DEPARTMENT OF THE INTERIOR
JOHN BARTON PAYNE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

WATER-SUPPLY PAPER 453

SURFACE WATER SUPPLY OF THE UNITED STATES

1917

PART III. OHIO RIVER BASIN

NATHAN C. GROVER, Chief Hydraulic Engineer
ALBERT H. HORTON and WARREN E. HALL, District Engineers

Prepared in cooperation with
THE STATES OF ILLINOIS AND KENTUCKY

WASHINGTON
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SURFACE WATER SUPPLY OF OHIO RIVER BASIN. 1917.

AUTHORIZATION AND SCOPE OF WORK.

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

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

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

The work was begun in 1888 in connection with special studies relating to irrigation in the arid West. Since the fiscal year ending June 30, 1895, successive sundry civil bills passed by Congress have carried the following item and appropriations:

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

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

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

In the execution of the work many private and State organizations have cooperated either by furnishing data or by assisting in collecting data. Acknowledgments for cooperation of the first kind are made in connection with the description of each station affected; cooperation of the second kind is acknowledged on page 11.

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

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

DEFINITION OF TERMS.

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

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

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

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

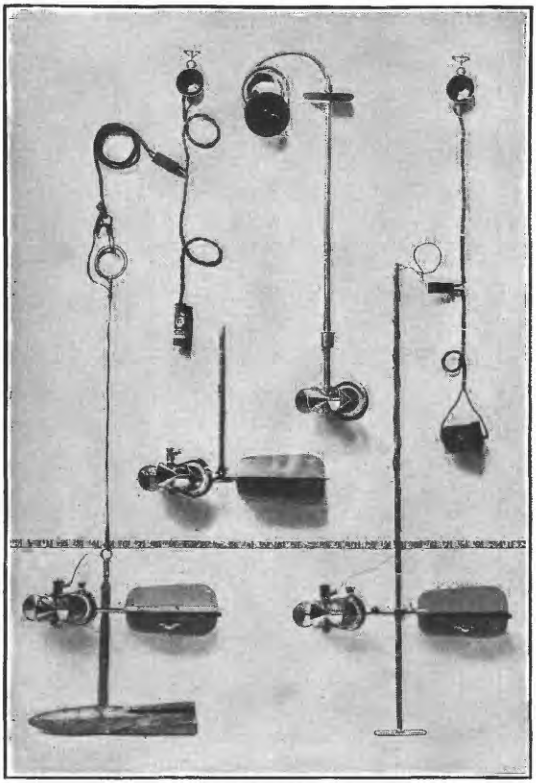
An "acre-foot," equivalent to 43,560 cubic feet, is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

The following terms not in common use are here defined:

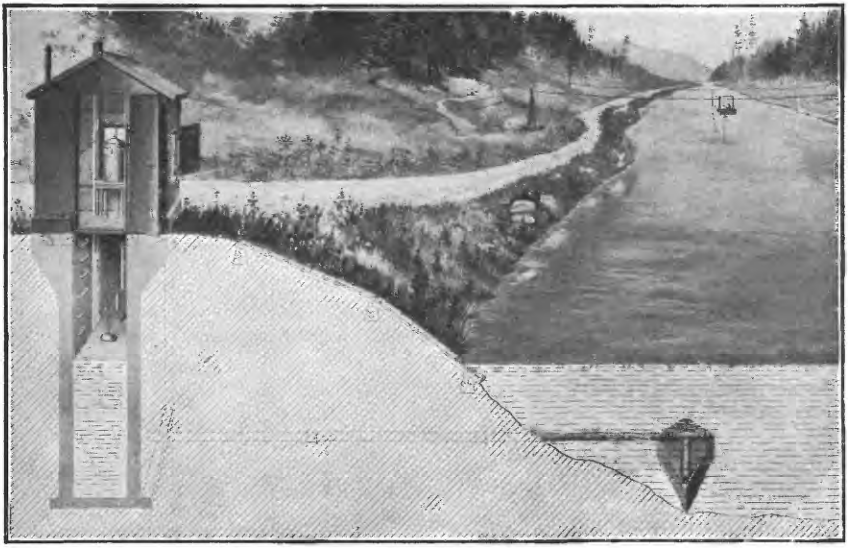
"Stage-discharge relation," an abbreviation for the term "relation of gage height to discharge."[1]

