, Ill., for 1911.

[Val. C. Wuerth, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.	9.7	14.0	7.7	5.3	11.1	3.2	2.75	1.9	.....	18.55	6.5	6.8
2.	10.2	12.4	7.15	5.0	11.7	3.05	2.65	1.85	.....	19.5	6.1	6.6
3.	14.7	10.6	6.8	4.9	11.0	3.0	2.55	1.85	.....	19.55	5.8	6.4
4.	10.0	9.2	6.45	13.5	10.0	2.9	2.45	1.85	.....	19.2	5.5	6.2
5.	8.7	8.4	6.4	16.0	8.7	2.85	2.4	1.9	.....	18.85	6.0	6.0
6.	7.6	8.85	6.3	16.7	6.5	3.0	2.3	1.9	.....	18.45	6.5	5.7
7.	7.6	11.3	10.3	16.0	6.1	4.65	2.15	2.65	1.85	17.3	7.1	5.5
8.	7.7	9.9	16.0	14.0	5.9	5.0	2.15	2.25	1.85	15.95	7.1	5.4
9.	7.8	9.0	17.0	11.7	5.6	4.3	2.15	1.95	2.55	13.4	6.5	5.7
10.	7.2	7.95	15.5	10.0	5.5	3.95	2.2	1.9	2.3	11.05	6.1	8.5
11.	6.4	7.2	13.1	8.7	5.3	3.9	2.1	1.9	2.65	9.95	5.8	11.0
12.	6.2	6.75	9.7	7.9	5.1	3.55	2.05	1.75	3.25	8.95	8.0	10.0
13.	6.3	6.6	9.2	12.4	5.0	3.4	2.05	1.75	4.25	8.25	14.1	9.8
14.	10.5	6.5	8.2	16.4	4.8	3.2	2.05	1.75	10.55	7.55	10.0	6.5
15.	15.3	7.95	7.5	17.6	4.5	2.95	2.1	1.75	10.6	7.25	9.2	6.8
16.	14.1	7.8	7.2	18.2	4.4	2.9	2.1	1.8	14.25	6.75	9.2	6.9
17.	11.3	12.2	6.6	17.5	4.4	2.75	2.05	1.75	16.75	6.15	9.4	10.5
18.	9.8	14.2	6.5	16.4	4.3	3.3	2.05	1.75	14.95	7.85	15.7	9.0
19.	8.7	14.0	6.8	15.6	4.2	3.0	2.05	.....	8.15	7.95	17.0	7.6
20.	8.0	14.7	6.4	16.9	4.1	2.85	2.1	.....	6.7	7.55	15.5	7.4
21.	6.8	13.7	5.9	15.9	4.5	2.8	2.1	.....	6.45	7.15	13.2	9.0
22.	8.2	11.7	5.6	12.5	4.1	2.55	1.95	.....	6.15	7.85	11.3	11.8
23.	7.7	9.7	5.4	11.2	3.95	2.5	1.95	.....	5.45	9.85	10.0	9.6
24.	7.2	9.15	5.2	9.1	3.9	2.5	1.95	.....	5.35	10.65	9.0	8.3
25.	6.5	10.0	5.0	8.1	3.8	3.45	2.0	.....	5.95	10.45	8.2	7.7
26.	6.4	11.7	5.0	7.5	3.65	3.0	1.9	.....	15.25	10.5	7.5	7.4
27.	9.1	11.9	9.0	7.1	3.5	2.95	1.85	.....	14.95	9.45	7.2	8.1
28.	15.3	8.9	8.8	7.1	3.35	2.8	1.85	.....	11.45	8.95	7.0	7.5
29.	16.8	.....	6.6	7.6	3.4	3.0	1.95	.....	16.75	8.45	8.5	6.7
30.	16.5	.....	6.1	10.0	3.3	2.85	1.9	.....	17.95	7.15	7.5	7.9
31.	15.6	.....	5.5	.....	3.25	.....	.....	.....	.....	6.8	.....	6.5

NOTE.—Relation of gage height to discharge affected by ice from about Jan. 3 to 11. Gage heights Jan. 4 to 11 to top of ice. From July 15 to Sept. 6 observer reported a sand bar underneath the gage. From July 15 to about Aug. 19 the bar was probably covered by water and the discharge is fairly represented by the gage heights. From about Aug. 19 to Sept. 16 the observer reported "Sand-bar reading beneath gage." During this period there was probably no water over the sand bar and the reported gage heights do not give the elevation of the water surface.

Daily discharge, in second-feet, of Embarrass River at Ste. Marie, Ill., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.	2,180	3,930	1,420	630	2,740	215	184	103	.....	5,800	992	1,100
2.	2,380	3,270	1,220	555	2,930	196	156	100	.....	6,180	861	1,030
3.	2,200	2,540	1,100	532	2,703	190	148	100	.....	6,210	769	959
4.	2,000	1,980	976	3,720	2,300	179	140	100	.....	6,060	683	893
5.	1,850	1,680	959	4,750	1,790	174	136	103	.....	5,920	830	830
6.	1,650	1,850	926	5,040	992	190	129	103	.....	5,750	992	740
7.	1,500	2,820	2,420	4,750	861	476	118	156	100	5,280	1,200	683
8.	1,350	2,260	4,750	3,930	799	555	118	126	100	4,730	1,200	652
9.	1,200	1,900	5,160	2,990	711	403	118	106	148	3,680	992	746
10.	1,050	1,510	4,540	2,300	683	336	122	103	129	2,720	861	1,720
11.	900	1,240	3,560	1,790	630	326	115	103	156	2,280	769	2,700
12.	893	1,080	2,180	1,490	579	267	112	94	222	1,890	1,530	2,300
13.	926	1,030	1,980	3,270	555	244	112	94	393	1,620	3,970	2,220
14.	2,500	992	1,600	4,910	509	215	112	94	2,520	1,360	2,300	990
15.	4,460	1,510	1,340	5,410	444	184	115	94	2,540	1,260	1,980	1,100
16.	3,970	1,460	1,240	5,650	423	179	115	97	4,030	1,080	1,980	1,130
17.	2,820	3,190	1,030	5,360	423	164	112	94	5,060	877	2,060	877
18.	2,220	4,010	992	4,910	403	229	112	94	4,320	1,470	4,630	1,900
19.	1,790	3,930	1,100	4,590	333	190	112	.....	1,590	1,510	5,160	1,380
20.	1,530	4,220	959	5,120	364	174	115	.....	1,060	1,360	4,540	1,310
21.	1,100	3,810	799	4,710	444	169	115	.....	976	1,220	3,600	1,900
22.	1,600	2,990	711	3,320	364	148	106	.....	877	1,470	2,820	3,030
23.	1,420	2,180	656	2,780	336	144	106	.....	670	2,240	2,300	2,140
24.	1,240	1,960	604	1,940	326	144	106	.....	643	2,560	1,900	1,640
25.	992	2,300	555	1,570	308	252	109	.....	814	2,480	1,600	1,420
26.	959	2,990	555	1,340	283	190	103	.....	4,440	2,500	1,340	1,310
27.	1,940	3,070	1,900	1,200	259	184	100	.....	4,320	2,080	1,240	1,570
28.	4,460	1,870	1,530	1,200	236	169	100	.....	2,880	1,990	1,160	1,340
29.	5,080	.....	1,030	1,380	244	190	106	.....	5,060	1,800	1,720	1,040
30.	4,960	.....	861	2,300	229	174	103	.....	5,550	1,220	1,340	1,490
31.	4,590	.....	683	.....	222	.....	103	.....	.....	1,100	.....	992

NOTE.—Daily discharge determined by means of a discharge rating curve poorly defined below 160 second-feet (gauge height 2.7 feet); well defined between 169 and 1,870 second-feet (gauge heights 2.8 and 8.9 feet); fairly well defined between 1,900 and 4,750 second-feet (gauge heights 9.0 and 16.0 feet). Above 4,750 second-feet (gauge height 16.0 feet) curve is extended as a tangent which starts at 2,700 second-feet (gauge height 11.0 feet). Daily discharge Jan. 3 to 11 estimated, because of ice, from climatologic records and run-off in adjacent drainage areas. Daily discharge Aug. 19 to Sept. 6 estimated, because of sand bar, from comparison with run-off in adjacent drainage areas. Mean discharge Aug. 19 to 31 estimated 85 second-feet. Mean discharge Sept. 1 to 6 estimated 80 second-feet.

Monthly discharge of Embarrass River at Ste. Marie, Ill., for 1911.

[Drainage area, 1,540 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	5,080	893	2,180	1.42	1.64	B.
February.....	4,220	992	2,410	1.56	1.62	A.
March.....	5,160	555	1,600	1.04	1.20	A.
April.....	5,650	532	3,110	2.02	2.25	A.
May.....	2,990	222	791	.514	.59	B.
June.....	555	144	228	.148	.17	B.
July.....	164	100	117	.076	.09	C.
August.....	156	.....	95.8	.062	.07	D.
September.....	5,550	.....	1,640	1.06	1.18	A.
October.....	6,210	877	2,820	1.83	2.11	A.
November.....	5,160	683	1,910	1.24	1.38	A.
December.....	3,030	656	1,440	.935	1.08	A.
The year.....	6,210	.....	1,520	.987	13.38	.....

NOTE.—See footnotes to table of daily discharge.

EAST BRANCH OF WHITE RIVER AT SHOALS, IND.

Location.—At highway bridge between East and West Shoals, Ind., a short distance above the Baltimore & Ohio Southwestern Railroad bridge.

Records available.—June 25, 1903, to July 21, 1906; October 12, 1908, to December 31, 1911.

Drainage area.—4,900 square miles (published by United States Weather Bureau).

Gage.—Standard chain gage attached to bridge. The gage datum was raised 61 feet on January 1, 1909, so as to be the same as that used by the United States Weather Bureau.

Channel.—Solid rock; practically permanent.

Discharge measurements.—Made from downstream side of bridge.

Floods.—Maximum gage height as published by the United States Weather Bureau was 34.1 feet March 30, 1904; flood of March, 1897, said to have been 1 to 1½ feet higher.

Winter flow.—Relation of gage height to discharge affected by ice during severe winters during portions of January and February. In ordinary winters there is little if any ice at the station.

Accuracy.—Drift lodged in the channel below the gaging section, noted in Water-Supply Paper 283 as the probable cause of the change in relation of gage height to discharge during the latter part of 1910, has been assumed to have been removed by the rise of January 1 to 5, 1911, and only one discharge rating curve has been used to determine the daily discharge for 1911 published in the following table. This discharge rating curve is based on discharge measurements made during 1909, 1910, and 1911, and the form of previous curves, reverses at about 3,980 second-feet (gage height 4.5 feet), is drawn as a tangent above 17,000 second-feet (gage height, 11.0 feet), and is fairly well defined.

Cooperation.—Gage readings are furnished by the United States Weather Bureau part of the year.

Discharge measurements of East Branch of White River at Shoals, Ind., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
		<i>Feet.</i>	<i>Sec.-feet.</i>
Sept. 21	Bailey and Monk.....	6.40	8,180
26	C. T. Bailey.....	3.68	2,010

Daily gage height, in feet, of East Branch of White River at Shoals, Ind., for 1911.

[O. H. Greist and G. H. Rowe, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	9.0	12.8	7.0	7.2	5.7	3.4	3.05	2.45	2.2	5.4	3.6	5.85
2.....	11.3	12.9	6.3	6.8	8.8	3.5	3.15	2.45	2.2	8.6	3.6	5.8
3.....	11.8	11.8	5.7	6.1	10.2	3.4	3.15	2.4	2.3	12.4	3.45	5.35
4.....	10.5	10.2	5.2	9.6	10.4	3.5	3.05	2.4	2.2	12.1	3.5	5.05
5.....	9.1	8.5	4.9	12.2	10.2	3.7	2.95	2.3	2.75	11.3	3.5	4.8
6.....	7.6	7.0	4.8	14.7	9.9	3.4	2.85	2.4	3.4	9.8	3.75	4.45
7.....	6.4	6.3	5.1	15.6	9.0	3.5	2.85	2.3	3.1	8.75	5.15	4.35
8.....	5.4	6.7	8.6	16.4	8.7	3.8	2.85	2.4	3.15	7.6	6.2	4.2
9.....	5.0	7.0	10.6	17.1	6.1	4.4	2.85	2.5	3.25	7.1	6.2	4.05
10.....	4.8	7.0	11.6	16.3	5.2	4.3	2.85	2.4	3.55	6.1	6.2	4.05
11.....	4.7	6.4	11.7	14.1	4.2	4.0	2.95	2.5	3.3	5.25	5.75	4.7
12.....	4.6	5.7	10.6	12.1	4.4	3.7	2.95	2.4	3.2	4.7	.....	6.6
13.....	4.9	5.3	9.4	9.1	4.4	3.4	2.85	2.4	3.4	4.4	.....	7.15
14.....	7.5	5.0	8.1	13.4	4.2	3.3	2.75	2.5	3.65	4.3	.....	8.8
15.....	9.9	4.9	6.6	16.7	4.2	3.2	2.75	2.4	3.75	.....	.....	10.9
16.....	12.3	4.8	5.6	16.6	4.1	3.0	2.75	2.4	3.7	.....	.....	11.0
17.....	12.6	4.8	5.1	17.5	3.9	3.05	2.75	2.4	4.45	.....	.....	10.6
18.....	11.0	5.0	4.8	18.8	3.9	3.05	2.75	2.3	6.5	5.35	.....	10.15
19.....	10.2	5.3	4.5	19.0	3.7	3.95	2.75	2.15	8.45	6.05	.....	9.55
20.....	8.7	5.9	4.5	18.3	3.7	3.65	2.75	2.3	8.35	6.5	.....	8.85
21.....	7.2	7.0	4.5	16.2	4.1	3.15	2.65	2.2	6.2	6.3	5.4	8.00
22.....	6.5	7.9	4.5	13.0	4.3	3.05	2.55	2.2	5.3	6.05	5.55	7.00
23.....	7.0	7.6	4.4	10.1	4.8	3.05	2.45	2.15	4.8	5.5	5.3	6.25
24.....	7.9	6.8	4.2	8.5	4.9	3.15	2.45	2.3	4.4	4.85	.....	5.95
25.....	7.7	6.4	4.2	7.5	4.7	3.25	2.45	2.2	3.95	4.3	5.35	5.7
26.....	7.0	6.4	4.2	6.6	4.6	3.15	2.45	2.3	3.6	4.1	5.3	5.5
27.....	6.3	6.8	4.2	6.0	4.2	3.05	2.45	2.2	3.45	4.0	6.0	5.5
28.....	6.7	7.2	4.7	5.5	4.0	2.95	2.45	2.2	3.45	3.85	5.7	5.75
29.....	8.0	.....	5.6	5.2	3.7	2.95	2.45	2.3	5.3	3.7	5.45	6.2
30.....	10.7	.....	6.5	5.1	3.6	2.95	2.45	2.2	5.65	3.65	5.5	6.45
31.....	12.1	.....	6.8	.....	3.6	.....	2.45	2.3	.....	3.6	.....	6.5

NOTE.—Relation of gage height to discharge probably not affected by ice during 1911.

Daily discharge, in second-feet, of East Branch of White River at Shoals, Ind., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.	13,600	19,700	9,670	10,100	6,830	1,580	1,100	535	370	6,140	1,910	7,170
2.	17,400	19,800	8,160	9,250	13,200	1,740	1,220	535	370	12,900	1,910	7,060
3.	18,200	18,200	6,830	7,720	15,700	1,580	1,220	500	430	19,100	1,660	6,020
4.	16,200	15,700	5,680	14,700	16,000	1,740	1,100	500	370	18,600	1,740	5,330
5.	13,800	12,700	4,970	18,800	15,700	2,100	985	430	785	17,400	1,740	4,730
6.	10,900	9,670	4,730	22,600	15,200	1,580	880	500	1,580	15,000	2,200	3,860
7.	8,380	8,160	5,450	23,900	13,600	1,740	880	430	1,160	13,100	5,560	3,600
8.	6,140	9,040	12,900	25,100	13,000	2,310	880	500	1,220	10,900	7,940	3,240
9.	5,210	9,670	16,400	26,200	7,720	3,730	880	570	1,360	9,880	7,940	2,880
10.	4,730	9,670	17,900	25,000	5,680	3,480	880	500	1,820	7,720	7,940	2,880
11.	4,480	8,380	18,000	21,600	3,240	2,760	985	570	1,430	5,800	6,940	4,480
12.	4,230	6,830	16,400	18,600	3,730	2,100	985	500	1,290	4,480	6,860	8,820
13.	4,970	5,910	14,300	13,800	3,730	1,580	880	500	1,580	3,730	6,780	9,980
14.	10,700	5,210	11,900	20,600	3,240	1,430	785	570	2,000	3,480	6,700	13,200
15.	15,200	4,970	8,820	25,600	3,240	1,290	785	500	2,200	4,120	6,220	16,800
16.	19,000	4,730	6,600	25,400	3,000	1,040	785	500	2,100	4,750	6,540	17,000
17.	19,400	4,730	5,450	26,800	2,530	1,100	785	500	3,860	5,390	6,460	16,400
18.	17,000	5,210	4,730	28,700	2,530	1,100	785	430	8,600	6,020	6,380	15,600
19.	15,700	5,910	3,980	29,000	2,100	2,640	785	345	12,600	7,610	6,300	14,600
20.	13,000	7,280	3,980	28,000	2,100	2,000	785	430	12,400	8,600	6,370	13,300
21.	10,100	9,670	3,980	24,800	3,000	1,220	695	370	7,940	8,160	6,140	11,700
22.	8,600	11,500	3,980	20,000	3,480	1,100	610	370	5,910	7,610	6,480	9,670
23.	9,670	10,900	3,730	15,600	4,730	1,100	535	345	4,730	6,370	5,910	8,050
24.	11,500	9,250	3,240	12,700	4,970	1,220	535	430	3,730	4,850	5,960	7,390
25.	11,100	8,380	3,240	10,700	4,480	1,360	535	370	2,640	3,480	6,020	6,830
26.	9,670	8,380	3,240	8,820	4,230	1,220	535	430	1,910	3,000	5,910	6,370
27.	8,160	9,250	3,240	7,500	3,240	1,100	535	370	1,660	2,760	7,500	6,370
28.	9,040	10,100	4,480	6,370	2,760	985	535	370	1,660	2,420	6,830	6,940
29.	11,700	-----	6,600	5,680	2,100	985	535	430	5,910	2,100	6,260	7,940
30.	16,500	-----	8,600	5,450	1,910	985	535	370	6,720	2,000	6,370	8,490
31.	18,600	-----	9,250	-----	1,910	-----	535	430	-----	1,910	-----	8,600

NOTE.—Daily discharge interpolated Oct. 15 to 17, Nov. 12 to 20, and Nov. 24. See "Accuracy" in station description.

Monthly discharge of East Branch of White River at Shoals, Ind., for 1911.

[Drainage area, 4,900 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	19,400	4,230	11,700	2.39	2.76	B.
February	19,800	4,730	9,600	1.96	2.04	A.
March	18,000	3,240	7,760	1.58	1.82	A.
April	29,000	5,450	18,000	3.67	4.10	B.
May	16,000	1,910	6,090	1.24	1.43	A.
June	3,730	985	1,660	.339	.38	A.
July	1,220	535	790	.161	.19	B.
August	570	345	456	.093	.11	C.
September	12,600	370	3,340	.682	.76	A.
October	19,100	1,910	7,400	1.51	1.74	B.
November	7,940	1,660	5,660	1.16	1.29	C.
December	17,000	2,880	8,560	1.75	2.02	B.
The year	29,000	345	6,720	1.37	18.64	

NOTE.—See footnotes to tables of daily gage heights and daily discharge and discussion under "Accuracy" in station description.

LITTLE WABASH RIVER NEAR CLAY CITY, ILL.

Location.—At the Baltimore & Ohio Southwestern Railroad bridge about 2 miles east of Clay City, Ill., and about 5 miles above the mouth of Big Muddy Creek.

Records available.—October 3, 1908, to December 31, 1911.

Drainage area.—808 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged.

Channel.—Probably permanent. Location of point of control not known.

Discharge measurements.—Made from downstream side of bridge.

Floods.—The flood of February 8, 1909, reached a height of 23.7 feet on the gage.

Winter flow.—Ice may affect the relation between gage height and discharge during portions of December, January, and February.

Remarks.—The station is at the toe of a horseshoe bend in the river, and the ground inside the bend along the railroad is very low. During high water the Little Wabash overflows into Little Muddy Creek and in extreme high water into Big Muddy Creek, forming at such times a sheet of water 4 miles wide along the railroad; the high-water discharge at this station can not therefore be determined. Eight measurements of discharge were made at this station during 1909-1911, but estimates are withheld because of impossibility of determining the high-water discharge.

Discharge measurements of Little Wabash River near Clay City, Ill., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Mar. 2	P. S. Monk.....	Feet. 10.84	Sec.-feet. 620
Nov. 1	Monk and Brown.....	7.53	145

Daily gage height, in feet, of Little Wabash River near Clay City, Ill., for 1911.