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

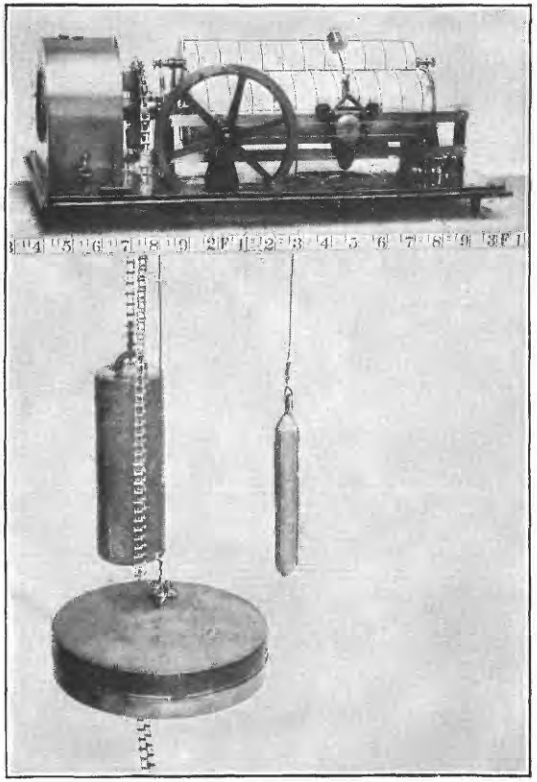
The "point of zero flow" for a gaging station is that point on the gage—the gage height—to which the surface of the river would fall if there were no flow.



A. PRICE CURRENT METERS.



B. TYPICAL GAGING STATION.



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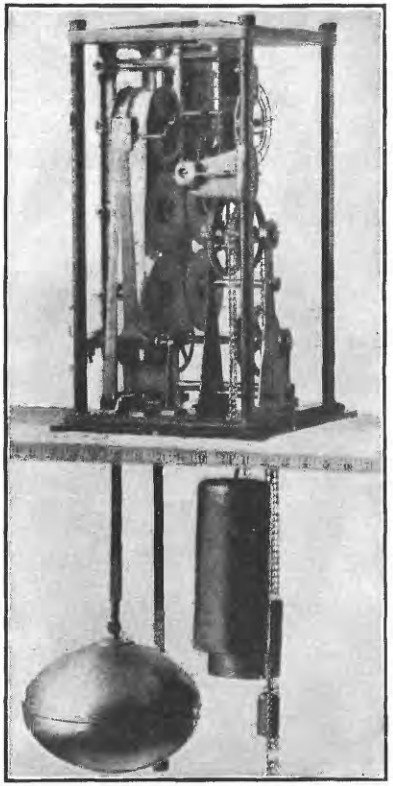

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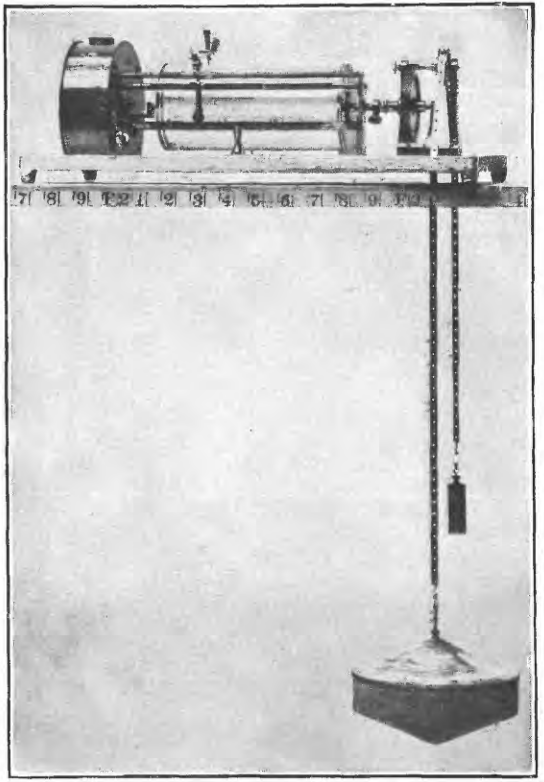

C. FRIEZ.

WATER-STAGE RECORDERS.

EXPLANATION OF DATA.

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

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

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

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

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

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

The table of daily discharge gives, in general, the discharge in second-feet corresponding to the mean of the gage heights read each day. At stations on streams subject to sudden or rapid diurnal fluctuation the discharge obtained from the rating table and the mean daily gage height may not be the true mean discharge for the day. If such stations are equipped with water-stage recorders the mean daily discharge may be obtained by averaging discharge at regular intervals during the day, or by using the discharge integrator,

an instrument operating on the principle of the planimeter and containing as an essential element the rating curve of the station.

In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest. As the gage height is the mean for the day it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge was consequently larger than given in the maximum column. Likewise, in the column headed "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this average flow computations recorded in the remaining columns, which are defined on page 8, are based.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

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

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

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

The monthly means for any station may represent with high accuracy the quantity of water flowing past the gage, but the figures showing discharge per square mile and depth of run-off in inches may be subject to gross errors caused by the inclusion of large noncontributing districts in the measured drainage area, by lack of information concerning water diverted for irrigation or other use, or by inability to interpret the effect of artificial regulation of the flow of the river above the station. "Second-feet per square mile" and "Run-off (depth in inches)" are therefore not computed if such errors appear probable. The computations are also omitted for stations on streams draining areas in which the annual rainfall is less than 20 inches. All figures representing "second-feet per square mile" and

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

"run-off (depth in inches)" previously published by the Survey should be used with caution because of possible inherent sources of error not known to the Survey.

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

COOPERATION.

Work in Illinois during the year ending September 30, 1917, was carried on in cooperation with the State of Illinois Rivers and Lakes Commission.

Work in Kentucky was done in cooperation with the State Geological Survey, J. B. Hoeing, State geologist.

The United States Engineer Corps cooperated in the maintenance of 9 gaging stations in the Ohio River basin and furnished base data for 30 additional stations.

Financial assistance was also rendered by the Alabama Geological Survey and The Tennessee Power Co.

DIVISION OF WORK.

Data for Allegheny River at Red House, N. Y., were collected and prepared for publication under the direction of C. C. Covert, district engineer, assisted by O. W. Hartwell and E. D. Burchard.

Data for the Ohio River basin, except those for the Allegheny at Red House, N. Y., for stations in Illinois, and for the basin of Tennessee River, were collected and prepared for publication under the direction of A. H. Horton, district engineer, assisted by B. E. Jones, B. J. Peterson, and B. L. Hopkins.

Data for stations in Illinois in Ohio basin were collected and prepared for publication under direction of W. G. Hoyt, district engineer, assisted by H. C. Beckman.

Field data for stations in the Tennessee River basin were collected under the direction of Warren E. Hall, district engineer, assisted by L. J. Hall. The records were prepared for publication under the direction of C. G. Paulsen, district engineer, assisted by B. J. Peterson and B. L. Hopkins.

The records were assembled and reviewed by A. H. Horton, B. E. Jones, and B. J. Peterson, and B. L. Hopkins.

GAGING-STATION RECORDS.

ALLEGHENY RIVER BASIN.

ALLEGHENY RIVER AT RED HOUSE, N. Y.

LOCATION.—At highway bridge in Red House, Cattaraugus County, 5 miles below Salamanca and 13 miles above boundary between New York and Pennsylvania. Conewango Creek, the outlet of Chautauqua Lake, enters the Allegheny in Pennsylvania about 30 miles below the station.

DRAINAGE AREA.—1,640 square miles.

RECORDS AVAILABLE.—September 4, 1903, to September 30, 1917.

GAGE.—Gurley seven-day water-stage recorder on left bank just below highway bridge; installed September 3, 1917; prior to this date, chain gage attached to upstream side of bridge near left end. Gage read and recorder inspected by W. E. Coe.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Coarse gravel; shifting occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.35 feet at 3 p. m. March 12 (discharge, 17,600 second-feet); minimum stage recorded, 3.15 feet October 6, 11, and 12 (discharge, 238 second-feet).