[William F. Davis, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	11.1	13.9	13.9	8.4	18.4	6.6	7.7	6.0	6.0	18.7	7.7	9.3
2.....	10.1	10.7	10.9	8.0	18.6	6.6	7.0	6.0	6.0	19.95	7.5	8.55
3.....	12.0	10.0	9.6	7.9	18.5	6.3	6.3	6.1	5.95	19.55	7.3	8.3
4.....	15.2	8.9	9.25	8.5	18.3	6.2	6.3	6.05	6.2	19.35	7.2	8.0
5.....	14.6	8.6	9.3	13.1	14.9	6.1	6.3	5.95	6.4	19.35	10.3	7.9
6.....	11.6	8.4	9.4	15.4	10.9	6.1	6.3	6.0	6.35	19.2	12.6	7.6
7.....	10.0	10.2	9.7	15.5	10.7	6.5	6.2	6.05	6.4	19.0	12.3	7.5
8.....	8.6	12.3	15.9	10.5	8.4	7.7	6.1	6.1	6.45	18.8	11.2	7.5
9.....	8.4	11.8	18.0	10.0	8.2	7.3	6.1	6.1	6.9	18.2	10.4	7.65
10.....	8.3	11.0	18.4	8.9	8.1	7.1	6.1	6.75	8.8	16.2	9.2	7.9
11.....	7.9	9.4	18.4	8.6	8.0	6.9	6.1	6.8	8.85	10.5	8.5	11.4
12.....	7.7	9.0	14.7	8.3	8.0	6.5	6.0	6.75	9.3	9.35	.....	15.4
13.....	7.7	8.8	13.3	9.6	7.7	6.4	6.0	6.55	9.5	9.1	13.2	15.3
14.....	7.6	8.7	12.4	17.0	7.6	6.3	6.0	6.5	9.75	8.6	16.9	11.1
15.....	9.6	8.4	10.2	18.3	7.3	6.3	6.0	6.35	11.0	8.15	14.0	9.5
16.....	14.2	8.9	8.8	18.4	7.2	6.3	6.1	6.2	15.0	8.2	10.9	9.5
17.....	13.7	10.4	8.4	18.4	7.1	6.4	6.0	6.1	17.2	7.8	10.2	11.1
18.....	9.7	12.7	8.1	18.4	7.0	6.4	6.1	6.0	18.1	7.75	11.0	14.5
19.....	8.9	15.2	7.9	17.3	7.0	6.7	6.1	6.0	18.2	7.7	17.0	13.2
20.....	8.3	17.4	9.5	17.6	7.0	6.6	6.1	6.0	18.3	7.6	18.0	11.0
21.....	8.1	17.6	9.0	18.2	6.9	6.5	6.1	6.15	18.55	7.6	17.5	10.0
22.....	17.1	17.1	8.3	18.3	6.8	6.4	6.1	6.6	18.4	12.4	16.4	15.15
23.....	8.0	14.4	8.0	17.3	6.7	6.3	6.1	6.5	14.05	13.5	15.1	16.2
24.....	8.0	13.1	7.8	13.8	9.0	6.3	6.1	6.5	9.8	12.2	10.4	11.4
25.....	8.0	12.2	7.4	9.7	8.1	6.3	6.05	6.4	9.75	11.6	9.6	10.9
26.....	7.9	14.0	7.5	8.7	7.5	6.5	6.0	5.95	9.8	11.0	9.2	9.5
27.....	8.4	14.0	9.3	8.4	7.3	9.9	6.0	6.0	15.0	9.3	8.6	9.2
28.....	10.6	14.0	14.3	8.4	7.0	8.3	6.0	6.0	17.2	8.35	8.6	11.0
29.....	14.0	.....	12.8	8.4	6.8	8.2	6.0	5.95	18.3	8.2	8.6	9.2
30.....	17.4	.....	11.2	8.7	6.7	8.1	6.0	6.0	18.6	7.45	9.3	10.1
31.....	17.0	.....	9.0	15.7	6.6	.....	6.0	5.95	.....	7.5	.....	10.5

NOTE.—Relation of gage height to discharge probably not affected by ice during 1911.

LITTLE WABASH RIVER NEAR GOLDEN GATE, ILL.

Location.—At Southern Railway bridge about 1 mile west of Golden Gate, Ill., and 1 mile below the mouth of Elm Creek.

Records available.—August 17, 1908, to December 31, 1911.

Drainage area.—1,780 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged.

Channel.—Probably permanent. Location of control not known.

Discharge measurements.—Made from downstream side of the bridge and, at high stages, also from downstream side of three wooden trestles east of the gaging station.

Floods.—The flood of May, 1908, reached a height of about 29.2 feet on the present gage datum.

Winter flow.—Ice may affect the relation between gage height and discharge during portions of December, January, and February.

Accuracy.—Backwater affects the relation of gage height to discharge at this station and, although 20 measurements of discharge have been made at this point during 1908–1911, no reliable estimates can be made.

Discharge measurements of Little Wabash River near Golden Gate, Ill., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Mar. 7	P. S. Monk.....	<i>Feet.</i> 6.50	<i>Sec.-feet.</i> 756
Oct. 30	Monk and Brown.....	9.81	1,490
		4.71	294

Daily gage height, in feet, of Little Wabash River near Golden Gate, Ill., for 1911.

[Ben Chalcraft, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	10.4	14.9	16.5	8.4	15.4	4.8	6.2	1.8	1.8	15.5	4.0	7.1
2.....	11.6	14.4	16.3	6.1	19.2	3.8	4.4	1.9	1.8	15.9	3.8	7.9
3.....	12.5	13.7	14.7	5.2	20.4	3.0	3.6	1.9	1.7	16.1	3.7	6.9
4.....	12.6	11.4	11.3	5.0	21.1	3.1	3.4	1.9	1.7	16.5	3.6	6.5
5.....	12.0	7.6	8.4	9.2	21.6	3.0	3.0	1.9	1.9	17.5	3.5	6.0
6.....	11.9	6.0	6.8	13.6	21.6	3.2	3.6	2.0	3.0	20.0	3.8	5.6
7.....	11.8	7.4	6.3	15.6	21.4	3.2	2.3	2.0	4.7	23.4	7.4	5.2
8.....	9.0	8.9	9.7	16.8	20.3	4.1	2.3	2.1	4.1	24.2	8.2	4.9
9.....	7.5	10.2	14.0	14.0	19.7	3.8	2.2	2.0	3.9	24.3	9.6	4.2
10.....	6.6	11.1	15.5	11.5	16.4	3.6	2.2	2.0	5.0	24.2	11.5	5.7
11.....	5.7	9.7	15.8	8.2	11.1	4.0	2.2	2.0	4.1	24.0	12.2	8.9
12.....	6.2	7.4	15.8	6.3	7.4	3.8	2.3	1.9	4.1	23.7	11.8	11.2
13.....	6.5	6.3	16.0	9.3	6.4	3.6	2.8	2.6	4.7	23.2	13.3	15.0
14.....	7.2	5.8	16.1	16.5	4.4	3.4	3.1	2.4	5.0	22.7	13.8	16.2
15.....	11.1	5.1	16.3	19.4	4.3	2.6	3.0	2.2	5.3	21.3	13.0	16.8
16.....	12.8	5.6	16.0	19.7	4.1	2.4	2.5	2.0	5.1	20.2	14.7	16.4
17.....	12.9	7.3	13.3	19.9	4.0	2.4	2.3	1.9	8.5	17.0	14.4	13.1
18.....	12.0	9.1	8.3	19.8	3.8	2.5	2.2	1.9	12.2	11.5	13.8	13.9
19.....	11.0	14.7	5.8	20.1	3.7	4.1	2.2	1.9	13.9	7.9	13.0	14.1
20.....	8.2	17.3	5.4	20.9	3.6	5.8	2.1	1.9	14.4	6.5	12.2	13.8
21.....	6.6	18.0	6.2	21.2	3.5	8.0	2.2	1.8	15.0	4.6	13.4	12.3
22.....	6.0	18.6	5.8	21.1	3.5	6.4	2.0	1.8	15.1	4.8	14.4	11.8
23.....	6.2	18.9	5.5	20.8	3.3	4.2	2.0	1.8	15.0	4.9	14.3	13.2
24.....	6.4	18.8	5.5	20.3	3.2	3.5	2.0	1.8	14.8	4.1	13.9	13.4
25.....	5.8	18.4	5.4	19.8	4.3	3.2	1.9	2.3	14.2	3.9	11.4	13.1
26.....	6.2	17.9	5.5	19.3	4.8	3.3	2.0	2.2	11.1	7.2	8.3	12.8
27.....	6.6	17.6	5.8	18.0	4.5	5.8	1.9	2.1	11.4	8.5	7.4	11.0
28.....	8.9	17.3	6.4	14.0	3.6	8.4	1.9	2.0	13.3	7.5	6.2	8.6
29.....	12.1	-----	9.4	9.0	3.3	8.8	1.8	2.0	14.2	5.5	6.7	8.1
30.....	14.0	-----	11.0	13.6	3.1	7.7	1.8	1.9	14.9	4.7	6.2	8.9
31.....	14.9	-----	10.3	-----	4.0	-----	1.8	1.9	-----	4.2	-----	9.4

NOTE.—Observer reported river full of "loose" ice Jan. 5, and full of "floating ice" Jan. 6. Relation of gage height to discharge probably not affected by ice during 1911.

LITTLE WABASH RIVER AT CARMÍ, ILL.

Location.—At highway bridge at northeast edge of Carmi, Ill., about one-fourth mile below the Big Four and Louisville & Nashville Railroad bridges, and about $4\frac{1}{2}$ miles below the mouth of Skillet Fork River.

Records available.—October 9, 1908, to December 31, 1911.

Drainage area.—3,090 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged.

Channel.—Probably permanent. Location of control not known.

Discharge measurements.—Made from downstream side of bridge.

Floods.—The following high-water marks have been preserved: 1875, 33.5 feet; about 1895, 34.0 feet; 1897, 34.5 feet; 1898, 36.0 feet; all based on present gage datum.

These gage heights are authentic, but there is a possibility that some of the dates are erroneous.

Winter flow.—Ice does not affect the flow in ordinary winters.

Accuracy.—Backwater exists at this station and reliable estimates of discharge can not be made.

Discharge measurements of Little Wabash River at Carmi, Ill., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
		<i>Feet.</i>	<i>Sec.-feet.</i>
Mar. 6	P. S. Monk.....	5.14	1,340
Oct. 26	Monk and Brown.....	2.66	362

Daily gage height, in feet, of Little Wabash River at Carmi, Ill., for 1911.

[Noah Weigant, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	6.7	9.0	14.45	6.3	20.6	2.45	4.30	1.75	1.75	9.6	2.75	4.4
2.....	7.3	10.1	13.2	4.8	20.3	2.5	3.45	1.90	1.75	10.6	2.6	4.05
3.....	8.3	10.1	12.0	3.9	19.65	2.5	2.85	1.80	1.75	10.9	2.4	3.9
4.....	8.5	9.8	10.4	3.3	19.4	2.5	2.50	1.75	1.8	10.95	2.3	3.7
5.....	8.7	8.95	8.1	3.65	19.95	2.6	2.30	1.70	1.8	11.4	2.25	3.45
6.....	8.5	8.8	5.7	6.8	20.45	2.9	2.25	1.90	1.95	12.0	2.35	3.05
7.....	7.8	9.3	4.75	9.5	20.75	2.6	2.15	1.80	2.2	12.75	2.4	2.9
8.....	6.95	9.85	5.9	11.4	20.75	2.4	2.05	1.75	2.5	13.8	2.5	2.75
9.....	5.65	10.2	7.8	11.8	20.45	2.5	1.95	1.70	2.65	14.8	2.7	2.65
10.....	4.4	10.35	10.15	10.75	19.6	3.1	1.9	1.70	2.75	15.9	5.6	2.65
11.....	3.65	10.1	11.45	9.3	17.75	2.8	1.85	1.8	3.05	17.2	6.3	2.85
12.....	3.45	9.45	11.85	7.9	13.2	2.6	1.8	1.85	2.85	17.7	5.8	3.4
13.....	3.3	8.05	11.4	8.05	8.0	2.4	1.8	1.85	2.8	17.3	4.6	7.65
14.....	3.0	6.15	10.8	17.0	4.32	2.25	1.8	1.9	2.9	17.15	4.7	8.15
15.....	4.1	4.75	10.4	18.15	3.18	2.15	2.0	1.9	3.1	16.75	7.6	8.9
16.....	5.9	3.65	9.55	18.1	2.9	2.05	2.05	1.9	3.2	16.4	9.1	9.3
17.....	7.1	4.05	8.45	18.55	2.65	2.0	2.05	1.95	3.8	15.3	9.35	9.4
18.....	7.6	5.05	7.1	19.2	2.5	2.4	2.0	1.95	4.15	13.15	9.05	9.35
19.....	7.6	8.6	5.35	19.7	2.4	2.8	1.9	1.95	6.55	10.10	8.3	9.1
20.....	6.9	14.95	3.65	20.45	2.3	3.1	1.85	1.95	8.4	7.9	7.45	9.05
21.....	5.65	16.1	3.15	20.4	2.25	3.3	1.8	1.9	9.05	5.95	7.9	9.3
22.....	4.45	16.2	3.05	20.35	2.25	4.0	1.8	1.9	9.35	4.35	8.3	9.75
23.....	3.85	16.4	3.25	20.35	2.25	3.5	1.7	1.9	9.4	3.3	8.95	10.3
24.....	3.65	16.75	3.1	20.0	2.2	2.95	1.7	1.9	9.05	2.75	8.85	10.65
25.....	3.65	16.95	3.0	19.2	2.3	2.55	1.7	1.85	8.65	2.45	8.15	10.9
26.....	3.65	16.85	2.9	17.85	2.4	2.3	1.7	1.85	6.05	2.5	7.1	10.35
27.....	3.7	16.4	2.9	16.45	2.5	2.25	1.65	1.85	6.65	3.5	5.4	9.0
28.....	4.15	15.5	2.9	14.8	2.5	2.4	1.65	1.8	6.55	4.1	4.3	6.8
29.....	5.35	.....	3.5	13.05	2.45	3.9	1.70	1.8	7.35	3.7	3.7	5.05
30.....	6.7	.....	5.7	13.65	2.4	4.7	1.70	1.8	9.0	3.3	3.3	4.55
31.....	7.9	.....	6.85	.....	2.4	.....	1.70	1.8	.....	3.0	.....	5.15

NOTE.—Relation of gage height to discharge was not affected by ice during 1911.

SKILLET FORK RIVER NEAR WAYNE CITY, ILL.

Location.—At Southern Railway bridge 1 mile east of Wayne City, Ill., about 4 miles below the mouth of Horse Creek.

Records available.—August 16, 1908, to December 31, 1911.

Drainage area.—481 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged.

Channel.—Permanent, rough; remains of rock dam at section. Point of control at section.

Discharge measurements.—Made from downstream side of bridge, and in high water also from downstream side of wooden railroad trestle about 1 mile east of main channel. Low-water measurements are made about 600 feet below regular section by wading or from a boat.

Floods.—Maximum gage height since establishment of gage, 21.8 feet, on March 11, 1909. No records previous to establishment of gage are available.

Point of zero flow.—A determination by leveling October 28, 1911, indicates that there would be no flow past the gage if the river stage were to fall to about 1.5 feet, as referred to the gage datum.

Winter flow.—Ice may affect the relation between gage height and discharge during portions of December, January, and February.

Discharge measurements of Skillet Fork River near Wayne City, Ill., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
1911.		<i>Feet.</i>	<i>Sec.-feet.</i>
Mar. 8	P. S. Monk.....	11.87	1,150
Oct. 29	Monk and Brown.....	2.60	a 19

a Measurement made by wading just above the regular section.

Daily gage height, in feet, of Skillet Fork River near Wayne City, Ill., for 1911.

[Evert Higdon, Jan.-Sept.; Geo. A. Johnson, Oct.-Dec., observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
1.....	4.3	4.6	6.8	3.3	20.1	2.4	2.6	1.95	.....	8.5	2.4	3.7
2.....	8.1	3.4	5.3	3.0	20.5	2.4	2.5	2.1	.....	8.2	2.4	3.6
3.....	4.8	3.0	4.9	2.9	20.1	2.4	2.4	2.1	.....	11.05	2.4	3.2
4.....	4.5	2.7	4.6	3.3	19.5	2.4	2.4	2.1	.....	12.2	2.4	3.0
5.....	5.0	2.3	4.3	12.9	14.9	2.4	2.3	2.1	.....	10.05	(a)	2.8
6.....	4.6	4.8	4.0	14.7	7.3	2.9	2.3	2.4	.....	5.65	.....	2.8
7.....	3.0	5.2	5.8	12.0	3.8	7.3	2.2	2.4	.....	3.65	.....	2.8
8.....	2.9	5.5	9.8	7.1	3.5	4.3	2.2	2.3	.....	4.25	.....	2.7
9.....	2.7	5.4	11.0	4.2	3.1	3.1	2.2	2.3	3.0	3.75	.....	3.6
10.....	2.7	4.6	11.3	3.9	2.9	2.9	2.2	2.3	4.4	4.4	.....	6.5
11.....	2.65	3.5	7.5	3.3	2.8	2.7	2.1	2.3	5.5	3.4	.....	9.9
12.....	2.3	3.1	5.25	3.2	2.6	2.5	2.1	2.2	3.8	3.1	6.4	10.1
13.....	3.0	2.9	4.7	7.9	2.5	2.4	2.1	2.2	3.0	2.7	11.8	9.2
14.....	3.65	3.0	3.8	19.2	2.7	2.4	2.1	2.2	2.8	2.6	10.2	6.5
15.....	3.8	3.4	3.3	19.6	2.6	2.3	2.0	2.2	2.8	2.5	7.3	5.2
16.....	3.9	4.3	3.0	18.9	2.6	2.3	2.0	2.2	5.3	2.5	5.4	5.6
17.....	3.95	4.4	3.0	15.7	2.5	2.3	2.0	2.1	7.2	2.4	4.6	9.6
18.....	3.9	5.65	2.9	7.7	2.5	2.3	2.0	2.1	9.8	2.5	7.5	9.2
19.....	3.1	8.9	2.85	6.0	2.5	2.4	2.0	2.1	7.8	2.4	8.6	6.5
20.....	2.9	18.7	2.75	10.4	2.5	2.8	2.0	2.1	8.9	2.4	6.4	5.7
21.....	2.9	17.6	2.85	10.5	2.5	2.6	2.0	2.1	6.8	2.5	5.5	10.5
22.....	2.8	13.5	2.8	9.6	2.5	2.5	2.0	2.2	5.3	2.5	4.7	13.1
23.....	2.85	9.8	2.8	5.2	2.5	2.5	2.0	(b)	3.5	2.6	3.8	12.5
24.....	2.8	7.6	2.75	4.0	2.4	2.4	2.0	.....	3.0	2.5	4.5	9.3
25.....	2.8	8.9	2.7	3.3	2.4	2.5	2.0	.....	2.8	2.7	4.8	6.8
26.....	3.2	8.7	2.7	3.1	2.4	3.1	2.0	.....	7.3	3.1	4.1	5.0
27.....	3.5	8.9	5.5	2.9	2.3	4.4	1.95	.....	10.0	2.8	3.8	5.2
28.....	5.0	8.7	7.9	3.0	2.3	4.3	1.95	.....	9.2	2.7	4.2	5.6
29.....	7.1	.....	6.8	4.1	2.3	3.2	1.95	.....	12.0	2.5	4.9	5.1
30.....	7.0	.....	5.0	18.0	2.3	2.8	1.95	.....	14.6	2.5	3.9	4.4
31.....	6.8	.....	3.9	.....	2.3	.....	1.95	.....	.....	2.5	.....	6.6

a Nov. 5 to 11, observer lost report.

b Aug. 23 to Sept. 8, gage chain stolen.

NOTE.—Relation of gage height to discharge probably not affected by ice during 1911.