1903–1917: Maximum stage recorded, 12.7 feet March 26, 1913 (discharge, about 40,000 second-feet); minimum stage recorded, 2.7 feet on several days in December, 1908 (discharge about 100 second-feet).

ICE.—Stage-discharge relation somewhat affected by ice.

REGULATION.—Low-water flow may be slightly affected by the operation of several small power plants above Salamanca. A storage reservoir on the divide between Oil Creek, tributary to Allegheny River, and Genesee River, tributary to Lake Ontario, was formerly used for supplying water to the Erie Canal system through the abandoned Genesee River Canal and Genesee River. The reservoir is no longer used for canal purposes, and the water is all turned into Allegheny River through Olean Creek.

ACCURACY.—Stage-discharge relation practically permanent between dates of shifting; affected by ice during most of February. Rating curve well defined between 300 and 900 second-feet and between 6,000 and 13,000 second-feet. Gage read to half tenths twice daily. Operation of water-stage recorder satisfactory September 3–14 and 29–30; daily gage height for this period determined by inspecting recorder graph. Daily discharge ascertained by applying mean daily gage height to rating table. Open-water records good; others fair.

Discharge measurements of Allegheny River at Red House, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec-ft.*
Oct. 25	E. D. Burchard	3.70	695	May 30	E. D. Burchard	7.02	8,130
25	do	3.70	707	June 26	do	4.81	2,470
Feb. 9[a]	do	6.92	883	26	do	4.78	2,410
Mar. 13	do	8.56	13,500	July 30	C. C. Covert	5.00	2,710
13	do	8.20	12,200	Aug. 20	J. W. Moulton	4.24	1,470
29	C. C. Covert	7.80	10,500	30	E. D. Burchard	3.57	634

[a] Measurement made through complete ice cover.

Daily discharge, in second-feet, of Allegheny River at Red House, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	278	368	6,600	1,730	2,000	8,250	7,730	1,890	8,060	3,610	1,890	1,010
2	278	495	6,600	1,730	1,700	6,000	7,400	1,890	7,400	7,080	1,570	1,570
3	278	595	5,410	1,730	1,500	4,090	7,400	2,230	7,400	8,060	1,140	2,040
4	265	545	4,090	1,730	1,400	3,850	7,080	2,060	6,170	6,770	890	1,620
5	265	423	2,980	2,400	1,200	3,850	7,400	2,230	4,300	5,060	775	1,240
6	254	423	2,050	6,600	1,100	3,850	7,400	2,410	4,550	3,610	665	1,010
7	265	405	1,580	7,550	1,000	3,850	7,730	3,610	8,750	3,180	665	902
8	265	423	1,580	4,860	950	3,850	6,470	4,800	12,800	4,300	665	832
9	278	595	1,730	3,850	900	2,590	5,600	4,550	13,200	4,060	665	775
10	265	810	1,440	3,620	850	1,810	4,800	4,550	10,800	4,060	665	698
11	238	990	1,300	2,500	800	3,850	4,800	4,300	11,200	3,830	665	625
12	238	930	1,170	1,890	800	15,000	4,550	4,550	10,200	7,400	775	585
13	345	930	1,110	1,730	750	14,100	4,300	4,060	7,730	7,080	665	546
14	648	1,050	1,110	1,580	700	10,800	4,060	3,830	6,770	6,170	720	498
15	545	1,050	990	1,580	700	9,800	3,390	3,390	5,060	5,060	1,010	.....
16	477	1,050	930	1,580	700	10,200	2,780	2,780	3,610	4,800	2,980	.....
17	423	1,110	850	1,730	700	7,730	2,410	2,060	2,590	4,060	2,780	.....
18	423	1,110	800	1,580	800	5,880	2,410	1,890	2,320	3,830	2,060	.....
19	545	1,170	800	1,510	950	5,060	2,230	1,890	2,060	3,180	1,730	.....
20	1,170	1,050	750	1,440	950	6,170	2,060	2,590	1,570	3,180	1,570	.....
21	1,970	1,050	700	1,440	900	7,400	2,140	4,060	1,420	2,980	1,140	.....
22	1,170	930	700	1,730	950	6,470	2,230	4,060	1,280	2,320	1,140	.....
23	1,170	930	700	2,220	900	6,170	2,060	4,060	1,280	2,410	1,280	.....
24	930	2,310	700	2,140	950	8,060	1,980	4,060	3,180	2,060	1,210	.....
25	755	3,400	750	2,050	1,200	9,450	2,060	4,060	4,060	1,890	1,010	.....
26	595	2,590	800	1,890	7,550	8,750	2,060	4,060	4,300	1,890	950	.....
27	545	2,050	1,000	1,890	12,400	9,800	2,060	4,300	2,980	2,140	775	.....
28	495	2,590	1,440	1,730	10,800	10,800	2,060	6,170	2,780	2,060	615	.....
29	423	4,860	2,400	1,440	.....	11,600	2,060	8,750	2,780	2,410	665	298
30	330	6,300	2,400	1,580	.....	10,200	1,980	8,750	2,780	2,780	720	304
31	390	.....	1,810	2,220	.....	7,080	.....	7,400	.....	2,320	890	.....