Daily discharge, in second-feet, of Skillet Fork River near Wayne City, Ill., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	137	160	343	62	5,900	5	14	0.2	.....	535	5	92
2.....	487	70	212	40	6,320	5	9	.5	.....	499	5	85
3.....	175	40	182	32	5,900	5	5	.5	.....	960	5	55
4.....	152	19	160	62	5,300	5	5	.5	.....	1,230	5	40
5.....	190	3	137	1,430	2,180	5	3	.5	.....	769	5	25
6.....	160	175	115	2,090	398	32	3	5	.....	238	54	25
7.....	40	205	250	1,180	100	398	1	5	.....	88	240	25
8.....	32	227	726	376	77	137	1	3	20	134	340	19
9.....	19	220	950	130	47	47	1	3	40	96	350	85
10.....	19	160	1,010	107	32	32	1	3	145	145	390	313
11.....	16	77	420	62	25	19	.5	3	227	70	450	742
12.....	3	47	208	55	14	9	.5	1	100	47	303	778
13.....	40	32	167	464	9	5	.5	1	40	19	1,130	630
14.....	88	40	100	5,000	19	5	.5	1	25	14	796	313
15.....	100	70	62	5,400	14	3	.3	1	25	9	398	205
16.....	107	137	40	4,700	14	3	.3	1	212	9	220	235
17.....	111	145	40	2,550	9	3	.3	.5	387	5	160	694
18.....	107	238	32	442	9	3	.3	.5	726	9	420	630
19.....	47	586	28	265	9	5	.3	.5	453	5	547	313
20.....	32	4,520	22	832	9	25	.3	.5	596	5	303	242
21.....	32	3,640	28	850	9	14	.3	.5	343	9	227	850
22.....	25	1,630	25	694	9	9	.3	1	212	9	167	1,490
23.....	28	726	25	205	9	9	.3	.....	77	14	100	1,310
24.....	25	431	22	115	5	5	.3	.....	40	9	152	646
25.....	25	586	19	62	5	9	.3	.....	25	19	175	343
26.....	55	559	19	47	5	47	.3	.....	398	47	122	190
27.....	77	586	227	32	3	145	.2	.....	760	25	100	205
28.....	190	559	464	40	3	137	.2	.....	630	19	130	235
29.....	376	.....	343	122	3	55	.2	.....	1,180	9	152	197
30.....	365	.....	190	3,930	3	25	.2	.....	2,050	9	107	145
31.....	343	.....	107	.....	3	.....	.2	.....	.....	9	.....	323

NOTE.—Daily discharge determined by means of a discharge rating curve fairly well defined between 1.0 and 1,180 second-feet (gauge heights 2.2 and 12.0 feet), and poorly defined above 1,180 second-feet (gauge height 12.0 feet). Daily discharge Aug. 23 to Sept. 8 and Nov. 5 to 11 estimated, because of gauge heights missing from observer's notes, by comparison with gauge heights at Mill Shoals and discharge of adjacent drainage areas. Mean discharge Aug. 23 to Sept. 7 estimated 1 second-foot.

Monthly discharge of Skillet Fork River near Wayne City, Ill., for 1911.

[Drainage area, 481 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	487	3	116	0.241	0.28	B.
February.....	4,520	3	567	1.18	1.23	B.
March.....	1,010	19	215	.447	.52	B.
April.....	5,400	32	1,050	2.18	2.43	C.
May.....	6,320	3	853	1.77	2.04	C.
June.....	398	3	40.2	.084	.09	C.
July.....	14	.....	1.60	.0033	.004	D.
August ^a	5	.....	1.35	.0028	.003	D.
September ^a	2,050	.....	290	.603	.67	C.
October.....	1,230	5	163	.339	.39	B.
November ^a	1,130	5	253	.526	.59	B.
December.....	1,490	19	370	.769	.89	B.
The year.....	6,320	.....	324	.674	9.14	

^a See footnotes to table of daily discharge.

SKILLET FORK RIVER NEAR MILL SHOALS, ILL.

Location.—At Baltimore & Ohio Southwestern Railroad bridge about 1 mile south of Mill Shoals, Ill., and 1½ miles below the mouth of Griffin Creek.

Records available.—October 9, 1908, to December 31, 1911.

Drainage area.—912 square miles.

Gage.—Standard chain gage attached to bridge; datum unchanged.

Channel.—Probably permanent; old piles in bottom affect measurements at low stages. Point of control at section.

Discharge measurements.—Made from top of downstream plate girder of bridge and long wooden trestle approaches at each end.

Floods.—Maximum gage height since establishment of gage is 24.4, which occurred March 14, 1909. No records of floods previous to establishment of gage are available.

Point of zero flow.—Estimated to be at 1.0 foot gage height, from an examination of the station at low water.

Winter flow.—Ice may affect the relation between gage height and discharge during portions of December, January, and February.

Accuracy.—Backwater exists at this station and reliable estimates of flow can not be made, although 17 measurements of discharge were made during 1909–1911.

Discharge measurements of Skillet Fork River near Mill Shoals, Ill., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Mar. 3	P. S. Monk.....	<i>Feet.</i> 8.61	<i>Sec.-feet.</i> 561
9	do.....	12.15	1,320
Oct. 27	Monk and Brown.....	1.88	α 8.1

α Measurement made from temporary bridge about 100 feet below the section.

Daily gage height, in feet, of Skillet Fork River near Mill Shoals, Ill., for 1911.

[John A. Clow, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	8.8	7.6	12.6	6.0	17.5	2.0	3.0	1.4	1.8	12.1	2.0	5.5
2.....	9.6	5.1	.....	5.3	19.8	2.0	2.9	1.4	1.8	11.9	2.0	5.3
3.....	10.6	5.0	8.4	4.8	20.5	1.9	2.6	1.4	1.8	11.5	1.8	5.0
4.....	9.7	4.9	7.0	4.9	21.4	2.0	2.1	1.4	1.8	11.9	1.8	4.9
5.....	8.6	5.1	6.7	7.6	21.7	2.2	2.0	1.4	2.4	12.1	1.8	4.8
6.....	7.4	6.8	6.4	11.3	21.4	2.4	2.0	1.4	2.8	11.5	1.9	3.8
7.....	5.7	7.9	7.5	13.5	21.2	2.9	2.0	1.4	3.0	.....	2.7	3.0
8.....	4.8	7.8	10.3	12.4	20.1	5.9	2.0	1.4	3.4	6.0	7.0	2.9
9.....	3.0	7.5	12.5	11.6	19.7	.....	1.9	1.4	4.0	6.3	8.0	2.6
10.....	3.1	6.9	12.7	8.3	18.1	3.9	2.6	1.5	4.7	6.6	7.8	2.4
11.....	3.9	6.1	12.0	7.6	15.9	3.7	4.9	1.6	5.3	6.9	8.1	4.8
12.....	4.1	5.1	9.3	5.2	11.3	3.0	3.9	1.7	5.7	7.6	8.7	7.7
13.....	4.2	4.9	7.0	13.9	6.1	2.9	3.4	1.7	4.9	7.5	7.3	10.7
14.....	3.1	4.8	6.0	15.6	5.2	2.8	3.0	1.7	4.6	7.0	10.2	9.8
15.....	3.0	5.1	5.6	18.3	4.9	2.4	2.9	1.7	4.4	6.3	9.8	8.7
16.....	3.0	5.9	4.5	19.0	3.5	2.0	2.6	1.8	3.8	5.7	8.9	7.0
17.....	.....	7.0	4.2	19.9	3.2	1.9	1.5	1.7	4.9	5.0	7.0	7.9
18.....	.....	8.4	4.0	20.0	3.0	2.0	1.5	1.7	8.2	3.9	8.0	10.1
19.....	.....	12.6	3.9	20.1	2.9	2.0	1.5	1.7	9.0	3.6	7.9	9.7
20.....	.....	17.0	3.8	20.2	2.9	2.0	1.5	1.7	9.0	2.4	7.6	9.0
21.....	.....	17.7	3.4	19.8	2.9	2.1	1.5	1.7	8.9	2.0	7.4	9.9
22.....	4.1	18.4	3.3	18.9	2.8	2.3	1.5	1.7	7.7	1.9	7.0	11.9
23.....	4.1	18.9	3.2	17.9	2.6	2.6	1.4	1.7	6.5	1.8	6.9	10.7
24.....	5.6	18.8	3.0	15.3	2.5	2.9	1.4	1.7	5.7	1.7	6.3	12.7
25.....	5.0	18.0	3.0	12.0	2.4	2.6	1.4	1.7	4.8	1.6	5.0	11.3
26.....	4.9	17.6	3.5	8.2	2.3	2.2	1.4	1.7	3.5	1.4	4.5	10.4
27.....	4.1	16.1	4.6	6.9	2.2	2.2	1.4	1.7	5.9	1.6	5.0	8.6
28.....	6.1	14.1	5.9	5.2	2.1	3.6	1.4	1.7	9.8	2.8	4.9	6.0
29.....	7.7	.....	6.8	5.6	2.1	4.9	1.4	1.7	10.3	3.0	4.6	6.0
30.....	8.9	.....	7.6	15.4	2.1	3.8	1.4	2.5	11.4	2.9	4.5	6.0
31.....	8.6	.....	6.5	.....	2.0	.....	1.4	2.0	.....	2.5	.....	6.9

NOTE.—No record of ice kept by observer. Relation of gage height to discharge probably not affected by ice during 1911.

TENNESSEE RIVER BASIN.

FRENCH BROAD RIVER AT ASHEVILLE, N. C.

Location.—At highway bridge known as Smith's Bridge, about 1 mile below the Southern Railway station at Asheville, about 2 miles below the mouth of Swannanoa River. Smith's Bridge is one-fourth mile above the new Southern Railway bridge and about one-fourth mile below a concrete highway bridge recently completed.

Records available.—March 19, 1903, to December 31, 1911. The United States Weather Bureau has maintained a gage at this point since March 19, 1903, and during 1904 a number of discharge measurements were made by the United States Geological Survey. Since January 1, 1905, the discharge measurements have been continued by the United States Geological Survey and the gage heights have been furnished by the United States Weather Bureau.

Drainage area.—987 square miles.

Gages.—Vertical staff attached to one of the bridge piers, and an auxiliary chain gage attached to the bridge in the first panel to the left of the staff gage. The staff gage ends at zero and the chain gage is used for readings below zero. Both gages are adjusted to the same datum, which has remained unchanged since they were established.

Channel.—Practically permanent; broken by three piers of the highway bridge. Bed of river is mostly rock, but is not excessively rough. Current good at all points.

Discharge measurements.—Made from the downstream side of the highway bridge.

Floods.—The flood of August 31, 1910, reached a height of about 8.8 feet by the gage datum. Stage of 10.6—"date unknown"—reported by the United States Weather Bureau.

Winter flow.—Ice does not affect the flow.

Accuracy.—The construction of a new railroad bridge across the river about 1,500 feet below the gage in 1907-8 caused changes in channel necessitating revision of the discharge rating curve. The coffer dams caused temporary and variable changes during 1908, but since the completion of the work comparatively permanent conditions of flow have been reestablished. Data for 1911 are considered reliable.

Cooperation.—Gage heights are furnished by the United States Weather Bureau.

Discharge measurements of French Broad River at Asheville, N. C., in 1911.

Date.		Hydrographer.	Gage height.	Discharge.
Aug.	5	R. E. Robertson.....	<i>Feet.</i> —0.08	<i>Sec.-feet.</i> 1,360
	7	.....do.....	— .33	1,130
	7	.....do.....	— .32	a 1,110
Nov.	1	.....do.....	— .28	1,100

a Measurement made at the concrete highway bridge about one-fourth mile above the gage.

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Daily gage height, in feet, of French Broad River near Asheville, N. C., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	0.5	-0.3	-0.1	0.0	0.9	0.1	-0.5	-0.8	0.5	-0.6	-0.4	0.0
2.....	1.2	-.3	.0	.0	.7	-.2	-.5	-.7	-.2	-.6	-.3	.0
3.....	2.2	-.3	-.1	-.1	.5	-.2	-.6	-.6	-.3	-.6	-.4	-.1
4.....	3.1	-.1	-.2	-.1	.4	-.3	-.6	.1	-.4	-.6	-.4	-.2
5.....	2.0	.0	-.2	3.2	.4	-.2	-.2	.0	-.4	-.6	-.4	-.3
6.....	1.1	-.1	-.2	3.9	.3	-.2	-.4	-.1	-.3	-.7	-.4	-.3
7.....	.8	.0	.0	3.2	.4	-.3	-.6	-.3	-.4	-.7	.4	-.3
8.....	.7	.0	.3	1.9	.3	.0	-.6	-.2	-.4	-.7	.1	-.3
9.....	.3	.9	.3	1.7	.2	-.2	-.5	-.3	-.6	-.8	.5	-.4
10.....	.1	1.3	.1	1.6	.2	-.3	-.6	-.6	-.6	-.7	.8	-.4
11.....	.1	.8	.0	1.0	.2	-.3	-.4	-.6	-.6	1.4	.3	-.4
12.....	.0	.5	.0	1.1	.2	-.4	-.2	-.7	-.6	.4	.2	-.3
13.....	.0	.4	-.1	2.9	.1	-.5	-.3	-.7	-.6	-.1	.5	-.3
14.....	.0	.3	.2	3.3	.3	-.5	.1	-.5	-.7	-.2	.4	-.3
15.....	.0	.2	.0	3.4	.2	-.5	-.4	-.6	-.7	-.5	.1	-.3
16.....	.0	.1	.0	3.1	.1	-.6	-.4	-.6	-.7	-.5	.1	-.1
17.....	.0	.1	-.1	2.3	.1	-.6	-.3	-.7	-.7	-.1	.0	.9
18.....	.1	.0	-.2	1.6	.0	-.6	-.4	-.7	-.8	2.9	.0	.8
19.....	.0	.0	-.2	1.4	.0	-.5	-.5	-.8	-.8	2.4	.5	.2
20.....	.0	.1	-.1	1.7	.0	-.5	-.5	-.8	-.8	.9	.2	.1
21.....	.0	.1	-.2	1.4	.5	-.4	-.6	-.8	-.8	.4	.0	.4
22.....	-.1	.0	-.3	1.1	.2	-.4	-.6	-.8	-.5	.2	-.1	1.7
23.....	-.1	.0	-.3	1.1	.0	-.5	-.6	-.9	.1	1.0	-.2	2.6
24.....	-.2	.0	-.3	.9	.5	-.5	-.7	-.9	1.7	.5	-.2	1.8
25.....	-.2	.0	-.3	.8	.2	-.5	-.6	-.9	.3	.1	.0	1.5
26.....	-.3	.0	.2	.7	.1	-.5	-.6	-.8	.0	.0	-.1	1.2
27.....	-.3	-.1	.8	.6	.0	-.6	-.6	-.4	-.1	-.1	-.2	1.3
28.....	-.2	-.1	.8	.6	.0	-.5	-.7	-.6	-.2	-.2	-.2	1.6
29.....	-.2	.....	.4	.6	.1	-.4	-.8	-.6	-.3	-.2	.7	1.1
30.....	-.2	.....	.1	.8	-.1	-.5	-.8	.3	-.4	-.3	.3	.8
31.....	-.2	.....	.1	.....	-.2	.....	-.8	1.5	.....	-.3	.....	.7

Daily discharge, in second-feet, of French Broad River near Asheville, N. C., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	1,940	1,100	1,290	1,390	2,460	1,490	920	670	1,940	830	1,010	1,390
2.....	2,910	1,100	1,390	1,390	2,190	1,190	920	750	1,190	830	1,100	1,390
3.....	4,760	1,100	1,290	1,290	1,940	1,190	830	830	1,100	830	1,010	1,290
4.....	6,900	1,290	1,190	1,290	1,820	1,100	830	1,490	1,010	830	1,010	1,190
5.....	4,350	1,390	1,190	7,160	1,820	1,190	1,190	1,390	1,010	830	1,010	1,100
6.....	2,750	1,290	1,190	9,070	1,710	1,190	1,010	1,290	1,100	750	1,010	1,100
7.....	2,320	1,390	1,390	7,160	1,820	1,100	830	1,100	1,010	750	1,820	1,100
8.....	2,190	1,390	1,710	4,150	1,710	1,390	830	1,190	1,010	750	1,490	1,100
9.....	1,710	2,460	1,710	3,770	1,600	1,190	920	1,100	830	670	1,940	1,010
10.....	1,490	3,070	1,490	3,590	1,600	1,100	830	830	830	750	2,320	1,010
11.....	1,490	2,320	1,390	2,600	1,600	1,100	1,010	830	830	3,240	1,710	1,010
12.....	1,390	1,940	1,390	2,750	1,600	1,010	1,190	750	830	1,820	1,600	1,100
13.....	1,390	1,820	1,290	6,390	1,490	920	1,100	750	830	1,290	1,940	1,100
14.....	1,390	1,710	1,600	7,420	1,710	920	1,490	920	750	1,190	1,820	1,100
15.....	1,390	1,600	1,390	7,690	1,600	920	1,010	830	750	920	1,490	1,100
16.....	1,390	1,490	1,390	6,900	1,490	830	1,010	830	750	920	1,490	1,290
17.....	1,390	1,490	1,290	4,980	1,490	830	1,100	750	750	1,290	1,390	2,460
18.....	1,490	1,390	1,190	3,590	1,390	830	1,010	750	670	6,390	1,390	2,320
19.....	1,390	1,390	1,190	3,240	1,390	920	920	670	670	5,200	1,940	1,600
20.....	1,390	1,490	1,290	3,770	1,390	920	920	670	670	2,460	1,600	1,490
21.....	1,390	1,490	1,190	3,240	1,940	1,010	830	670	670	1,820	1,390	1,820
22.....	1,290	1,390	1,100	2,750	1,600	1,010	830	670	920	1,600	1,290	3,770
23.....	1,290	1,390	1,100	2,750	1,390	920	830	590	1,490	2,600	1,190	5,660
24.....	1,190	1,390	1,100	2,460	1,940	920	750	590	3,770	1,940	1,190	3,960
25.....	1,190	1,390	1,100	2,320	1,600	920	830	590	1,710	1,490	1,390	3,410
26.....	1,100	1,390	1,600	2,190	1,490	920	830	670	1,390	1,390	1,290	2,910
27.....	1,100	1,290	2,320	2,060	1,390	830	830	1,010	1,290	1,290	1,190	3,070
28.....	1,190	1,290	2,320	2,060	1,390	920	750	830	1,190	1,190	1,190	3,590
29.....	1,190	.....	1,820	2,060	1,490	1,010	670	830	1,100	1,190	2,190	2,750
30.....	1,190	.....	1,490	2,320	1,290	920	670	1,710	1,010	1,100	1,710	2,320
31.....	1,190	.....	1,490	.....	1,190	.....	670	3,410	.....	1,100	.....	2,190

NOTE.—Daily discharge determined by means of a discharge rating curve well defined between 920 and 10,800 second-feet (gage heights —0.5 and 4.5 feet).

Monthly discharge of French Broad River near Asheville, N. C., for 1911.

[Drainage area, 987 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	6,900	1,100	1,890	1.91	2.20	A.
February.....	3,070	1,100	1,540	1.56	1.62	A.
March.....	2,320	1,100	1,420	1.44	1.66	A.
April.....	9,070	1,290	3,790	3.84	4.28	A.
May.....	2,460	1,190	1,630	1.65	1.90	A.
June.....	1,490	830	1,020	1.03	1.15	B.
July.....	1,490	670	915	.927	1.07	C.
August.....	3,410	590	966	.979	1.13	C.
September.....	3,770	670	1,100	1.11	1.24	C.
October.....	6,390	670	1,590	1.61	1.86	B.
November.....	2,320	1,010	1,470	1.49	1.66	A.
December.....	5,660	1,010	1,990	2.02	2.33	A.
The year.....	9,070	590	1,530	1.55	22.10	

TENNESSEE RIVER AT KNOXVILLE, TENN.

Location.—At county highway bridge at Gay Street, in the city of Knoxville, about 4 miles below the junction of French Broad and Holston rivers.

Records available.—January 17, 1899, to December 31, 1911. The United States Weather Bureau began river observations February 1, 1883, but the earlier gage-height records are not continuous. For a number of years prior to 1899 daily gage readings were made for about one-half of the year, including the winter season.

Drainage area.—8,990 square miles.

Gage.—Vertical gage on one of the county bridge piers; used since January 1, 1909. The original gage on a pier of the old bridge at the same site was used prior to 1899. During construction of the new bridge, January 17, 1899, the gage was removed to the Knoxville & Augusta Railroad bridge one-half mile downstream. Later during the same year a more permanent gage was installed, 1,000 feet still farther downstream at a point on the right bank just below the mouth of West Knoxville Bayou. This gage was set to read the same as the original gage, having its zero point 2.3 feet lower than that of the original gage on account of fall in the river. All gage heights for 1899 were adjusted to conform to this gage, and it was used continuously until December 31, 1908. The present gage at the county bridge reads the same at low stages as the one it supersedes, but the two gages do not read the same at higher stages. A relation based on comparative readings has been computed by the United States Weather Bureau, and has been applied to the discharge rating curve to adapt it to the present gage.

Channel.—Wide and relatively shallow, with rough, rocky bottom. Permanency of flow will depend upon the permanency of some river-improvement wing dams below.

Discharge measurements.—Made from the downstream side of the bridge, floor of which is about 100 feet above water.

Floods.—The flood of March, 1875, reached a height of about 39.0 feet by the gage datum (United States Weather Bureau publication).

Point of zero flow.—Assuming that the improved boat channels below the station are 3.0 feet deep at low water, according to the plan for that portion of the river, there would be no flow past the gage if the river stage were to fall to about 4.5 feet below the gage datum.

Winter flow.—Ice does not affect the flow.

Accuracy.—The discharge rating curve for the present gage is based chiefly on the curve for the former gage adjusted according to the relative readings of the two gages. Discharge measurements made during 1909 and 1911, referred to the present gage, agree well with the derived curve, but all parts of the curve have not yet been verified by discharge measurements. Estimates of discharge are withheld from publication for the present. (See Water-Supply Paper No. 283.)