NOTE.—Discharge, Dec. 17-27 and Feb. 2-25, estimated because of ice, from discharge measurements, weather records, study of gage-height graph and comparison with similar studies for stations on adjacent streams. Mean discharge Sept. 15-28, estimated 407 second-feet.

Monthly discharge of Allegheny River at Red House, N. Y., for the year ending Sept 30, 1917.

[Drainage area, 1,640 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,970	238	533	0.325	0.37
November	6,300	368	1,420	.866	.97
December	6,600	700	1,850	1.13	1.30
January	7,550	1,440	2,360	1.44	1.66
February	12,400	700	2,000	1.22	1.27
March	15,000	1,810	7,300	4.45	5.13
April	7,730	1,980	4,090	2.49	2.78
May	4,800	1,890	3,910	2.38	2.74
June	13,200	1,280	5,450	3.32	3.70
July	8,060	1,890	3,990	2.43	2.80
August	2,980	615	1,130	.690	.80
September	2,060	370	675	.412	.46
The year	15,000	238	2,900	1.77	23.98

MONONGAHELA RIVER BASIN.

TYGART RIVER NEAR DAILEY, W. VA.

LOCATION.—At Burnt Bridge, on Staunton-Parkersburg pike 1 mile northeast of Dailey, Randolph County, 2 miles south of Beverly, on Western Maryland Railroad. Stalnaker Run enters river on right about 1,000 feet below station and above control.

DRAINAGE AREA.—194 square miles (measured on topographic maps).

RECORDS AVAILABLE.—April 20, 1915, to September 30, 1917.

GAGE.—Vertical staff on face of right abutment of bridge near downstream end; read by Charles W. Chenoweth.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading. Stay wire is used for measurements at high stages. Flow of Stalnaker Run is included.

CHANNEL AND CONTROL.—One channel at all stages, straight for 100 feet above and 1,300 feet below bridge. Right bank high; left bank low; large overflow through meadows at high stages. Stream bed is rocky, but banks are sandy. Control probably permanent. Point of zero flow, September 26, 1917, at gage height, 0.2 foot ± 0.1 foot.

EXTREMES OF STAGE.—Maximum stage recorded during year, 13.4 feet at 7 a. m., March 12; minimum stage, 0.6 foot at 7 a. m., September 6, 1916. Highest known flood reached a stage represented by gage height about 16 feet.

ICE.—Stage-discharge relation affected by ice at times.

ACCURACY.—Stage-discharge relation probably permanent; affected by ice during December, January, and February. Rating curve not yet developed. Gage read twice daily to half-tenths. Records good.

COOPERATION.—Station maintained in cooperation with United States Engineer Corps.