Cooperation.—Gage heights are furnished by the United States Weather Bureau.

Discharge measurements of Tennessee River at Knoxville, Tenn., in 1911.

Date.	Hydrographer.	Gage height.	Dis-charge.
		<i>Feet.</i>	<i>Sec.-feet.</i>
Nov. 2	R. E. Robertson.....	0.60	4,370
27	.....do.....	1.70	8,930

Daily gage height, in feet, of Tennessee River at Knoxville, Tenn., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	2.2	5.5	1.8	2.4	3.8	0.9	1.5	-0.5	1.1	0.2	0.6	1.1
2.....	4.7	3.7	1.8	2.4	5.5	.9	1.0	-.5	1.9	.2	.5	1.1
3.....	7.7	2.8	1.8	2.3	4.4	1.0	.6	-.4	1.5	.7	.5	1.0
4.....	11.6	2.8	1.8	2.3	3.9	1.0	.3	.0	1.3	.1	.3	.9
5.....	11.0	4.0	1.8	6.1	3.0	1.0	.3	.0	.5	.8	.1	.8
6.....	7.1	4.3	1.8	13.6	2.7	.9	.0	.4	.4	.9	.2	.8
7.....	4.1	3.4	4.1	14.2	2.4	.9	.0	1.0	.9	.5	.6	.7
8.....	3.1	3.7	11.6	11.4	2.3	1.1	-.1	.8	.6	.2	1.1	.6
9.....	2.8	10.2	14.5	8.6	2.1	1.0	.4	1.0	.2	.0	1.8	.4
10.....	2.2	13.2	10.8	7.2	2.1	1.0	1.5	1.0	.0	.0	1.9	.4
11.....	2.1	11.6	6.6	7.1	2.0	.9	1.8	.6	-.3	1.0	1.8	.2
12.....	2.0	8.4	4.5	5.4	1.9	.9	1.2	.2	-.4	1.2	1.7	.0
13.....	1.8	5.3	3.6	4.4	1.9	.9	1.4	.0	-.6	1.7	1.7	.2
14.....	2.0	3.8	3.2	4.9	1.9	.9	1.4	-.1	-.8	1.3	1.8	.4
15.....	1.8	3.4	3.0	6.2	1.8	.9	1.2	-.1	-.8	1.0	1.7	.5
16.....	1.7	3.1	2.8	7.9	2.0	.9	1.2	.5	-1.0	.4	1.7	.6
17.....	1.6	2.9	2.6	6.2	2.0	.8	1.2	1.0	-.6	.3	1.6	.7
18.....	1.6	2.4	2.3	5.3	1.9	.7	1.1	.5	-.2	1.9	1.6	1.2
19.....	1.7	2.3	2.3	4.3	1.6	.5	1.0	.5	.0	3.7	1.5	1.6
20.....	1.6	2.3	2.3	5.3	1.5	.7	.9	.1	.0	4.2	1.4	1.6
21.....	1.5	2.1	2.6	4.8	1.5	.7	.9	-.3	-.2	2.6	2.0	1.5
22.....	1.4	2.1	2.5	4.3	1.4	.6	.6	-.5	-.2	2.0	1.8	1.7
23.....	1.6	2.1	2.3	3.8	1.4	.6	.3	-.5	-.3	1.5	1.6	2.5
24.....	2.4	2.0	2.3	3.4	1.3	.5	.0	-.7	-.8	1.2	1.6	3.4
25.....	3.0	2.0	2.2	3.2	1.3	.5	.3	-.7	1.1	.9	1.7	4.1
26.....	2.5	2.0	2.1	2.8	1.3	.6	1.0	-.7	1.3	1.1	1.8	3.8
27.....	2.3	2.0	2.4	2.6	1.2	.4	1.0	-.6	1.0	1.0	1.8	5.1
28.....	2.0	1.8	2.9	2.4	1.1	1.1	.8	-.4	.8	.9	1.6	5.8
29.....	2.0	.....	2.8	2.4	1.1	1.4	.6	-.4	.6	.7	1.2	4.6
30.....	2.2	.....	3.0	2.8	1.0	1.6	.2	-.4	.3	.7	1.1	3.4
31.....	3.0	.....	2.9	.....	1.0	.....	-.3	.0	.....	.6	.....	3.0

TENNESSEE RIVER AT CHATTANOOGA, TENN.

Location.—At Hamilton County highway bridge in the city of Chattanooga, just below Chattanooga Island, 4 miles below South Chickamauga Creek and 3 miles above Chattanooga Creek.

Records available.—January 1, 1879, to December 31, 1911. The United States Weather Bureau began observations of gage heights January 1, 1879. Earlier records beginning in 1875, when the first gage was established are fragmentary. Discharge measurements were first made by the United States Geological Survey in 1897. Gage heights from January 1, 1900, have been published by the United States Geological Survey. A number of discharge measurements made by the United States Weather Bureau in 1893 have also been published by the United States Geological Survey.

Drainage area.—21,400 square miles (published by the United States Weather Bureau).

Gage.—The present standard gage consists of a sloping iron section (railroad T rail) bolted to rock and a vertical timber attached to the rock cliff on the left bank at the foot of Lookout Street, about 200 feet upstream from the bridge. It was erected October 31, 1884. The original gage was established in 1875. An automatic recording gage, which makes its record in the Weather Bureau office, has been used for several years. There is also a vertical section of brass gage attached to the pier nearest the left bank, and recently half-foot graduations have been painted on the pipe incasing the recording gage float, to be read from the bridge with the aid of a glass. The datum has remained the same for all of the gages.

Channel.—Permanent or nearly so, though a portion of the bed is sand. Current good.

Discharge measurements.—Made from downstream footway of bridge; elevation about 100 feet above water.

Floods.—The flood of March 11, 1867, reached a height of about 58.0 feet by the gage datum (information from United States Weather Bureau).

Point of zero flow.—Reports of the United States engineers show that the bottom of the excavated boat channel at Ross Towhead, $2\frac{1}{2}$ miles below the gage, is about 5 feet lower than gage datum, which indicates that there would be no flow past the gage if the stage were to fall to about -5.0 feet.

Winter flow.—Ice does not appreciably affect the flow.

Artificial control.—None probably at present. A large dam for lock and power plant about 20 miles below will, when completed, raise the water level at Chattanooga, and will entirely destroy the usefulness of the gage heights for estimates of flow.

Accuracy.—Daily gage heights in the following table are as furnished by the United States Weather Bureau and were obtained from the automatic recording gage record with corrections based on periodic readings of the gage painted on the float pipe. The reading of the automatic recording gage has been checked at various times by engineers of the Survey and found to be essentially correct, but on November 25, 1911, a discrepancy of 0.5 foot was noted, the automatic recording gage reading too high by that amount. The discharge measurements made by Survey engineers are referred to the cliff or float pipe gages, to which, therefore, the discharge rating curve refers. The accuracy of daily and monthly discharge obtained by applying this rating curve to the automatic recording gage record is questionable and these discharge values should be used with caution. It should be noted, however, that the discrepancy in the published daily discharge for November 24 and 25 as obtained from the Weather Bureau gage heights and the measured discharge on those days is due in part to the difference in the time of the gage readings.

Cooperation.—The daily gage heights have all been furnished by the United States Weather Bureau.

Discharge measurements of Tennessee River at Chattanooga, Tenn., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Nov. 24	R. E. Robertson.....	<i>Fect.</i> a 4. 20	<i>Sec.-fect.</i> 23, 100
25	.....do.....	b 3. 90	20, 800

^a Gage height obtained by reducing readings on Weather Bureau recording gage by 0.5 foot.

^b Gage height as read on Weather Bureau gage on float pipe and found to be 0.5 foot less than recorded by Weather Bureau recording gage.

Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	4.7	6.5	5.4	7.0	6.8	3.4	3.7	2.6	1.6	2.2	2.8	4.2
2.....	10.7	7.4	5.2	6.3	9.9	3.3	3.1	2.5	1.6	2.0	2.7	4.0
3.....	20.5	9.7	5.2	5.9	11.7	3.2	2.7	2.5	2.0	2.0	2.5	3.9
4.....	24.2	8.5	5.2	5.6	11.6	3.2	2.6	2.5	3.1	2.0	2.4	3.7
5.....	24.9	7.8	5.0	14.6	9.9	3.1	2.6	3.1	2.8	2.0	2.4	3.5
6.....	22.9	8.7	4.8	25.3	8.4	3.1	2.3	3.5	2.6	2.0	2.3	3.3
7.....	18.6	9.3	4.7	28.8	7.4	3.1	2.3	3.4	2.9	2.0	2.4	3.1
8.....	12.9	9.5	4.7	29.8	6.9	3.0	2.3	3.3	2.9	2.1	2.9	3.0
9.....	9.5	15.4	11.4	29.9	6.5	3.0	2.3	3.2	3.0	2.6	3.4	2.9
10.....	8.1	21.7	18.2	27.3	6.0	3.0	2.3	3.2	2.8	2.6	3.9	2.8
11.....	7.2	23.7	20.0	21.1	5.8	3.2	2.3	3.0	2.6	2.6	4.5	2.7
12.....	6.5	23.9	16.4	17.0	5.6	3.2	2.9	3.0	2.5	2.7	4.8	2.7
13.....	6.0	20.6	11.3	15.8	5.4	2.9	3.2	2.6	2.5	3.7	5.0	2.7
14.....	5.6	15.0	9.1	13.8	5.1	2.5	3.2	2.6	2.3	3.9	5.7	2.9
15.....	5.2	11.4	7.9	12.6	4.8	2.4	3.2	2.4	2.3	3.8	6.0	3.5
16.....	5.0	9.7	7.2	13.9	4.6	2.3	3.5	2.4	2.2	3.8	5.6	5.3
17.....	4.7	8.6	6.3	14.7	4.4	2.2	3.4	2.4	2.1	4.0	5.2	6.7
18.....	4.6	7.7	5.6	14.8	4.4	2.2	3.4	2.4	2.0	5.6	5.0	6.5
19.....	4.5	7.1	5.2	14.0	4.4	2.2	3.4	2.7	2.0	6.0	5.0	5.4
20.....	4.5	6.7	4.9	15.6	4.4	2.2	3.3	2.8	2.1	7.0	5.1	4.8
21.....	4.5	6.7	4.8	15.9	4.3	2.3	2.9	2.7	2.1	7.2	5.1	4.8
22.....	4.5	6.7	4.9	14.3	4.3	2.3	2.7	2.4	2.0	7.7	5.0	4.8
23.....	4.3	6.6	4.9	12.2	4.4	2.4	2.8	2.2	2.0	6.4	5.0	6.4
24.....	4.3	6.4	4.9	10.7	4.9	2.4	2.9	2.0	2.0	5.0	4.8	8.0
25.....	4.2	6.3	4.9	9.5	4.8	2.4	5.0	1.9	2.0	4.4	4.5	9.8
26.....	5.1	6.0	4.9	8.7	4.6	2.4	4.8	1.8	2.0	3.9	4.4	10.2
27.....	6.0	5.8	5.4	8.0	4.2	2.4	4.9	1.7	2.1	3.8	4.3	14.5
28.....	5.8	5.6	6.7	7.5	4.0	2.4	3.8	1.6	2.9	3.6	4.3	18.5
29.....	5.4	.....	7.4	7.1	3.8	2.2	3.2	1.6	2.9	3.3	4.3	18.7
30.....	5.4	.....	7.4	6.8	3.6	3.5	2.8	1.6	2.4	3.0	4.3	14.6
31.....	5.9	.....	7.4	.....	3.5	.....	2.7	1.6	.....	2.9	.....	13.1

NOTE.—See "Accuracy" in station description.

Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	25,400	36,500	29,600	39,700	38,400	18,100	19,700	14,000	9,490	12,100	15,000	22,500
2.....	64,300	42,300	28,400	35,200	58,900	17,600	16,500	13,600	9,490	11,200	14,500	21,400
3.....	131,000	57,600	28,400	32,700	71,000	17,000	14,500	13,600	11,200	11,200	13,600	20,800
4.....	156,000	49,600	28,400	30,800	70,300	17,000	14,000	13,600	16,500	11,200	13,100	19,700
5.....	161,000	45,000	27,200	90,700	58,900	16,500	14,000	16,500	15,000	11,200	13,100	18,600
6.....	147,000	50,900	26,000	163,000	48,900	16,500	12,600	18,600	14,000	11,200	12,600	17,600
7.....	118,000	54,900	25,400	187,000	42,300	16,500	12,600	18,100	15,500	11,200	13,100	16,500
8.....	79,100	56,200	25,400	194,000	39,000	16,000	12,600	17,600	15,500	11,700	15,500	16,000
9.....	56,200	96,100	69,000	195,000	36,500	16,000	12,600	17,000	16,000	14,000	18,100	15,500
10.....	47,000	139,000	115,000	177,000	33,300	16,000	12,600	17,000	15,000	14,000	20,800	15,000
11.....	41,000	153,000	127,000	135,000	32,100	17,000	12,600	16,000	14,000	14,000	24,300	14,500
12.....	36,500	154,000	103,000	107,000	30,800	17,000	15,500	16,000	13,600	14,500	26,000	14,500
13.....	33,300	131,000	68,300	98,800	29,600	15,500	17,000	14,000	13,600	19,700	27,200	14,500
14.....	30,800	93,400	53,600	85,200	27,800	13,600	17,000	14,000	12,600	20,800	31,400	15,500
15.....	28,400	69,000	45,600	77,100	26,000	13,100	17,000	13,100	12,600	20,300	33,300	18,600
16.....	27,200	57,600	41,000	85,900	24,800	12,600	18,600	13,100	12,100	20,300	30,800	29,000
17.....	25,400	50,300	35,200	91,400	23,700	12,100	18,100	13,100	11,700	21,400	28,400	37,800
18.....	24,800	44,300	30,800	92,000	23,700	12,100	18,100	13,100	11,200	20,800	27,200	36,500
19.....	24,300	40,400	28,400	85,600	23,700	12,100	18,100	14,500	11,200	33,300	27,200	29,600
20.....	24,300	37,800	26,600	97,500	23,700	12,100	17,600	15,000	11,700	39,700	27,800	26,000
21.....	24,300	37,800	26,000	99,500	23,100	12,600	15,500	14,500	11,700	41,000	27,800	26,000
22.....	24,300	37,800	26,600	88,600	23,100	12,600	14,500	13,100	11,200	44,300	27,200	26,000
23.....	23,100	37,100	26,600	74,400	23,700	13,100	15,000	12,100	11,200	35,800	27,200	35,800
24.....	23,100	35,800	26,600	64,300	26,600	13,100	15,500	11,200	11,200	27,200	26,000	46,300
25.....	22,500	35,200	26,600	56,200	26,000	13,100	27,200	10,800	11,200	23,700	24,300	58,300
26.....	27,800	33,300	26,600	50,900	24,800	13,100	26,000	10,300	11,200	20,800	23,700	60,900
27.....	33,300	32,100	29,600	46,300	22,500	13,100	26,000	9,900	11,700	20,300	23,100	90,000
28.....	32,100	30,800	37,800	43,000	21,400	13,100	20,300	9,490	15,500	19,200	23,100	117,000
29.....	29,600	.....	42,300	40,400	20,300	14,000	17,000	9,490	15,500	17,600	23,100	118,000
30.....	29,600	.....	42,300	38,400	19,200	18,600	15,000	9,490	13,100	16,000	23,100	90,700
31.....	32,700	.....	42,300	.....	18,600	.....	14,500	9,490	.....	15,500	.....	80,500

NOTE.—Daily discharge determined from a rating curve well defined between 8,050 and 37,100 second-feet (gage heights 1.2 and 6.6 feet), fairly well defined between 37,800 and 86,600 second-feet (gage heights 6.7 and 14.0 feet), and poorly defined above 86,600 second-feet (gage height 14.0 feet). The discharge rating curve is based on five measurements made during 1910 and 1911 and the form of the 1909 rating curve. See "Accuracy" in station description.

Monthly discharge of Tennessee River at Chattanooga, Tenn., for 1911.

[Drainage area, 21,400 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	161,000	22,500	51,100	2.39	2.76	C.
February.....	154,000	30,800	62,100	2.90	3.02	C.
March.....	127,000	25,400	42,400	1.98	2.28	B.
April.....	195,000	30,800	90,100	4.21	4.70	C.
May.....	71,000	18,600	32,700	1.53	1.76	B.
June.....	18,600	12,100	14,700	.687	.77	B.
July.....	27,200	12,600	16,700	.780	.90	B.
August.....	18,600	9,490	13,600	.636	.73	B.
September.....	16,500	9,490	12,800	.598	.67	B.
October.....	44,300	11,200	20,500	.958	1.10	B.
November.....	33,300	12,600	22,700	1.06	1.18	B.
December.....	118,000	14,500	37,700	1.76	2.03	C.
The year.....	195,000	9,490	34,500	1.61	21.90	

SOUTH FORK OF HOLSTON RIVER AT BLUFF CITY, TENN.

Location.—At highway bridge at Bluff City, Tenn., 300 feet below Virginia & Southwestern Railway bridge, 1 mile below the mouth of Indian Creek, and about 10 miles above the mouth of Watauga River.

Records available.—July 17, 1900, to December 31, 1911.

Drainage area.—828 square miles.

Gage.—Vertical staff attached to downstream side of bridge pier nearest the right bank; datum unchanged since established.

Channel.—Very irregular in depth and velocity of current; surface height controlled by shallow ledge below; probably permanent.

Discharge measurements.—Made from downstream side of the bridge. Also made from the railroad bridge 300 feet above, where the section is much better except at low stages when the current there becomes sluggish.

Winter flow.—Ice does not affect the flow. A few days the observer has reported "Frozen," but this has probably referred to the water at the foot of gage rather than in the channel.

Cooperation.—Since January 1, 1905, the gage heights have been furnished by the United States Weather Bureau.

Discharge measurements of South Fork of Holston River at Bluff City, Tenn., in 1911.

Date.	Hydrographer.	Gage height.	Dis- charge.
Nov. 29	R. E. Robertson.....	<i>Fect.</i> 1.20	<i>Sec.-feet.</i> 734
29do.....	1.20	711

NOTE.—Both discharge measurements were made from the Virginia & Southwestern Railway bridge.

Daily gage height, in feet, of South Fork of Holston River at Bluff City, Tenn., for 1911

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	2.4	4.0	1.5	2.3	2.9	0.7	0.8	0.1	0.6	0.2	0.4	1.0
2.....	4.1	3.3	1.5	2.1	2.7	.8	.5	.5	.4	.3	.4	1.0
3.....	5.1	2.9	1.5	1.9	2.3	.7	.5	1.4	.3	1.3	.3	.9
4.....	5.4	2.8	1.3	2.0	2.1	.7	.5	1.3	.2	1.5	.3	.9
5.....	3.8	2.9	1.2	3.7	1.9	.7	.7	.9	.4	.8	.2	.8
6.....	2.9	2.9	3.0	6.1	1.8	2.9	1.1	.5	.5	.5	.3	.8
7.....	2.4	2.4	3.6	5.2	1.7	1.5	.7	.3	.6	.4	1.0	.7
8.....	2.1	2.4	7.8	3.8	1.6	1.3	1.0	.3	.4	.3	1.3	.7
9.....	1.8	5.7	5.1	5.1	1.6	1.0	1.7	.5	.3	.3	1.1	.7
10.....	1.7	6.7	3.9	4.7	1.5	.8	1.3	.4	.1	.4	1.2	.6
11.....	1.6	4.7	3.4	3.7	1.5	.8	2.3	.3	.7	.6	1.1	.6
12.....	1.5	3.7	3.0	3.2	1.4	.7	2.1	.3	1.9	.7	1.0	.6
13.....	1.4	3.2	2.6	2.9	1.4	.7	1.7	.3	.6	.5	1.4	.6
14.....	1.4	2.7	2.5	2.5	1.6	.6	1.0	.3	.6	.5	1.4	.6
15.....	1.4	2.6	2.3	3.2	1.6	.6	.9	.3	.4	.4	1.3	.5
16.....	1.4	2.4	2.1	4.3	1.4	.6	.8	.4	.3	.6	1.1	.7
17.....	1.3	2.2	1.9	3.5	1.4	.5	.7	.5	.3	.4	1.0	.9
18.....	1.3	2.0	1.9	3.1	1.2	.5	.6	.4	.2	2.8	1.1	.8
19.....	1.3	2.0	1.9	2.6	1.2	.8	.6	.3	.3	2.4	1.8	.7
20.....	1.2	2.0	2.5	3.3	1.2	1.0	.6	.3	.4	1.8	1.7	.6
21.....	1.2	1.9	2.3	3.1	1.1	.9	.5	.2	.3	1.4	1.6	.7
22.....	1.5	1.9	2.1	2.8	1.1	.8	.5	.2	.3	1.0	1.3	.7
23.....	5.3	1.9	2.1	2.5	1.0	.6	.5	.2	.3	.9	1.1	2.2
24.....	3.7	1.9	1.9	2.3	1.1	.6	.4	.2	.3	.8	1.2	2.4
25.....	2.9	1.8	1.8	2.1	1.0	.7	.7	.2	.3	.7	1.6	2.9
26.....	2.5	1.7	1.8	2.0	.9	.6	.5	.2	.3	.7	1.3	2.6
27.....	2.5	1.6	2.0	1.9	.8	.6	.4	.3	.3	.6	1.2	2.9
28.....	2.6	1.5	2.6	1.8	.8	.7	.3	.3	.2	.6	1.2	2.7
29.....	2.8	.....	2.5	1.8	.7	1.5	.3	.2	.2	.5	1.2	2.2
30.....	3.6	.....	2.5	1.7	.7	1.9	.2	.2	.2	.5	1.1	2.0
31.....	5.8	.....	2.5	.....	.7	.....	.1	.3	.....	.5	.....	1.9

Daily discharge, in second-feet, of South Fork of Holston River at Bluff City, Tenn., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	1,900	4,060	1,020	1,790	2,500	475	530	212	420	245	325	650
2.....	4,220	3,040	1,020	1,580	2,250	530	370	370	325	285	325	650
3.....	5,990	2,500	1,020	1,380	1,790	475	370	940	285	860	285	590
4.....	6,580	2,370	860	1,480	1,580	475	370	860	245	1,020	285	590
5.....	3,760	2,500	785	3,610	1,380	475	475	590	325	530	245	530
6.....	2,500	2,500	2,630	8,050	1,280	2,500	715	370	370	370	285	530
7.....	1,900	1,900	3,460	6,180	1,190	1,020	475	285	420	325	650	475
8.....	1,580	1,900	12,000	3,760	1,100	860	650	285	325	285	860	475
9.....	1,280	7,200	5,990	5,990	1,100	650	1,190	370	285	285	715	475
10.....	1,190	9,410	3,910	5,260	1,020	530	860	325	212	325	785	420
11.....	1,100	5,260	3,180	3,610	1,020	530	1,790	285	475	420	715	420
12.....	1,020	3,610	2,630	2,900	940	475	1,580	285	1,380	475	650	420
13.....	940	2,900	2,130	2,500	940	475	1,190	285	590	420	940	420
14.....	940	2,250	2,010	2,010	1,100	420	650	285	420	370	940	420
15.....	940	2,130	1,790	2,900	1,100	420	590	285	325	325	860	370
16.....	940	1,900	1,580	4,560	940	420	530	325	285	420	715	475
17.....	860	1,680	1,380	3,320	940	370	475	370	285	325	650	590
18.....	860	1,480	1,380	2,760	785	370	420	325	245	2,370	715	530
19.....	860	1,480	1,380	2,130	785	530	420	285	285	1,900	1,280	475
20.....	785	1,480	2,010	3,040	785	650	420	285	325	1,280	1,190	420
21.....	785	1,380	1,790	2,760	715	590	370	245	285	940	1,100	475
22.....	1,020	1,380	1,580	2,370	715	530	370	245	285	650	860	475
23.....	6,380	1,380	1,580	2,010	650	420	370	245	285	590	715	1,680
24.....	3,610	1,380	1,380	1,790	715	420	325	245	285	530	785	1,900
25.....	2,500	1,280	1,280	1,580	650	475	475	245	285	475	1,100	2,500
26.....	2,010	1,190	1,280	1,480	590	420	370	245	285	475	860	2,130
27.....	2,010	1,100	1,480	1,880	530	420	325	285	285	420	785	2,500
28.....	2,130	1,020	2,130	1,280	590	475	285	285	245	420	785	2,250
29.....	2,370	.....	2,010	1,280	475	1,020	285	245	245	370	785	1,680
30.....	3,460	.....	2,010	1,190	475	1,380	245	245	245	370	715	1,480
31.....	7,410	.....	2,010	.....	475	.....	212	285	.....	370	.....	1,380

NOTE.—Daily discharge computed from a rating curve fairly well defined below 3,320 second-feet (gage height 3.5 feet).

Monthly discharge of South Fork of Holston River at Bluff City, Tenn., for 1911.

[Drainage area, 828 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	7,410	785	2,380	2.87	3.31	B.
February.....	9,410	1,020	2,560	3.09	3.22	B.
March.....	12,000	785	2,280	2.75	3.17	B.
April.....	8,050	1,190	2,860	3.45	3.85	B.
May.....	2,500	475	1,000	1.21	1.40	B.
June.....	2,500	370	627	.757	.84	B.
July.....	1,790	212	571	.690	.80	B.
August.....	940	212	337	.407	.47	C.
September.....	1,380	212	352	.425	.47	C.
October.....	2,370	245	595	.719	.83	B.
November.....	1,280	245	730	.882	.98	B.
December.....	2,500	370	915	1.11	1.28	B.
The year.....	12,000	212	1,260	1.52	20.62	

HOLSTON RIVER NEAR ROGERSVILLE, TENN.

Location.—At Virginia & Southwestern Railway bridge near Austins Mill, a small railroad station, and 3 miles south of Rogersville. Station 150 feet below the mouth of Honeycut Creek and about 2 miles below Dodson Creek, both small streams from the south.

Records available.—March 10, 1902, to December 31, 1911. Gage heights furnished by United States Weather Bureau. Discharge measurements were begun in 1904 by the United States Geological Survey. No gage heights or estimates of flow have been published by the United States Geological Survey prior to January 1, 1904, but it is thought that the 1904 discharge rating curve is applicable to the United States Weather Bureau gage heights back to the beginning.

Drainage area.—3,060 square miles.

Gage.—Vertical staff attached to downstream side of bridge pier nearest the right bank; datum unchanged.

Channel.—Practically permanent; section good for measurements.

Discharge measurements.—Made from top of the high-decked steel railroad bridge. A new highway bridge has recently been built half a mile above. The section at the new bridge appears to be good for measurements, and if it proves so it will be the regular place for future measurements.

Floods.—The flood of January 23 and 24, 1906, reached a maximum height of 17.5 feet by the gage datum. The stage was 15.0 feet on the morning of January 24.

Winter flow.—Ice does not affect the flow to any considerable extent.

Accuracy.—Discharge measurements made November 28, 1911, and June 21, 1912 (before the preparation of this report), indicate a change in the relation of gage height to discharge as expressed by the discharge rating curve used from 1906 to 1910. The last discharge measurement was previously made March 16, 1909. Estimates of discharge for 1911 are based on a new rating curve. Published estimates of discharge for 1910 should be used with caution as noted in the last paragraph of the description of this station in Water-Supply Paper 283. The change may be due to some change in the gage when the bridge was reconstructed during 1910, but this probably does not affect the 1911 data.

Cooperation.—The United States Weather Bureau has maintained the gage and furnished all the gage-height records.

The following discharge measurement was made by R. E. Robertson:

November 28, 1911: Gage height, 2.27 feet; discharge, 2,560 second-feet.

Daily gage height, in feet, of Holston River near Rogersville, Tenn., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	3.6	5.6	2.5	3.3	4.0	1.8	1.9	1.3	1.6	1.4	1.4	2.1
2.....	5.1	4.5	2.5	3.2	4.3	1.8	1.8	1.3	1.8	1.4	1.5	2.0
3.....	7.7	4.0	2.5	3.1	3.8	1.9	1.6	1.3	1.6	1.6	1.4	2.0
4.....	8.8	4.0	2.4	3.0	3.5	1.8	1.6	1.3	1.5	1.7	1.4	1.9
5.....	6.4	4.3	2.4	5.0	3.4	1.8	1.6	1.3	1.5	2.4	1.4	1.9
6.....	4.7	3.9	3.0	8.7	3.2	1.8	1.6	1.6	1.7	1.9	1.4	1.8
7.....	4.0	3.9	5.4	7.3	3.0	2.8	1.9	1.5	1.8	1.7	2.0	1.8
8.....	3.6	3.9	11.0	5.8	2.8	2.0	1.8	1.4	1.7	1.5	2.4	1.7
9.....	3.5	9.5	9.4	5.7	2.7	2.0	2.0	1.8	1.6	1.4	2.4	1.7
10.....	3.0	8.9	6.0	6.6	2.7	1.9	2.8	1.5	1.6	1.4	2.4	1.6
11.....	2.8	7.6	5.0	5.5	2.6	1.9	2.2	1.3	1.5	1.9	2.3	1.5
12.....	2.7	5.4	4.3	4.7	2.6	1.8	2.6	1.2	1.5	2.1	2.1	1.5
13.....	2.5	4.6	4.0	4.3	2.5	1.6	2.7	1.7	1.9	2.1	2.4	1.5
14.....	2.4	4.2	3.8	4.0	2.5	1.6	2.3	1.7	1.8	1.9	2.5	1.5
15.....	2.4	3.8	3.6	5.0	2.7	1.6	2.2	1.4	1.7	1.7	2.4	1.5
16.....	2.4	3.7	3.4	6.0	2.6	1.5	2.0	1.5	1.6	1.5	2.3	1.5
17.....	2.4	3.6	3.3	5.0	2.4	1.5	1.9	1.5	1.5	1.6	2.1	1.7
18.....	2.4	3.2	3.2	4.4	2.4	1.5	1.8	1.5	1.5	3.0	2.4	1.8
19.....	2.4	3.2	3.0	4.0	2.5	1.5	1.8	1.5	1.5	4.7	2.5	1.8
20.....	2.4	3.1	3.2	4.1	2.3	1.5	1.7	1.5	1.5	3.3	2.7	1.6
21.....	2.4	3.1	3.6	4.4	2.3	1.7	1.7	1.5	1.5	2.6	2.6	1.8
22.....	2.4	3.0	3.3	4.0	2.3	1.8	1.6	1.5	1.4	2.2	2.3	1.8
23.....	4.0	2.9	3.3	3.9	2.2	1.8	1.5	1.5	1.5	2.1	2.2	3.1
24.....	5.0	2.8	3.2	3.6	2.2	1.7	1.4	1.4	1.5	2.0	2.4	3.7
25.....	4.0	2.7	3.0	3.4	2.1	1.6	1.4	1.4	1.5	2.0	2.7	3.9
26.....	3.5	2.6	2.8	3.2	2.0	1.8	1.4	1.4	1.5	1.9	2.6	4.0
27.....	3.2	2.5	3.1	3.0	2.0	2.0	1.4	1.4	1.4	1.7	2.4	4.7
28.....	3.2	2.5	3.7	2.8	1.9	1.9	1.4	1.4	1.4	1.6	2.3	4.6
29.....	3.6	.....	3.7	2.8	1.9	1.9	1.4	1.5	1.4	1.4	2.3	4.0
30.....	3.9	.....	3.5	3.2	1.9	2.1	1.3	1.5	1.4	1.4	2.1	3.4
31.....	7.1	.....	3.4	.....	1.8	.....	1.3	1.5	.....	1.4	.....	3.4

Daily discharge, in second-feet, of Holston River near Rogersville, Tenn., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	5,930	13,000	3,000	5,050	7,150	1,570	1,760	680	1,210	850	850	2,150
2.....	11,000	8,800	3,000	4,770	8,120	1,570	1,570	680	1,570	850	1,030	1,950
3.....	21,400	7,150	3,000	4,500	6,530	1,760	1,210	680	1,210	1,210	850	1,950
4.....	25,800	7,150	2,780	4,230	5,630	1,570	1,210	680	1,030	1,390	850	1,760
5.....	16,200	8,120	2,780	10,600	5,340	1,570	1,210	680	1,030	2,780	850	1,760
6.....	9,490	6,840	4,230	25,400	4,770	1,570	1,210	1,210	1,390	1,760	850	1,570
7.....	7,150	6,840	12,200	19,800	4,230	3,720	1,760	1,030	1,570	1,390	1,950	1,570
8.....	5,930	6,840	34,600	13,800	3,720	1,950	1,570	850	1,390	1,030	2,780	1,390
9.....	5,630	28,600	28,200	13,400	3,470	1,950	1,950	1,570	1,210	850	2,780	1,390
10.....	4,230	26,200	14,600	17,000	3,470	1,760	3,720	1,030	1,210	850	2,780	1,210
11.....	3,720	21,000	10,600	12,600	3,230	1,760	2,350	680	1,030	1,760	2,560	1,030
12.....	3,470	12,200	8,120	9,490	3,230	1,570	3,230	515	1,030	2,150	2,150	1,030
13.....	3,000	9,140	7,150	8,120	3,000	1,210	3,470	1,390	1,760	2,150	2,780	1,030
14.....	2,780	7,790	6,530	7,150	3,000	1,210	2,560	1,390	1,570	1,760	3,000	1,030
15.....	2,780	6,530	5,930	10,600	3,470	1,210	2,350	850	1,390	1,390	2,780	1,030
16.....	2,780	6,230	5,340	14,600	3,230	1,030	1,950	1,030	1,210	1,030	2,560	1,030
17.....	2,780	5,930	5,050	10,600	2,780	1,030	1,760	1,030	1,030	1,210	2,150	1,390
18.....	2,780	4,770	4,770	8,460	2,780	1,030	1,570	1,030	1,030	4,230	2,780	1,570
19.....	2,780	4,770	4,230	7,150	3,000	1,030	1,570	1,030	1,030	9,490	3,000	1,570
20.....	2,780	4,500	4,770	7,470	2,560	1,030	1,390	1,030	1,030	5,050	3,470	1,210
21.....	2,780	4,500	5,930	8,460	1,390	1,390	1,390	1,030	1,030	3,230	3,230	1,570
22.....	2,780	4,230	5,050	7,150	2,560	1,570	1,210	1,030	850	2,350	2,560	1,570
23.....	7,150	3,970	5,050	6,840	2,350	1,570	1,030	1,030	1,030	2,150	2,350	4,500
24.....	10,600	3,720	4,770	5,930	2,350	1,390	850	850	1,030	1,950	2,780	6,230
25.....	7,150	3,470	4,230	5,340	2,150	1,210	850	850	1,030	1,950	3,470	6,840
26.....	5,630	3,230	3,720	4,770	1,950	1,570	850	850	1,030	1,760	3,230	7,150
27.....	4,770	3,000	4,500	4,230	1,950	1,570	850	850	850	1,390	2,780	9,490
28.....	4,770	3,000	6,230	3,720	1,760	1,760	850	850	850	1,210	2,560	9,140
29.....	5,930	.....	6,230	3,720	1,760	1,760	850	1,030	850	850	2,560	7,150
30.....	6,840	.....	5,630	4,770	1,760	2,150	680	1,030	850	850	2,150	5,340
31.....	19,000	.....	5,340	.....	1,570	.....	680	1,030	.....	850	.....	5,340

NOTE.—Daily discharge computed from a rating curve fairly well defined between 1,030 and 12,600 second-feet (gage heights, 1.5 and 5.5 feet), and assumed a tangent above 10,600 second-feet (gage height, 5.0 feet). See "Accuracy," in station description.

Monthly discharge of Holston River near Rogersville, Tenn., for 1911.

[Drainage area, 3,060 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	25,800	2,780	7,090	2.32	2.68	B.
February.....	28,600	3,000	8,270	2.70	2.81	C.
March.....	34,600	2,780	7,340	2.40	2.77	C.
April.....	25,400	3,720	8,990	2.94	3.28	B.
May.....	8,120	1,570	3,400	1.11	1.28	B.
June.....	3,720	1,030	1,580	.516	.58	B.
July.....	3,720	680	1,600	.523	.60	B.
August.....	1,570	515	951	.311	.36	B.
September.....	1,760	850	1,140	.373	.42	B.
October.....	9,490	850	1,990	.650	.75	B.
November.....	3,470	850	2,350	.768	.86	A.
December.....	9,490	1,030	3,000	.980	1.13	B.
The year.....	34,600	515	3,940	1.29	17.52	

DOE RIVER AT BLEVINS, TENN.

Location.—At Eastern Tennessee & Western North Carolina Railroad bridge, one-fourth mile west of Blevins, Tenn., $4\frac{1}{2}$ miles above the mouth of Little Doe River.

Records available.—December 16 to 31, 1911.

Drainage area.—62.2 square miles.

Gage.—Standard chain gage attached to bridge.

Channel.—Bottom sandy; may shift.

Discharge measurements.—Made from upstream side of bridge or by wading at section about one-fourth mile above bridge.

Winter flow.—The relation of gage height to discharge may be occasionally affected by ice, but only for short periods during unusually severe winters.

Accuracy.—Sufficient data have not been obtained to permit estimates of discharge to be made.

Discharge measurements of Doe River at Blevins, Tenn., in 1911.

Date.	Hydrographer.	Gage height.	Dis- charge.
Dec. 9	A. H. Horton.....	<i>Fect.</i> 1.74	<i>Sec.-feet.</i> 31.9
23	.....do.....	2.19	146

Daily gage height, in feet, of Doe River at Blevins, Tenn., for 1911.

[C. A. Johnson, observer.]

Day.	Dec.	Day.	Dec.	Day.	Dec.
1.....		11.....		21.....	1.90
2.....		12.....		22.....	2.11
3.....		13.....		23.....	2.18
4.....		14.....		24.....	2.18
5.....		15.....		25.....	2.19
6.....		16.....	1.98	26.....	2.18
7.....		17.....	1.82	27.....	2.22
8.....		18.....	1.78	28.....	2.10
9.....		19.....	1.78	29.....	2.08
10.....		20.....	1.77	30.....	2.00
				31.....	2.20

DOE RIVER AT VALLEY FORGE, TENN.

Location.—At Eastern Tennessee & Western North Carolina Railroad bridge at Valley Forge, about 4 miles above the mouth of the river.

Records available.—December 11 to December 31, 1911.

Drainage area.—132 square miles.

Gage.—Standard chain gage attached to bridge.

Channel.—Bottom sandy, may shift.

Discharge measurements.—Made from the upstream side of the bridge or by wading at a section about 40 feet above the bridge. The direction of the current makes a decided angle with the bridge.

Winter flow.—Ice may affect the relation of gage height to discharge for short periods, but only during unusually severe winters.

Accuracy.—Sufficient data have not been obtained to permit estimates of discharge to be made.

Discharge measurements of Doe River at Valley Forge, Tenn., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Dec. 9	A. H. Horton	<i>Feet.</i> 1.17	<i>Sec.-feet.</i> 71.6
23	.....do	1.81	278

Daily gage height, in feet, of Doe River at Valley Forge, Tenn., for 1911.

[W. C. Garrison, observer.]

Day.	Dec.	Day.	Dec.	Day.	Dec.
1.....		11.....	1.16	21.....	1.30
2.....		12.....	1.15	22.....	1.38
3.....		13.....	1.15	23.....	1.76
4.....		14.....	1.15	24.....	1.70
5.....		15.....	1.18	25.....	1.64
6.....		16.....	1.38	26.....	1.76
7.....		17.....	1.38	27.....	1.95
8.....		18.....	1.28	28.....	1.76
9.....		19.....	1.18	29.....	1.55
10.....		20.....	1.18	30.....	1.58
				31.....	1.71

LITTLE TENNESSEE RIVER AT JUDSON, N. C.

Location.—At Southern Railway bridge one-fourth mile north of the Southern Railway station at Judson, $2\frac{1}{2}$ miles below the mouth of Nantahala River, 1 mile below Alarka Creek, one-fourth mile below Sawyer Branch, and 3 miles above the mouth of Tuckasegee River.

Records available.—June 25, 1896, to December 31, 1911.

Drainage area.—675 square miles.

Gage.—The present gage is a vertical staff in two sections on right bank 100 feet above the bridge. Lower section bolted to rock; upper section on tree. This gage superseded the chain gage on the bridge on July 1, 1905. The staff gage set to read the same as the chain gage at stage 3.0 feet, but owing to slope of water surface its datum was raised 0.5 foot. The original gage was first a wire gage, but afterwards a boxed chain gage was used. Although the continuity of the record was interrupted by broken wires and stolen chains the datum of the original gage was not changed.

Channel.—Rough, rocky bottom; section divided by two piers. Current swift and irregular.

Discharge measurements.—Made from downstream side of railroad bridge. Some recent measurements have been made at a trestle for small flume crossing the river about one-fourth mile above the gage, where the section is better.

Winter flow.—Not affected by ice.

Accuracy.—Relation of gage height to discharge does not appear permanent, probably because of moving of bowlders at and below the station during floods, when current is very swift. No discharge measurements above about 3,000 second-feet have been made in recent years, and values in the following table of daily discharge above that point should be used with caution.

Discharge measurements of Little Tennessee River at Judson, N. C., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Aug. 9	R. E. Robertson.....	<i>Feet.</i> 3.15	<i>Sec.-ft.</i> 1,020
9	do.....	3.13	1,040

Daily gage height, in feet, of Little Tennessee River at Judson, N. C., for 1911.