Discharge measurements of Tygart River near Dailey, W. Va., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 6	B. E. Jones	3.47	702
8	....do	4.42	1,120
Sept. 26	Peterson and Hopkins	.75	10.2

Daily gage height, in feet, of Tygart River near Dailey, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.35	1.30	1.62	2.70	3.29	4.78	2.00	2.54	2.82	1.98	1.18	0.63
2	1.98	1.30	1.58	2.46	3.66	3.77	1.99	2.28	2.85	1.46	1.10	.63
3	1.72	1.24	1.50	2.82	3.40	5.84	1.96	2.10	2.82	1.34	1.07	.63
4	1.55	1.16	1.46	3.76	3.36	6.92	1.80	2.00	2.48	1.28	1.06	.63
5	1.45	1.14	1.56	4.34	3.20	5.92	1.85	1.98	2.23	1.18	1.05	.63
6	1.32	1.10	1.68	7.74	3.20	4.20	2.70	1.80	2.12	1.10	1.02	1.05
7	1.28	1.10	1.58	4.36	.....	3.82	3.35	1.75	1.94	1.04	1.00	1.05
8	1.22	1.08	1.65	3.62	.....	7.90	5.18	1.81	1.79	.99	1.03	1.60
9	1.30	1.06	1.59	2.82	.....	5.31	3.62	2.75	1.72	.96	1.04	2.40
10	1.58	1.14	1.58	2.48	3.20	4.04	3.15	3.03	1.98	.95	.96	1.65
11	1.42	1.12	1.52	2.24	3.20	5.52	3.40	2.70	2.05	.90	.92	1.39
12	1.32	1.10	1.58	2.09	.....	13.00	3.80	2.48	1.78	.90	.86	1.18
13	1.25	1.08	1.60	2.20	.....	7.70	3.40	2.29	1.62	.90	.85	1.05
14	1.22	1.10	1.66	2.82	.....	9.48	2.91	2.12	1.54	.90	.85	.97
15	1.20	1.08	1.70	3.24	.....	4.71	2.60	2.08	1.50	.90	.85	.90
16	1.20	1.00	1.70	3.10	.....	3.95	2.27	1.91	1.44	1.00	.82	.88
17	1.40	1.00	1.70	2.55	3.20	3.88	2.05	1.80	1.38	1.12	.82	.82
18	2.18	1.00	1.70	2.38	3.20	4.05	2.00	1.76	1.29	1.55	.74	.80
19	2.05	1.00	1.70	2.18	.....	3.29	1.92	1.72	1.24	1.85	.70	.76
20	2.52	1.00	1.70	1.95	5.55	3.18	1.84	1.67	1.26	1.45	.67	.74
21	2.85	1.00	1.82	3.97	4.62	3.70	1.76	1.64	1.22	1.36	.65	.74
22	2.28	1.00	5.31	10.60	3.38	5.72	1.72	1.57	1.14	1.40	.64	1.52
23	1.92	1.02	4.09	5.06	3.02	3.97	1.64	1.52	1.08	2.08	.62	.94
24	1.74	2.06	2.87	3.48	9.14	4.99	1.60	1.48	1.30	2.05	.68	.81
25	1.61	2.28	2.50	2.86	5.04	4.40	1.60	1.40	1.05	2.92	.72	.78
26	1.52	1.80	2.26	2.45	3.66	3.30	1.60	1.36	1.02	2.32	.75	.75
27	1.51	1.76	2.82	1.75	4.43	2.81	1.58	8.32	1.00	1.96	.71	.75
28	1.51	1.82	6.98	2.19	5.42	2.60	1.59	8.02	1.08	1.67	.65	.75
29	1.51	1.68	5.65	2.20	.....	2.44	2.79	9.12	2.02	1.56	.64	.78
30	1.29	1.62	3.88	2.68	.....	2.26	2.70	5.20	2.32	1.42	.64	.80
31	1.26	.....	2.86	2.60	.....	2.10	.....	3.52	.....	1.34	.63	.....

NOTE.—No gage readings Feb. 7-9, 12-16, and 19. Gage read to top of ice Dec. 14-21, Jan. 15, Feb. 3, 5, 10, 11, 17, 18.

TYGART RIVER AT BELINGTON, W. VA.

LOCATION.—At highway bridge at Belington, Barbour County, one-fourth mile above mouth of Mill Creek.