[Miss E. G. Enloe, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	3.5	3.1	3.7	4.2	4.8	2.9	2.9	2.9	3.5	3.0	3.2	3.8
2.....	4.5	3.1	3.7	4.8	4.7	2.9	3.0	3.0	3.0	3.0	3.2	3.7
3.....	7.9	3.9	3.6	5.3	4.6	3.3	3.0	5.5	2.9	3.0	3.2	3.7
4.....	6.0	3.95	3.5	10.1	4.6	3.3	2.9	4.0	3.1	2.9	3.15	3.6
5.....	4.5	3.9	3.9	9.5	4.5	3.3	2.9	3.5	3.0	2.9	3.3	3.5
6.....	4.3	3.9	3.9	8.3	4.5	3.3	2.8	3.5	4.0	2.9	3.3	3.5
7.....	4.2	3.85	4.0	7.0	4.3	3.3	2.8	3.5	3.5	2.9	4.4	3.5
8.....	4.2	4.5	4.0	6.8	4.1	3.2	2.8	3.2	3.0	2.8	3.6	3.5
9.....	4.15	5.0	3.9	7.5	4.0	3.2	3.8	3.2	3.0	2.8	5.0	3.5
10.....	4.1	4.5	3.9	7.0	3.9	3.2	3.5	3.0	2.95	3.2	4.4	3.45
11.....	3.95	4.4	4.0	6.9	3.9	3.2	3.3	3.0	2.9	4.7	4.0	3.5
12.....	3.95	4.4	3.9	6.8	3.9	3.2	3.2	3.0	2.9	4.0	3.6	3.5
13.....	3.9	4.1	3.8	6.4	3.9	3.1	3.0	3.0	3.0	3.2	4.4	3.5
14.....	3.9	4.1	3.7	6.4	3.9	3.1	3.0	3.0	3.0	3.1	4.2	3.5
15.....	3.8	4.0	3.5	6.0	3.9	3.1	3.0	2.9	3.3	3.1	4.0	3.6
16.....	3.8	4.0	3.5	6.3	3.8	3.1	3.0	2.9	3.3	3.0	3.8	4.1
17.....	3.7	3.9	3.4	6.0	3.8	3.1	2.9	2.9	3.0	3.4	3.8	4.1
18.....	3.6	3.9	3.4	5.9	3.8	3.1	3.0	2.8	2.9	7.4	4.9	3.8
19.....	3.6	3.85	3.5	5.9	3.8	3.1	3.0	2.8	2.9	6.9	4.4	3.6
20.....	3.4	3.85	3.5	5.7	3.8	3.0	3.3	2.7	2.9	4.9	4.1	4.1
21.....	3.4	3.8	3.4	5.6	3.9	3.0	3.5	2.7	2.9	4.0	4.0	5.2
22.....	3.3	3.8	3.4	5.5	3.5	3.0	3.2	2.7	3.0	3.8	3.8	6.9
23.....	3.3	3.7	3.4	5.5	3.7	3.0	3.0	2.7	3.0	3.7	3.8	5.6
24.....	3.3	3.6	3.3	5.4	3.8	3.0	3.0	2.6	3.9	3.6	4.1	5.6
25.....	3.2	3.6	3.3	5.2	3.8	3.8	3.0	2.6	4.0	3.5	4.0	5.4
26.....	3.2	4.0	4.0	5.0	3.8	3.8	3.0	2.6	4.6	3.5	3.8	5.8
27.....	3.2	3.8	3.9	4.9	3.8	3.9	2.9	2.5	3.35	3.45	3.8	7.2
28.....	3.2	3.8	3.6	4.9	3.1	3.9	2.9	2.5	3.2	3.4	3.9	6.6
29.....	3.2	.....	5.0	4.8	3.1	3.0	2.9	2.5	3.1	3.35	4.2	5.6
30.....	3.1	.....	4.8	4.8	3.0	3.0	2.9	2.6	3.05	3.3	4.0	5.0
31.....	3.1	.....	4.7	.....	3.0	.....	2.9	4.0	.....	3.3	.....	6.8

Daily discharge, in second-feet, of Little Tennessee River at Judson, N. C., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	1,370	1,000	1,590	2,190	3,170	850	850	850	1,370	925	1,080	1,700
2.....	2,640	1,000	1,590	3,170	2,990	850	925	925	925	925	1,080	1,590
3.....	11,900	1,820	1,480	4,160	2,810	1,170	925	4,610	850	925	1,080	1,590
4.....	5,900	1,880	1,370	20,100	2,810	1,170	850	1,940	1,000	850	1,040	1,480
5.....	2,640	1,820	1,820	17,800	2,640	1,170	850	1,370	925	850	1,170	1,370
6.....	2,330	1,820	1,820	13,300	2,640	1,170	780	1,370	1,940	850	1,170	1,370
7.....	2,190	1,760	1,940	8,930	2,330	1,170	780	1,370	1,370	850	2,480	1,370
8.....	2,190	2,640	1,940	8,310	2,060	1,080	780	1,080	925	780	1,480	1,370
9.....	2,120	3,550	1,820	10,600	1,940	1,080	1,700	1,080	925	780	3,550	1,370
10.....	2,060	2,640	1,820	8,930	1,820	1,080	1,370	925	888	1,080	2,480	1,320
11.....	1,880	2,480	1,940	8,620	1,820	1,080	1,170	925	850	2,990	1,940	1,370
12.....	1,880	2,480	1,820	8,310	1,820	1,080	1,080	925	850	1,940	1,480	1,370
13.....	1,820	2,060	1,700	7,070	1,820	1,000	925	925	925	1,080	2,480	1,370
14.....	1,820	2,060	1,590	7,070	1,820	1,000	925	925	925	1,000	2,190	1,370
15.....	1,700	1,940	1,370	5,900	1,820	1,000	925	850	1,170	1,000	1,940	1,480
16.....	1,700	1,940	1,370	6,770	1,700	1,000	925	850	1,170	925	1,700	2,060
17.....	1,580	1,820	1,270	5,900	1,700	1,000	850	850	925	1,270	1,700	2,060
18.....	1,480	1,820	1,270	5,630	1,700	1,000	925	780	850	10,200	3,360	1,700
19.....	1,480	1,760	1,370	5,630	1,700	1,000	925	780	850	8,620	2,480	1,480
20.....	1,270	1,760	1,370	5,100	1,700	925	1,170	715	850	3,360	2,060	2,060
21.....	1,270	1,700	1,270	4,850	1,820	925	1,370	715	850	1,940	1,940	3,950
22.....	1,170	1,700	1,270	4,610	1,370	925	1,080	715	925	1,700	1,700	8,620
23.....	1,170	1,590	1,270	4,610	1,590	925	925	715	925	1,590	1,700	4,850
24.....	1,170	1,480	1,170	4,380	1,700	925	925	650	1,820	1,480	2,060	4,850
25.....	1,080	1,480	1,170	3,950	1,700	1,700	925	650	1,940	1,370	1,940	4,380
26.....	1,080	1,940	1,940	3,550	1,700	1,700	925	650	2,810	1,370	1,700	5,360
27.....	1,080	1,700	1,820	3,360	1,700	1,820	850	585	1,220	1,320	1,700	9,570
28.....	1,080	1,700	1,480	3,360	1,000	1,820	850	585	1,080	1,270	1,820	7,690
29.....	1,080	.....	3,550	3,170	1,000	925	850	585	1,000	1,220	2,190	4,850
30.....	1,000	.....	3,170	3,170	925	925	850	650	962	1,170	1,940	3,550
31.....	1,000	.....	2,990	.....	925	.....	850	1,940	.....	1,170	.....	8,310

NOTE.—Daily discharge determined by means of a discharge rating curve that is fairly well defined below 2,990 second-feet (gage height 4.7 feet) and poorly defined above that point.

Monthly discharge of Little Tennessee River at Judson, N. C., for 1911.

[Drainage area, 675 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	11,900	1,000	2,070	3.07	3.54	B.
February.....	3,550	1,000	1,900	2.81	2.93	B.
March.....	3,550	1,170	1,720	2.55	2.94	B.
April.....	20,100	2,190	6,750	10.0	11.16	C.
May.....	3,170	925	1,880	2.79	3.22	B.
June.....	1,820	850	1,120	1.66	1.85	A.
July.....	1,700	780	969	1.44	1.66	A.
August.....	4,610	585	1,050	1.56	1.80	A.
September.....	2,810	850	1,130	1.67	1.86	A.
October.....	10,200	780	1,830	2.71	3.12	B.
November.....	3,550	1,040	1,890	2.80	3.12	B.
December.....	9,570	1,320	3,120	4.62	5.33	B.
The year.....	20,100	585	2,110	3.13	42.53	

NOTE.—See footnote to table of daily discharge and discussion under "Accuracy" in station description.

LITTLE TENNESSEE RIVER AT MCGHEE, TENN.

Location.—At Louisville & Nashville Railroad bridge, one-third mile south of McGhee and one-half mile below the mouth of Tellico River.

Records available.—November 29, 1904, to December 31, 1911.

Drainage area.—2,470 square miles.

Gage.—Chain gage on crossties, upstream side of the railroad bridge, owned by United States Weather Bureau. Prior to December 1, 1905, the same gage was on the old railroad bridge 1,000 feet below. The present datum is 0.3 foot higher than the original datum, allowing for slope in river measured at gage height 4.0 feet.

Channel.—Mostly sand and gravel but practically permanent.

Discharge measurements.—Made from the downstream side of the railroad bridge.

Floods.—The flood of February 22, 1906, reached a height of 22.2 feet by the gage datum. The United States Weather Bureau reports a height of 39.0 feet March, 1867, and 38.5 feet in 1884.

Point of zero flow.—Report of the United States Engineers shows the controlling ledge below the gage to be about 2.5 feet lower than low water at the gage. Assuming their low water to be the same as lowest records places the point of zero flow at about - 0.3 foot by the gage datum.

Winter flow.—Ice does not affect the flow.

Cooperation.—Gage-height records have been furnished by the United States Weather Bureau.

Discharge measurements of Little Tennessee River at McGhee, Tenn., in 1911.

Date.	Hydrographer.	Gage height.	dis-charge.
Aug. 4	R. E. Robertson.....	<i>Feet.</i> 4.15	<i>Sec.-feet.</i> 6,150
Nov. 3do.....	2.60	2,200

Daily gage height, in feet, of Little Tennessee River at McGhee, Tenn., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	4.1	3.9	3.7	4.4	5.3	3.3	2.9	2.6	3.4	2.5	2.6	3.3
2.....	8.1	3.7	4.2	4.2	5.0	3.4	2.7	2.9	2.9	2.4	2.6	3.2
3.....	10.9	3.6	4.0	4.1	4.7	3.2	2.7	3.2	2.6	2.5	2.5	3.1
4.....	12.2	4.0	3.8	4.0	4.5	3.2	2.8	3.8	2.5	2.6	2.5	3.0
5.....	7.4	4.5	3.7	8.0	4.4	3.1	3.2	4.0	2.7	2.6	2.5	3.0
6.....	5.5	4.3	3.7	14.4	4.3	3.7	3.0	3.6	3.0	2.4	2.5	2.9
7.....	5.1	4.3	4.8	9.3	4.3	3.3	2.9	3.1	3.8	2.4	3.7	2.9
8.....	4.8	4.4	4.6	9.0	4.2	3.2	2.7	3.1	3.1	2.3	3.6	2.9
9.....	4.6	11.2	4.9	9.0	4.1	3.2	3.0	3.5	2.9	2.3	3.5	2.9
10.....	4.3	8.8	4.5	7.8	4.1	3.1	4.3	3.1	2.7	2.4	4.2	2.8
11.....	4.1	6.5	4.6	6.7	4.0	3.1	3.2	2.8	2.7	3.7	3.8	2.8
12.....	3.9	5.7	4.4	6.6	4.0	3.0	3.2	2.8	3.0	3.6	4.2	2.9
13.....	3.9	5.3	4.2	7.3	4.0	2.9	3.1	2.2	2.8	3.0	4.2	2.9
14.....	3.8	5.0	4.1	6.7	3.8	2.9	3.6	2.9	2.7	2.6	3.9	2.9
15.....	3.7	4.8	4.0	6.7	3.8	2.8	3.2	3.0	2.5	2.6	3.6	3.0
16.....	3.7	4.6	3.8	7.0	.....	2.8	3.0	3.2	2.5	2.5	3.5	3.2
17.....	3.6	4.4	3.7	6.2	.....	2.8	3.9	2.9	2.6	2.8	3.3	3.6
18.....	3.6	4.3	3.7	5.7	.....	2.9	3.7	2.7	2.6	9.8	3.6	3.5
19.....	3.8	4.2	3.7	5.5	.....	3.0	3.2	3.3	2.5	5.0	4.6	3.1
20.....	3.7	4.2	4.2	9.1	3.7	3.2	2.9	2.8	2.5	4.0	4.0	3.0
21.....	3.7	4.0	4.1	7.0	3.7	3.5	2.9	2.6	2.5	3.6	3.8	3.4
22.....	3.6	4.0	3.9	6.2	4.1	3.0	3.9	2.5	2.8	3.4	3.6	4.4
23.....	3.6	3.9	3.9	5.8	3.8	3.0	3.4	2.5	2.7	3.3	3.3	7.2
24.....	3.6	3.9	3.8	5.5	4.0	3.0	3.1	2.4	2.5	3.2	3.5	5.5
25.....	3.4	3.8	3.8	5.2	3.8	2.9	6.3	2.4	3.2	3.0	3.9	5.5
26.....	3.4	3.8	3.7	5.0	3.7	2.9	4.1	2.4	3.3	2.9	3.5	5.0
27.....	3.4	3.8	5.2	4.8	3.5	2.8	3.3	2.6	2.9	2.9	3.2	10.2
28.....	3.4	3.7	5.5	4.8	3.4	3.4	3.0	2.6	2.7	2.8	3.3	8.4
29.....	3.5	.....	4.8	4.8	3.4	3.8	2.9	2.6	2.6	2.8	3.2	5.9
30.....	3.9	.....	4.5	4.7	3.3	3.1	2.8	2.4	2.5	2.8	3.4	5.2
31.....	4.3	.....	4.5	.....	3.2	.....	2.8	2.4	.....	2.7	.....	5.4

Daily discharge, in second-feet, of Little Tennessee River at McGhee, Tenn., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	5,680	5,150	4,630	6,500	9,120	3,650	2,790	2,250	3,890	2,090	2,250	3,650
2.....	17,800	4,630	5,950	5,950	8,220	3,890	2,420	2,790	2,790	1,940	2,250	3,420
3.....	27,400	4,380	5,410	5,080	7,350	3,420	2,420	3,420	2,250	2,090	2,090	3,200
4.....	32,100	5,410	4,890	5,410	6,780	3,420	2,600	4,890	2,090	2,250	2,090	2,990
5.....	15,600	6,780	4,630	17,500	6,500	3,200	3,420	5,410	2,420	2,250	2,090	2,990
6.....	9,720	6,220	4,630	40,300	6,220	4,630	2,990	4,380	2,990	1,940	2,090	2,790
7.....	8,520	6,220	7,640	21,800	6,220	3,650	2,790	3,200	4,890	1,940	4,630	2,790
8.....	7,640	6,500	7,060	20,800	5,950	3,420	2,420	3,200	3,200	1,790	4,380	2,790
9.....	7,060	28,400	7,930	20,800	5,080	3,420	2,990	4,130	2,790	1,790	4,130	2,790
10.....	6,220	20,200	6,780	16,900	5,080	3,200	6,220	3,200	2,420	1,940	5,950	2,600
11.....	5,680	12,800	7,060	13,400	5,410	3,200	3,420	2,600	2,420	4,630	4,890	2,600
12.....	5,150	10,300	6,500	13,100	5,410	2,990	3,420	2,600	2,990	4,380	5,950	2,790
13.....	5,150	9,120	5,950	15,300	5,410	2,790	3,200	1,650	2,600	2,990	5,950	2,790
14.....	4,890	8,220	5,680	13,400	4,890	2,790	4,380	2,790	2,420	2,250	5,150	2,790
15.....	4,630	7,640	5,410	13,400	4,890	2,600	3,420	2,990	2,090	2,250	4,380	2,990
16.....	4,630	7,060	4,890	14,300	4,840	2,600	2,990	3,420	2,090	2,090	4,130	3,420
17.....	4,380	6,500	4,630	11,800	4,780	2,600	5,150	2,790	2,250	2,600	3,650	4,380
18.....	4,380	6,220	4,630	10,300	4,730	2,790	4,630	2,420	2,250	23,500	4,380	4,130
19.....	4,890	5,950	4,630	9,720	4,680	2,990	3,420	3,650	2,090	8,220	7,060	3,200
20.....	4,630	5,950	5,950	21,200	4,630	3,420	2,790	2,600	2,090	5,410	5,410	2,990
21.....	4,630	5,410	5,680	14,300	4,630	4,130	2,790	2,250	2,090	4,380	4,890	3,890
22.....	4,380	5,410	5,150	11,800	5,680	2,990	5,150	2,090	2,600	3,380	4,380	6,500
23.....	4,380	5,150	5,150	10,600	4,890	2,990	3,890	2,090	2,420	3,650	3,650	15,000
24.....	4,380	5,150	4,890	9,720	5,410	2,990	3,200	1,940	2,090	3,420	4,130	9,720
25.....	3,890	4,890	4,890	8,820	4,890	2,790	12,200	1,940	3,420	2,990	5,150	9,720
26.....	3,890	4,890	4,630	8,220	4,630	2,790	5,680	1,940	3,650	2,790	4,130	8,220
27.....	3,890	4,890	8,820	7,640	4,130	2,600	3,650	2,250	2,790	2,790	3,420	24,900
28.....	3,890	4,630	9,720	7,640	3,890	3,890	2,990	2,250	2,420	2,600	3,650	18,800
29.....	4,130	.....	7,640	7,640	3,890	4,890	2,790	2,250	2,250	2,600	3,420	10,900
30.....	5,150	.....	6,780	7,350	3,650	3,200	2,600	1,940	2,090	2,600	3,890	8,820
31.....	6,220	.....	6,780	.....	3,420	.....	2,600	1,940	.....	2,420	.....	9,420

NOTE.—Daily discharge determined by means of a discharge rating curve fairly well defined between 1,390 and 1,650 second-feet (gage heights 2.0 and 2.2 feet), well defined between 1,790 and 8,820 second-feet (gage heights 2.3 and 5.2 feet), and fairly well defined between 9,120 and 24,200 second-feet (gage heights 5.3 and 10.0 feet). Daily discharge interpolated May 16 to 19.

Monthly discharge of Little Tennessee River at McGhee, Tenn., for 1911.

[Drainage area, 2,470 square miles.]

Month	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	32,100	3,890	7,580	3.07	3.54	B.
February.....	28,400	4,380	7,060	3.10	3.23	B.
March.....	9,720	4,630	5,970	2.42	2.79	A.
April.....	40,300	5,410	13,000	5.26	5.87	B.
May.....	9,120	3,420	5,370	2.17	2.50	B.
June.....	4,890	2,600	3,260	1.32	1.47	A.
July.....	12,200	2,420	3,720	1.51	1.74	A.
August.....	5,410	1,650	2,810	1.14	1.31	A.
September.....	4,890	2,090	2,630	1.06	1.18	A.
October.....	23,500	1,790	3,630	1.47	1.70	A.
November.....	7,060	2,090	4,120	1.67	1.86	A.
December.....	24,900	2,600	6,060	2.45	2.82	B.
The year.....	40,300	1,650	5,470	2.21	30.01	

TUCKASEGEE RIVER AT BRYSON, N. C.

Location.—At highway bridge in the town of Bryson, half a mile below the mouth of Deep Creek and about 15 miles above the junction of Tuckasegee River with Little Tennessee River.

Records available.—November 7, 1897, to December 31, 1911.

Drainage area.—662 square miles.

Gage.—Vertical staff attached to the right bank bridge pier; datum unchanged.

Channel.—Permanent, or nearly so, as to relation of gage height to discharge, though sandy at section.

Discharge measurements.—Made from the downstream side of the bridge.

Winter flow.—Ice does not affect the relation of gage height to discharge.

Accuracy.—Excellent for low and ordinary stages; discharge rating curves not so well defined for high stages, depending upon one discharge measurement made in 1901.

Discharge measurements of Tuckasegee River at Bryson, N. C., in 1911.

Date.	Hydrographer.	Gage height.	Dis-charge.
Aug. 8	R. E. Robertson.....	<i>Feet.</i> 1.80	<i>Sec.-feet.</i> 1,330
9	do.....	1.45	877

Daily gage height, in feet, of Tuckasegee River at Bryson, N. C., for 1911.

[J. M. Welch, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	2.35	1.6	1.85	1.9	2.4	1.65	1.25	1.20	1.45	1.15	1.20	1.38
2.....	3.95	1.6	1.8	1.9	2.15	1.55	1.30	1.45	1.28	1.18	1.20	1.38
3.....	5.5	1.5	1.7	1.8	2.15	1.5	1.25	1.95	1.22	1.25	1.20	1.40
4.....	3.9	2.05	1.65	3.1	2.1	1.45	1.50	2.00	1.25	1.28	1.20	1.45
5.....	2.9	1.8	2.5	6.9	2.1	1.45	1.40	1.70	1.22	1.15	1.25	1.38
6.....	2.4	1.85	2.3	4.6	2.05	1.45	1.28	1.48	1.75	1.10	1.55	1.35
7.....	2.2	1.8	2.45	3.75	2.0	1.4	1.25	1.40	1.35	1.10	1.70	1.32
8.....	2.1	2.9	2.45	3.5	1.9	1.5	1.25	1.70	1.20	1.10	1.42	1.30
9.....	2.0	2.95	2.35	3.4	1.9	1.4	1.85	1.38	1.25	1.12	2.00	1.30
10.....	1.85	2.7	2.3	3.05	1.9	1.4	1.60	1.30	1.25	1.90	1.65	1.30
11.....	1.8	2.55	2.15	2.75	1.9	1.4	1.50	1.30	1.35	1.90	1.55	1.30
12.....	1.8	2.3	2.0	3.4	1.8	1.35	1.48	1.30	1.25	1.45	1.75	1.35
13.....	1.8	2.1	1.9	3.3	1.8	1.3	1.40	1.40	1.15	1.25	1.80	1.30
14.....	1.7	2.1	1.9	3.25	1.8	1.3	1.80	1.38	1.15	1.28	1.60	1.38
15.....	1.7	2.0	1.8	3.25	1.75	1.3	1.70	1.35	1.15	1.20	1.55	1.45
16.....	1.6	1.95	1.75	3.05	1.7	1.3	1.75	1.40	1.15	1.15	1.50	1.80
17.....	1.6	1.9	1.7	2.75	1.7	1.3	1.60	1.30	1.10	3.60	1.45	1.70
18.....	1.7	1.9	1.7	2.5	1.75	1.4	1.45	1.20	1.15	2.80	2.15	1.48
19.....	1.6	1.8	1.85	3.1	1.75	1.45	1.30	1.20	1.15	1.90	1.80	1.42
20.....	1.6	2.3	1.9	3.1	1.7	1.5	1.42	1.15	1.18	1.70	1.60	1.50
21.....	1.6	1.95	1.8	2.75	1.85	1.4	1.60	1.10	1.40	1.50	1.60	1.70
22.....	1.6	1.85	1.7	2.65	1.7	1.3	1.55	1.10	1.22	1.60	1.50	2.60
23.....	1.6	1.8	1.9	2.45	1.65	1.35	1.32	1.10	1.38	1.55	1.55	2.60
24.....	1.5	1.8	1.75	2.4	1.8	1.3	1.70	1.10	1.50	1.38	1.80	2.35
25.....	1.5	1.75	1.7	2.35	1.65	1.3	1.80	1.10	1.42	1.40	1.60	2.25
26.....	1.55	1.7	2.0	2.3	1.6	1.25	1.45	1.25	1.38	1.32	1.50	2.70
27.....	1.55	1.7	2.3	2.2	1.6	1.3	1.32	1.22	1.22	1.30	1.50	4.20
28.....	1.6	1.7	2.25	2.2	1.6	2.15	1.28	1.15	1.18	1.30	1.50	2.80
29.....	1.6	.....	2.2	2.2	1.6	1.4	1.25	1.10	1.15	1.25	1.60	2.35
30.....	1.9	.....	2.1	2.7	1.5	1.3	1.20	1.65	1.15	1.25	1.48	2.20
31.....	1.7	.....	1.95	.....	1.5	.....	1.20	1.85	.....	1.22	.....	3.60

Daily discharge, in second-feet, of Tuckasegee River at Bryson, N. C., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	2,220	1,090	1,440	1,510	2,300	1,160	678	625	900	578	625	818
2.....	5,670	1,090	1,360	1,510	1,890	1,020	730	900	709	606	625	818
3.....	10,700	960	1,220	1,360	1,890	960	678	1,580	646	678	625	840
4.....	5,540	1,740	1,160	3,670	1,810	900	960	1,660	678	709	625	900
5.....	3,250	1,360	2,480	18,400	1,810	900	840	1,220	646	578	678	818
6.....	2,300	1,440	2,130	7,530	1,740	900	709	936	1,300	530	1,020	785
7.....	1,970	1,360	2,390	5,160	1,660	840	678	840	785	530	1,220	752
8.....	1,810	3,250	2,390	4,560	1,510	960	678	1,220	625	530	864	730
9.....	1,660	3,360	2,220	4,330	1,510	840	1,440	818	678	548	1,660	730
10.....	1,440	2,850	2,130	3,560	1,510	840	1,090	730	678	1,510	1,160	730
11.....	1,360	2,570	1,890	2,950	1,510	840	960	730	785	1,510	1,020	730
12.....	1,360	2,130	1,660	4,330	1,360	785	936	730	678	900	1,300	785
13.....	1,360	1,810	1,510	4,110	1,360	730	840	840	578	678	1,360	730
14.....	1,220	1,810	1,510	4,000	1,360	730	1,360	818	578	709	1,090	730
15.....	1,220	1,660	1,360	4,000	1,300	730	1,220	785	578	625	1,020	900
16.....	1,090	1,580	1,300	3,560	1,220	730	1,300	840	578	578	960	1,360
17.....	1,090	1,510	1,220	2,950	1,220	730	1,090	730	530	4,800	900	1,220
18.....	1,220	1,510	1,220	2,480	1,300	840	900	625	578	3,050	1,890	936
19.....	1,090	1,360	1,440	3,670	1,300	900	730	625	578	1,510	1,360	864
20.....	1,090	2,130	1,510	3,670	1,220	960	864	578	606	1,220	1,090	960
21.....	1,090	1,580	1,360	2,950	1,440	840	1,090	530	840	960	1,090	1,220
22.....	1,090	1,440	1,220	2,760	1,220	730	1,020	530	646	1,090	960	2,660
23.....	1,090	1,360	1,510	2,390	1,160	785	752	530	818	1,020	1,020	2,660
24.....	960	1,360	1,300	2,300	1,360	730	1,220	530	960	818	1,360	2,220
25.....	960	1,300	1,220	2,220	1,160	730	1,360	530	864	840	1,090	2,050
26.....	1,020	1,220	1,660	2,130	1,090	678	900	678	818	752	960	2,850
27.....	1,020	1,220	3,050	1,970	1,090	730	752	646	646	730	960	6,350
28.....	1,090	1,220	2,050	1,970	1,090	1,890	709	578	606	730	960	3,050
29.....	1,090	.....	1,970	1,970	1,090	840	678	530	578	678	1,090	2,220
30.....	1,510	.....	1,810	2,850	.....	730	625	1,160	578	678	936	1,970
31.....	1,220	.....	1,580	.....	960	.....	625	1,440	.....	646	.....	4,800

NOTE.—Daily discharge determined by means of a discharge rating curve that is well defined below 3,400 second-feet (gage height, 3.0 feet) and poorly defined above that point.

Monthly discharge of Tuckasegee River at Bryson, N. C., for 1911.

[Drainage area, 662 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	10,700	960	1,960	2.96	3.41	B. A.
February.....	3,360	960	1,690	2.55	2.66	A. A.
March.....	3,050	1,160	1,690	2.55	2.94	A. A.
April.....	18,400	1,360	3,690	5.57	6.21	B. A.
May.....	2,300	960	1,400	2.11	2.43	A. A.
June.....	1,890	678	866	1.31	1.46	A. A.
July.....	1,440	625	917	1.39	1.60	A. A.
August.....	1,660	530	823	1.24	1.43	A. A.
September.....	1,300	530	702	1.06	1.18	B. A.
October.....	4,800	530	1,010	1.53	1.76	A. A.
November.....	1,890	625	1,050	1.59	1.77	A. A.
December.....	6,350	730	1,590	2.40	2.77	B. A.
The year.....	18,400	530	1,450	2.19	29.62	

NOTE.—See footnote to table of daily discharge and discussion under "Accuracy" in station description.

HIWASSEE RIVER AT MURPHY, N. C.

Location.—At highway bridge near the Louisville & Nashville Railroad station, half a mile above the mouth of Valley River.

Records available.—June 26, 1896, to August 8, 1897; October 19, 1897, to December 31, 1911.

Drainage area.—410 square miles.

Gage.—Chain gage attached to downstream side of bridge. Original wire-rope gage was near the same point on bridge. Datum unchanged since October 20, 1897. Record of datum of former gage was lost when wire rope broke August 8, 1897.

Channel.—Permanent; rough; rock bottom at measuring section. Controlling bar below is rock and gravel of less permanent nature. Rebuilding railroad bridge piers 80 feet downstream has also changed channel and relation of gage height to discharge to some extent.

Discharge measurements.—Made from the upstream side of bridge.

Winter flow.—Ice does not affect the relation of gage height to discharge.

Discharge measurements of Hiwassee River at Murphy, N. C., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Aug. 10	R. E. Robertson.....	<i>Feet.</i> 5.20	<i>Sec.-feet.</i> 343
10	do.....	5.27	381

Daily gage height, in feet, of Hiwassee River at Murphy, N. C., for 1911.

[Miss Willie Mingus, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	5.8	5.75	5.8	5.9	6.05	5.6	5.2	5.3	5.3	5.1	5.2	5.4
2.....	7.4	5.7	6.0	5.85	6.1	5.5	5.3	5.4	5.15	5.05	5.2	5.4
3.....	8.8	5.75	6.0	5.8	6.1	5.5	5.25	5.6	5.3	5.15	5.2	5.4
4.....	7.8	5.8	5.95	5.8	6.05	5.5	5.4	6.6	5.1	5.15	5.2	5.35
5.....	6.85	5.75	5.85	8.9	6.0	5.45	5.3	5.9	5.1	5.1	5.2	5.3
6.....	6.4	5.7	5.85	8.8	6.0	5.5	5.3	5.6	5.6	5.05	5.2	5.3
7.....	6.2	5.85	5.85	7.4	5.95	5.55	5.2	5.4	5.5	5.05	5.7	5.3
8.....	6.05	6.0	5.85	7.8	5.9	5.6	5.9	5.4	5.25	5.0	5.25	5.3
9.....	6.05	7.4	5.8	8.5	5.9	5.5	5.9	5.3	5.15	5.05	5.35	5.3
10.....	5.9	7.2	5.8	7.5	5.8	5.4	5.35	5.3	5.15	5.15	5.7	5.3
11.....	5.8	6.6	5.75	7.1	5.8	5.4	5.75	5.25	5.2	5.9	5.55	5.3
12.....	5.8	6.6	5.7	7.7	5.8	5.35	5.85	5.2	5.25	5.4	5.5	5.3
13.....	5.7	6.5	5.7	7.5	5.75	5.3	5.45	5.2	5.15	5.25	5.9	5.25
14.....	5.7	6.4	5.7	7.1	5.75	5.3	5.8	5.2	5.15	5.2	5.65	5.25
15.....	5.6	6.3	5.65	7.0	5.7	5.3	5.5	5.3	5.15	5.2	5.6	5.3
16.....	5.6	6.1	5.6	6.9	5.7	5.3	5.95	5.4	5.2	5.1	5.5	5.4
17.....	5.55	6.15	5.6	6.7	5.7	5.3	7.4	5.25	5.1	5.3	5.45	5.5
18.....	5.8	6.0	5.6	6.6	5.9	5.3	5.7	5.2	5.1	5.7	5.7	5.4
19.....	5.65	5.9	6.6	6.55	5.75	5.4	5.5	5.2	5.15	5.95	5.7	5.4
20.....	5.65	6.2	6.15	6.35	5.7	5.7	5.4	5.2	5.25	5.65	5.6	5.4
21.....	5.6	6.0	5.8	6.75	5.75	5.4	5.4	5.15	5.45	5.5	5.5	6.0
22.....	5.6	6.0	5.75	6.75	5.8	5.35	5.85	5.15	5.3	5.4	5.45	5.9
23.....	5.6	5.95	5.75	6.5	6.0	5.3	5.5	5.1	5.2	5.35	5.45	7.0
24.....	5.55	5.85	5.65	6.45	6.3	5.3	5.4	5.1	5.2	5.3	5.5	6.4
25.....	5.55	5.8	5.65	6.45	6.8	5.3	5.9	5.1	5.15	5.3	5.5	6.3
26.....	5.6	5.8	5.7	6.3	5.7	5.3	5.45	5.1	5.1	5.3	5.5	6.2
27.....	5.6	5.85	6.65	6.2	5.65	5.3	5.35	5.2	5.1	5.25	5.45	7.2
28.....	5.6	5.8	6.25	6.2	5.8	5.8	5.3	5.1	5.1	5.25	5.4	6.65
29.....	5.8	.....	6.1	6.25	5.9	5.3	5.25	5.1	5.1	5.2	5.5	6.25
30.....	5.8	.....	6.1	6.2	5.6	5.25	5.2	5.1	5.1	5.25	5.45	6.05
31.....	5.75	.....	6.0	.....	5.65	.....	5.2	5.6	.....	5.2	.....	6.55

Daily discharge, in second-feet, of Hiwassee River at Murphy, N. C., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	795	752	795	885	1,020	630	335	405	405	270	885	475
2.....	2,760	710	975	840	1,070	550	405	475	302	238	335	475
3.....	5,510	752	975	795	1,070	550	370	630	405	302	335	475
4.....	3,470	795	930	795	1,020	550	475	1,610	270	302	335	440
5.....	1,920	752	840	5,730	975	512	405	885	270	270	335	405
6.....	1,380	710	840	5,510	975	550	405	630	630	238	335	405
7.....	1,170	840	840	2,760	930	590	335	475	550	238	710	405
8.....	1,020	975	840	3,470	885	630	885	475	370	205	370	405
9.....	1,020	2,760	795	4,370	885	550	885	405	302	238	440	405
10.....	885	2,430	795	2,930	795	475	440	405	302	302	710	405
11.....	795	1,610	752	2,930	795	475	752	370	335	885	590	405
12.....	795	1,610	710	3,290	795	440	840	335	370	475	550	405
13.....	710	1,490	710	3,930	752	405	512	335	302	370	885	370
14.....	710	1,380	710	2,280	752	405	795	335	302	335	670	370
15.....	630	1,270	670	2,130	710	405	550	405	302	335	630	405
16.....	630	1,070	630	1,990	710	405	930	475	335	270	550	475
17.....	590	1,120	630	1,730	710	405	2,760	370	270	405	512	550
18.....	795	975	630	1,610	885	405	710	335	270	710	710	475
19.....	670	885	630	1,550	752	475	550	335	302	930	710	475
20.....	670	1,170	1,120	1,320	710	710	475	335	370	670	630	475
21.....	630	975	795	1,800	752	475	475	302	512	550	550	975
22.....	630	975	752	1,800	795	440	840	302	405	475	512	885
23.....	630	930	752	1,490	975	405	550	270	335	440	512	2,130
24.....	590	840	670	1,440	1,270	405	475	270	335	405	550	1,380
25.....	590	795	670	1,440	1,860	405	885	270	302	405	550	1,270
26.....	630	795	710	1,270	710	405	512	270	270	405	550	1,170
27.....	630	840	1,670	1,170	670	405	440	335	270	370	512	2,430
28.....	630	795	1,220	1,170	795	795	405	270	270	370	475	1,670
29.....	795	.....	1,070	1,220	885	405	370	270	270	335	550	1,220
30.....	795	.....	1,070	1,170	630	370	335	270	270	370	512	1,020
31.....	752	.....	975	.....	670	.....	335	630	.....	335	.....	1,550

NOTE.—Daily discharge computed from a rating curve well defined between 270 and 3,290 second-feet (gage heights 5.1 and 7.7 feet), above which it is poorly defined.

Monthly discharge of Hiwassee River at Murphy, N. C., for 1911.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	5,510	590	1,100	2.68	3.09	B.
February.....	2,760	710	1,110	2.71	2.82	A.
March.....	1,670	630	844	2.06	2.38	A.
April.....	5,730	795	2,120	5.17	5.77	A.
May.....	1,860	630	878	2.14	2.47	A.
June.....	795	370	488	1.19	1.33	A.
July.....	2,760	335	627	1.53	1.76	A.
August.....	1,610	270	435	1.06	1.22	A.
September.....	630	270	340	.829	.92	B.
October.....	930	205	402	.980	1.13	A.
November.....	885	335	532	1.30	1.45	A.
December.....	2,430	370	787	1.92	2.21	A.
The year.....	5,730	205	802	1.96	26.55	

HIWASSEE RIVER AT RELIANCE, TENN.

Location.—At Louisville & Nashville Railroad bridge at Reliance, Tenn., 1 mile below the mouth of Lost Creek and 2 miles above Spring Creek.

Records available.—August 17, 1900, to December 31, 1911.

Drainage area.—1,180 square miles.

Gage.—Vertical staff attached to a tree on right bank 150 feet above the bridge. On August 3, 1911, the gage was raised 0.10 foot to agree with the original datum. (See "Accuracy" below.)

Channel.—Section is in a pool above a rock ledge diagonally across the river. At lower end of ledge is a small corn mill with some addition to the natural dam, probably varying in extent.

Discharge measurements.—Made from the downstream side of the bridge.

Winter flow.—Ice does not affect the relation of gage height to discharge.

Artificial control.—None above. The small mill below may affect the low-water flow.

Accuracy.—On August 3 it was found by leveling that the gage had settled 0.10 foot, i. e., the gage read high by that amount. The gage was raised to agree with the original datum. It is probable that this error affected the 1910 daily gage heights as published in Water-Supply Paper 283, but since the same error probably entered into the gage heights of the discharge measurements used to determine the 1910 discharge rating table, the published estimates of daily and monthly discharge for 1910 are probably not in error as a result of the settlement of the gage. Gage heights for 1911 in the following tables have been adjusted to the original datum by reducing those observed prior to August 3 by 0.10 foot.

Discharge measurements of Hiwassee River at Reliance, Tenn., in 1911.

Date.	Hydrographer.	Gage height.	Dis-charge.
Aug. 3	R. E. Robertson.....	<i>Feet.</i> 1.38	<i>Sec.-feet.</i> 1,140
Nov. 4do.....	1.01	692

Daily gage height, in feet, of Hiwassee River at Reliance, Tenn., for 1911.

[C. V. Higdon, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	2.0	1.9	2.05	2.5	2.3	1.6	1.15	1.3	1.45	0.95	1.1	1.3
2.....	3.7	1.85	2.5	2.45	2.25	1.55	1.15	1.3	1.15	.9	1.05	1.2
3.....	6.2	1.75	2.25	1.9	2.25	1.55	1.1	1.4	1.05	.9	1.05	1.2
4.....	5.1	1.8	2.1	1.9	2.2	1.5	1.2	1.4	1.0	1.0	1.0	1.2
5.....	3.4	2.0	2.0	3.6	2.15	1.5	1.35	1.35	1.0	.9	1.0	1.2
6.....	2.75	1.9	1.95	6.2	2.1	1.5	1.2	1.5	1.4	.9	1.05	1.2
7.....	2.4	1.8	1.95	3.9	2.05	1.55	1.3	1.45	2.0	.85	1.4	1.2
8.....	2.25	3.4	2.0	4.9	2.0	1.5	1.15	1.3	1.3	.85	1.45	1.2
9.....	2.25	5.2	2.0	5.9	2.0	1.5	1.5	1.3	1.1	.95	1.4	1.2
10.....	2.05	4.1	1.95	4.1	2.0	1.45	1.25	1.15	1.05	.95	1.9	1.2
11.....	2.0	3.1	1.95	3.4	1.95	1.4	1.4	1.15	1.1	1.5	1.4	1.2
12.....	1.95	2.9	1.85	3.5	1.9	1.4	1.55	1.1	1.15	1.55	1.6	1.2
13.....	1.85	2.8	1.85	3.3	1.9	1.35	1.65	1.05	1.15	1.2	2.1	1.15
14.....	1.8	2.6	1.85	3.2	1.85	1.3	1.6	1.2	1.1	1.1	1.6	1.2
15.....	1.8	2.4	1.85	3.2	1.8	1.3	1.45	1.15	1.0	1.0	1.65	1.25
16.....	1.75	2.3	1.7	3.2	1.8	1.35	1.5	1.2	1.0	1.0	1.5	1.3
17.....	1.7	2.25	1.7	2.85	1.8	1.35	1.85	1.25	1.05	1.3	1.4	1.5
18.....	1.75	2.2	1.7	2.7	1.9	1.4	1.85	1.15	1.0	4.4	1.45	1.4
19.....	1.8	2.15	1.75	2.8	1.85	1.4	1.45	1.1	1.0	2.2	1.9	1.3
20.....	1.75	2.3	2.1	4.3	1.8	1.6	1.3	1.1	1.05	1.7	1.6	1.25
21.....	1.75	2.25	1.95	3.3	1.9	1.8	1.3	1.05	1.1	1.5	1.5	1.5
22.....	1.7	2.2	1.8	3.0	1.9	1.4	1.55	1.0	1.2	1.35	1.45	1.4
23.....	1.7	2.15	1.85	2.8	1.95	1.45	1.65	1.0	1.1	1.3	1.35	2.5
24.....	1.7	2.0	1.8	2.65	2.2	1.3	1.6	1.0	1.05	1.3	1.4	2.3
25.....	1.75	1.95	1.8	2.35	2.0	1.3	1.55	.95	1.05	1.2	1.55	2.35
26.....	1.65	1.9	1.8	2.35	1.8	1.25	1.7	.95	1.0	1.15	1.45	2.45
27.....	1.7	1.9	2.8	2.4	1.75	1.25	1.35	.95	1.0	1.15	1.35	3.8
28.....	1.7	2.05	2.6	2.35	1.7	1.25	1.25	1.0	.95	1.15	1.35	3.1
29.....	1.75	.....	2.3	2.35	1.7	1.25	1.2	1.1	.95	1.1	1.35	2.5
30.....	1.95	.....	2.3	2.35	1.65	1.2	1.2	1.0	.95	1.1	1.4	2.5
31.....	2.1	.....	2.15	.....	1.6	.....	1.2	1.0	.....	1.1	.....	2.4

NOTE.—See discussion under "Accuracy" in station description.

Daily discharge, in second-feet, of Hiwassee River at Reliance, Tenn., for 1911.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	2,260	2,050	2,370	3,460	2,950	1,490	850	1,040	1,260	630	790	1,040
2.....	7,300	1,950	3,460	3,330	2,830	1,410	850	1,040	850	580	735	910
3.....	17,600	1,760	2,260	2,050	2,830	1,410	790	1,180	735	580	735	910
4.....	12,800	1,850	2,480	2,050	2,710	1,330	910	1,180	680	680	680	910
5.....	6,240	2,260	2,260	6,940	2,600	1,330	1,110	1,110	680	580	680	910
6.....	4,160	2,050	2,160	17,600	2,480	1,330	910	1,330	1,180	580	735	910
7.....	3,200	1,850	2,160	8,030	2,370	1,410	1,040	1,260	2,260	535	1,180	910
8.....	2,830	6,240	2,260	12,000	2,260	1,330	850	1,040	1,040	535	1,260	910
9.....	2,830	13,200	2,260	16,300	2,260	1,330	1,330	1,040	790	630	1,180	910
10.....	2,370	8,780	2,160	8,780	2,260	1,260	975	850	735	630	2,050	910
11.....	2,260	5,230	2,160	6,240	2,160	1,180	1,180	850	790	1,330	1,180	910
12.....	2,160	4,600	1,950	6,590	2,050	1,180	1,410	790	850	1,410	1,490	910
13.....	1,950	4,300	1,950	5,900	2,050	1,110	1,580	735	850	910	2,480	850
14.....	1,850	3,730	1,950	5,560	1,950	1,040	1,490	910	790	790	1,490	910
15.....	1,850	3,200	1,950	5,560	1,850	1,040	1,260	850	680	680	1,580	975
16.....	1,760	2,950	1,660	5,560	1,850	1,110	1,330	910	680	680	1,330	1,040
17.....	1,660	2,830	1,660	4,450	1,850	1,110	1,950	975	735	1,040	1,180	1,330
18.....	1,760	2,710	1,660	4,010	2,050	1,180	1,950	850	680	9,940	1,260	1,180
19.....	1,850	2,600	1,760	4,300	1,950	1,180	1,260	790	680	2,710	2,050	1,040
20.....	1,760	2,950	2,480	9,550	1,850	1,490	1,040	790	735	1,660	1,490	975
21.....	1,760	2,830	2,160	5,900	2,050	1,850	1,040	735	790	1,330	1,330	1,330
22.....	1,660	2,710	1,850	4,910	2,050	1,180	1,410	680	910	1,110	1,260	1,180
23.....	1,660	2,600	1,950	4,300	2,160	1,260	1,580	680	790	1,040	1,110	3,460
24.....	1,660	2,260	1,850	3,870	2,710	1,040	1,490	680	735	1,040	1,180	2,950
25.....	1,760	2,160	1,850	3,080	2,260	1,040	1,410	630	735	910	1,410	3,080
26.....	1,580	2,050	1,850	3,080	1,850	975	1,660	630	680	850	1,260	3,330
27.....	1,660	2,050	4,300	3,200	1,760	975	1,110	630	680	850	1,110	7,660
28.....	1,660	2,370	3,730	3,080	1,660	975	975	680	630	850	1,110	5,230
29.....	1,760	.....	2,950	3,080	1,660	975	910	790	630	790	1,110	3,460
30.....	2,160	.....	2,950	3,080	1,580	910	910	680	630	790	1,180	3,460
31.....	2,480	.....	2,600	.....	1,490	.....	910	680	.....	790	.....	3,200

NOTE.—Daily discharge computed from a rating curve well defined between 490 and 3,460 second-feet (gage heights 0.8 and 2.5 feet), and fairly well defined between 3,730 and 6,590 second-feet (gage heights 2.6 and 3.5 feet).

Monthly discharge of Hiwassee River at Reliance, Tenn., for 1911.

[Drainage area, 1,180 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January.....	17,600	1,580	3,230	2.74	3.16	B.
February.....	13,200	1,760	3,430	2.91	3.03	B.
March.....	4,300	1,660	2,310	1.96	2.26	B.
April.....	17,600	2,050	5,860	4.97	5.54	B.
May.....	2,950	1,490	2,140	1.81	2.09	B.
June.....	1,850	910	1,210	1.03	1.15	A.
July.....	1,950	790	1,210	1.03	1.19	A.
August.....	1,330	630	871	.738	.85	A.
September.....	2,260	630	830	.703	.78	A.
October.....	9,940	535	1,210	1.03	1.19	A.
November.....	2,480	680	1,250	1.06	1.18	A.
December.....	7,660	850	1,860	1.58	1.82	B.
The year.....	17,600	535	2,110	1.79	24.24	

OCOEE RIVER AT COPPER HILL, TENN.

Location.—At new highway bridge recently built on site of suspension footbridge, from which discharge measurements were formerly made, in town of Copper Hill, Tenn., one-half mile above the mouth of Fightingtown Creek.

Records available.—March 21, 1903, to December 31, 1911.

Drainage area.—374 square miles.

Gage.—Chain gage attached to upstream side of the bridge, installed August 2, 1911.

This gage is near the location of the original sloping gage, a portion of which was cut away for the bridge pier. A temporary vertical staff gage was set September 16, 1910, to read the same as the original sloping gage, and the standard chain gage was set August 2, 1911, to read the same as the temporary gage. The chain gage should, therefore, read the same as the original sloping gage, i. e., both refer to the same datum. On August 2, 1911, a discrepancy of 0.10 foot between the bench mark and the two gages was found by wye levels, the gages being too high by that amount. It has been assumed that the error was made in the original levels and the recorded elevation of the bench mark changed to agree with the gages. The discharge measurements have been referred to the gages, and so the records of discharge need no revision.

Channel.—Is not permanent, but the relation of gage height to discharge has remained fairly constant.

Discharge measurements.—Made from the downstream side of the bridge.

Winter flow.—Ice does not affect the relation of gage height to discharge.

Discharge measurements of Ocoee River at Copper Hill, Tenn., in 1911.

Date.	Hydrographer.	Gage height.	Discharge.
Aug. 1	R. E. Robertson	<i>Feet.</i> 0.87	<i>Sec.-feet.</i> 436
2	do.	.82	429
Nov. 6	do.	.67	334

Daily gage height, in feet, of Ocoee River at Copper Hill, Tenn., for 1911.

[C. H. Black, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.		1.4	2.1	1.2	0.85	0.9	0.7	0.45	0.65	0.7
2.		1.3	2.1	1.2	.8	.9	.6	.45	.6	.8
3.		1.2	1.95	1.2	.8	1.2	.6	.45	.6	.7
4.		1.4	1.9	1.2	.9	1.05	.6	.45	.55	.8
5.			1.8	1.15	.95	.9	.7	.45	.55	.7
6.			1.8	1.1	.9	.8	1.2	.45	.6	.75
7.		2.95	1.75	1.0	1.0	.85	1.1	.45	1.6	.7
8.			1.75	1.0	1.1	.9	.75	.48	1.45	.7
9.			1.7	1.0	1.4	.75	.65	.50	1.35	.7
10.		3.4	1.7	1.0	1.2	.7	1.0	1.3	1.1	.7
11.		2.85	1.7	.9	1.65	.7	.9	1.8	.95	.7
12.			1.6	.9	1.4	.7	.7	1.4	.85	.7
13.		3.2	1.65	.85	1.3	.6	.7	1.0	.7	.7
14.		2.8	1.6	.8	1.45	.7	.6	.6	.6	.7
15.		2.95	1.5	.9	1.5	.8	.6	.6	.6	.7
16.		2.65	1.5	.88	1.4	.7	.6	.6	.7	.85
17.		2.5	1.5	1.0	1.3	.7	.55	2.9	.8	.75
18.		2.45	1.5	1.1	1.5	.7	.6	2.2	1.9	.75
19.	1.55		1.5	1.0	1.4	.7	.8	1.1	1.1	.75
20.	1.5	3.6	1.5	1.0	1.4	.7	.95	.85	.9	.8
21.	1.3	2.7	1.75	1.0	1.15	.65	.7	.7	.8	1.35
22.	1.3	2.45	1.55	.9	1.0	.6	.6	.7	.75	2.8
23.	1.3	2.3	1.7	.9	.9	.6	.6	.7	.75	2.4
24.	1.25	2.2	1.7	1.0	1.95	.6	.55	.7	.85	1.8
25.	1.2	2.15	1.45	1.0	1.9	.6	.6	.65	.9	1.7
26.	1.9	2.15	1.3	.9	1.05	.6	.6	.65	.8	3.1
27.	2.5	2.0	1.3	.9	.85	.7	.5	.6	.8	3.0
28.	1.7	2.1	1.2	.9	.85	.6	.48	.65	.8	3.1
29.	1.7	2.15	1.2	.88	.78	.6	.45	.65	1.0	1.6
30.	1.7	2.1	1.2	.82	.78	.6	.45	.65	.85	1.7
31.	1.5		1.2		.95	1.3		.65		2.5

NOTE.—Gage heights are missing Jan. 1 to Mar. 18 because of inability of observer to read gage, as a result of the fire at the ferry on Dec. 2, 1910. See "Gage" station description.

Daily discharge, in second-feet, of Ocoee River at Copper Hill, Tenn., for 1911.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		728	1,170	614	436	456	370	274	359	370
2		670	1,170	614	413	459	330	274	330	473
3		614	1,080	614	413	614	330	274	330	370
4		728	1,040	614	459	534	330	274	311	413
5		1,070	977	587	484	459	370	274	311	370
6		1,420	977	560	459	413	614	274	330	392
7		1,760	945	508	508	436	560	274	350	370
8		1,870	945	508	560	459	392	285	758	370
9		1,970	913	508	728	392	350	292	699	370
10		2,080	913	508	614	370	508	670	560	370
11		1,690	913	459	882	370	459	977	484	370
12		1,820	850	459	728	370	370	728	436	370
13		1,940	882	436	670	330	370	508	370	370
14		1,650	850	413	758	370	330	330	330	370
15		1,760	788	459	788	413	330	330	330	370
16		1,550	788	450	728	370	330	330	370	436
17		1,440	788	508	670	370	311	1,720	413	392
18		1,410	788	560	788	370	330	1,240	1,040	392
19	819	1,820	788	508	728	370	413	560	560	392
20	788	2,230	788	508	728	370	484	436	459	413
21	670	1,580	945	508	587	350	370	370	413	699
22	670	1,410	819	459	508	330	330	370	392	1,650
23	670	1,310	913	459	459	330	330	370	392	1,380
24	642	1,240	913	508	1,080	330	311	370	436	977
25	614	1,210	758	508	1,040	330	330	350	459	913
26	1,040	1,210	670	459	534	330	330	350	413	1,860
27	1,440	1,110	670	459	436	370	292	330	413	1,790
28	913	1,170	614	459	436	330	285	350	413	1,860
29	913	1,210	614	450	404	330	274	350	508	850
30	913	1,170	614	422	404	330	274	350	436	913
31	788		614		484	679		350		1,440

NOTE.—Daily discharge computed from a rating curve well defined between 272 and 728 second-feet (gage heights, 0.5 and 1.4 feet) and fairly well defined throughout the remainder of the range of discharge covered by the 1911 gage heights. Daily discharge interpolated Apr. 5, 6, 8, 9, 12, and 19.

Monthly discharge of Ocoee River at Copper Hill, Tenn., for 1911.

[Drainage area, 374 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accu- racy.
	Maximum.	Minimum.	Mean.	Per square mile.		
March 19-31	1,440	614	837	2.24	1.08	A.
April	2,230	614	1,430	3.82	4.26	B.
May	1,170	614	855	2.29	2.64	A.
June	614	413	503	1.34	1.50	A.
July	1,080	404	610	1.63	1.88	A.
August	670	330	398	1.06	1.22	A.
September	614	274	367	.981	1.09	B.
October	1,720	274	459	1.23	1.42	A.
November	1,040	311	463	1.24	1.38	A.
December	1,860	370	710	1.90	2.19	B.

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in the Ohio River basin during 1911 by M. R. Hall, A. H. Horton, and C. T. Bailey.

Miscellaneous measurements in Ohio River basin in 1911.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.	Drainage area.	Discharge per square mile.
				Feet.	Sec.-ft.	Sq. miles.	Sec.-ft.
July 21	New River....	K a n a w h a River.	From cable at Grayson, Va., 1 mile below Chestnut Creek.	a 1.93	892	1,230	0.72
17	.....do.....	.....do.....	Highway Bridge at Eggleston, Va., 1½ miles above Stinking Creek.	(b)	1,560	2,920	.53
21	Chestnut Creek.	New River....	Mouth (between Fries Junction and Grayson, Va.).	(c)	19.4	57.6	.34
21	Brush Creek.	.....do.....	.....do.....	(c)	.9	11.3	.08
Mar. 20	Kentucky River.	Ohio River....	Frankfort, Ky.....	d 7.9	3,580	d 5,140	.70
June 6	East Fork of Little River.	Little River....	Elkmont, Tenn.....	(e)	38	38.5	.99
6	Middle Fork of Little River.	East Fork of Little River (East and Middle Forks form Little River).	Railroad bridge at Forks, about 3 miles above Townsend, Tenn., just above the mouth of Middle Fork and below the mouth of Laurel Creek.	(f)	50	48.5	1.03
5	Little River...	French Broad River.	Foot bridge about three-fourths mile below depot at Townsend, Tenn.	g 3.07	114	120	.95
5	.....do.....	.....do.....	Suspension foot bridge at depot at Townsend, Tenn.	g 3.07	120	120	1.00
7	.....do.....	.....do.....	Covered railroad bridge of branch road leading to tannery at Walanda, Tenn., a short distance above the dam.	(h)	114	183	.62

a Vels, Blackwell, and Buck's gage. (Drowned out by backwater from Appalachian Power Co.'s dam in 1912, before the preparation of this report.)

b Water surface 36.00 feet below top of downstream I-bar of upstream pair of I-bars, 22.5 feet from the left pier of highway bridge at Eggleston.

c Measurement made with floats to determine inflow to New River between Fries Junction and Grayson, Va.

d U. S. Engineer Corps gage at Lock No. 4, about three-fourths mile below Louisville & Nashville R. R. bridge. Daily gage heights and drainage area published by U. S. Weather Bureau. (Flow of Benson Creek immediately below Louisville & Nashville R. R. bridge, zero in this case, included in measurement.)

e No permanent reference point. Measurement made from foot logs opposite depot at Elkmont at point where an island divides stream into two channels. Both channels of shifting character. Measuring sections rough, and not suitable for accurate determination of discharge.

f Water surface 18.85 feet below top of the iron girder, upstream side of bridge, 10 feet from end of girder on left bank.

g Water surface 2.93 feet below chisel draft on the top edge of a well-defined ledge of rock under the downstream edge of the suspension bridge at left bank and at Townsend depot. The datum to which the gage heights are referred is 6.00 feet below this chisel draft.

h Water surface 28.9 feet below the top of iron plate on top of wooden upper chord at third set of heavy iron hanger rods from right bank end of bridge. Water surface was about 0.3 foot higher at time of measurement, about 8 a. m., than at 6 p. m. the day before.

SUMMARY OF DISCHARGE PER SQUARE MILE.

The following summary of discharge per square mile is given to allow ready comparison of relative rates of run-off from different areas in the Ohio River drainage basin. It shows in a general way the seasonal distribution of run-off and the effect of snow, ground,

surface, and artificial storage. But the most important fact worth noting is the almost entire lack of uniformity or agreement between any two streams. It indicates that the discharge of each stream is a law unto itself, and that all projects dependent upon stream flow, if they are to be developed along the safest and most economical lines, must be based on records of stream flow collected with great care over a long series of years as near the location of the project under consideration as possible.

Summary of discharge, in second-feet per square mile, for river stations in the Ohio River drainage basin in 1911.

	Drainage area.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	Sq. mi.													
Allegheny River at Redhouse, N. Y....	1,640	5.05	1.72	2.71	3.54	1.19	0.90	0.29	0.99	1.59	1.69	2.50	2.41	2.05
Allegheny River at Kittanning, Pa....	9,010	5.04	2.92	2.10	3.20	1.07	.62	.20	.75	2.44	3.03	2.83	3.16	2.28
Kiskiminetas River at Avonmore, Pa....	1,720	4.62	2.60	2.18	3.60	.73	.69	.23	.36	2.66	2.87	1.57	2.52	2.05
Blacklick Creek at Blacklick, Pa.....	388	5.31	2.75	1.89	3.52	.64	.45	.11	.26	2.47	3.45	1.81	2.85	2.12
Tygart River at Belington, W. Va....	390	7.00	2.28	3.67	4.46	.57	.92	.35	.66	2.95	4.51	1.91	2.06	2.62
Tygart River at Fetterman, W. Va....	1,340	5.99	2.16	2.71	4.03	.40	.81	.18	.64	2.85	4.34	1.67	2.33	2.34
West Fork River at Enterprise, W. Va....	750	4.57	1.67	1.71	3.23	.22	.20	.08	.64	2.28	3.09	1.28	2.28	1.77
Cheat River near Morgantown, W. Va....	1,380	6.84	2.58	3.49	4.93	.80	2.01	.46	1.28	3.12	4.67	1.90	3.04	2.93
New River at Radford, Va.....	2,720	1.66	1.45	1.50	2.74	1.13	.79	.60	.61	62	1.05	.69	1.41	1.18
Greenbrier River at Alderson, W. Va....	1,340	5.25	2.17	3.27	4.31	.56	.39	.17	.15	.73	1.94	1.64	1.64	1.85
Miami River at Hamilton, Ohio.....	3,580	2.11	1.46	.91	1.90	.96	.30	.23	.16	.36	1.05	.96	1.60	1.00
Dix River near Burgin, Ky.....	416	3.10	4.52	.76	2.67	1.94	.20	.....	.....	.....	.53	2.31	6.56	.....
Embarrass River near Oakland, Ill.....	535	1.02	1.71	.51	2.09	.25	.24	.02	.01	1.17	2.60	1.33	.92	.98
Embarrass River at Ste. Marie, Ill.....	1,540	1.42	1.56	1.04	2.02	.51	.15	.08	.06	1.06	1.83	1.24	.94	.99
East Branch of White River at Shoals, Ind.....	4,900	2.39	1.96	1.58	3.67	1.24	.34	.16	.09	.68	1.51	1.16	1.75	1.37
Skillet Fork River near Wayne City, Ill.....	481	.24	1.18	.45	2.18	1.77	.08	(a)	(a)	.60	.34	.53	.77	.67
French Broad River near Asheville, N. C.....	987	1.91	1.56	1.44	3.84	1.65	1.03	.93	.98	1.11	1.61	1.49	2.02	1.55
Tennessee River at Chattanooga, Tenn.	21,400	2.39	2.90	1.98	4.21	1.53	.69	.78	.64	.60	.96	1.06	1.76	1.61
South Fork of Holston River at Bluff City, Tenn.....	828	2.87	3.09	2.75	3.45	1.21	.76	.69	.41	.42	.72	.88	1.11	1.52
Holston River near Rogersville, Tenn.	3,060	2.32	2.70	2.40	2.94	1.11	.52	.52	.31	.37	.65	.77	.98	1.29
Little Tennessee River at Judson, N.C.	675	3.07	2.81	2.55	10.0	2.79	1.66	1.44	1.56	1.67	2.71	2.80	4.62	3.13
Little Tennessee River at McGhee, Tenn.....	2,470	3.07	3.10	2.42	5.26	2.17	1.32	1.51	1.14	1.06	1.47	1.67	2.45	2.21
Tuckasegee River at Bryson, N. C.....	662	2.96	2.55	2.55	5.57	2.11	1.31	1.39	1.24	1.06	1.53	1.59	2.40	2.19
Hiwassee River at Murphy, N. C.....	410	2.63	2.71	2.06	5.17	2.14	1.19	1.53	1.06	.83	.98	1.80	1.92	1.96
Hiwassee River at Reliance, Tenn.....	1,180	2.74	2.91	1.96	4.97	1.81	1.03	1.03	.74	.70	1.03	1.06	1.58	1.79
Ocoee River at Copper Hill, Tenn.....	374	3.82	2.29	1.34	1.63	1.06	.98	1.23	1.24	1.90

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