DRAINAGE AREA.—390 square miles.

RECORDS AVAILABLE.—June 5, 1907, to September 30, 1917.

GAGE.—Chain gage attached to the upstream side of highway bridge to left of center of the river; read by S. A. Campbell. Sea-level elevation of zero of gage, 1,679.89 feet.

DISCHARGE MEASUREMENTS.—Made from upstream side of the bridge.

CHANNEL AND CONTROL.—Practically permanent; straight above and below.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 21.48 feet at 7.30 a. m., March 13 (discharge about 20,000 second-feet); minimum stage, 2.01 feet at 7 a. m., August 29 and September 30 (discharge 14 second-feet).

ICE.—Ice may affect stage-discharge relation for short periods during December, January, and February.

ACCURACY.—Stage-discharge relation practically permanent; apparently little affected by ice during 1917. Daily discharge determined from rating curve well defined between 300 and 4,000 second-feet, fairly well defined between 13 and 300 second-feet; beyond these limits curve is extension. Gage read daily in the morning to hundredths. Daily discharge ascertained by applying mean daily gage heights to rating table. Open-water rating curve used to determine winter discharge, as effect of ice on stage-discharge relation was considered small.

The following discharge measurement was made by Peterson and Hopkins: September 22, 1917—Gage height, 2.16 feet; discharge, 23.8 second-feet.

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	233	79	252	700	1,000	3,370	540	1,000	1,340	205	69	212
2	395	53	212	672	1,340	2,110	440	700	1,130	202	48	38
3	233	53	176	1,830	1,000	2,110	372	515	940	185	72	67
4	169	75	169	2,920	1,000	2,270	350	440	820	110	97	69
5	138	52	226	1,900	760	4,630	230	1,830	565	104	101	39
6	79	30	540	3,640	418	3,010	1,760	760	465	69	82	24
7	93	77	395	3,190	540	1,970	1,480	310	395	43	35	31
8	18	51	310	1,690	540	6,800	1,760	270	330	222	34	310
9	40	56	233	1,060	490	6,690	2,510	540	233	84	40	540
10	89	53	252	820	350	2,830	1,480	1,200	216	69	182	418
11	15	59	233	645	233	2,510	1,270	1,000	672	44	95	192
12	138	49	252	418	270	12,300	1,340	820	233	40	75	15
13	114	82	252	1,060	230	20,000	1,620	672	270	32	37	82
14	91	77	395	645	270	13,400	1,060	540	226	31	31	61
15	82	77	350	1,200	226	4,830	1,060	440	192	22	27	44
16	77	70	350	1,060	350	2,590	1,130	395	188	155	23	42
17	15	86	418	880	290	1,340	465	330	133	155	22	41
18	233	70	372	730	330	1,340	395	270	128	119	23	17
19	330	72	406	565	940	1,690	330	208	84	222	19	23
20	395	73	406	465	1,900	205	350	233	89	590	15	22
21	590	82	440	820	3,190	1,200	290	202	104	182	14	18
22	515	19	940	9,060	1,760	2,670	252	192	99	290	12	24
23	418	53	3,930	7,860	1,060	2,510	222	233	70	131	12	36
24	310	138	2,190	2,040	940	1,900	216	222	67	310	17	46
25	233	730	1,060	1,270	1,000	1,480	133	212	79	158	88	32
26	198	590	700	820	1,000	1,900	212	158	72	490	23	23
27	136	372	590	565	1,410	1,130	195	169	61	1,200	26	16
28	128	270	2,270	515	3,830	1,000	252	7,260	618	233	17	17
29	440	270	6,030	590	.....	730	233	6,360	222	350	14	14
30	440	230	1,620	700	.....	618	219	3,830	202	252	20	14
31	82	.....	1,270	590	.....	540	.....	2,350	.....	82	17	.....

Monthly discharge of Tygart River at Belington, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 390 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	590	15	209	0.536	0.62
November	730	19	135	.346	.39
December	6,030	169	879	2.25	2.59
January	9,060	418	1,640	4.21	4.85
February	3,830	226	952	2.44	2.54
March	20,000	205	3,600	9.23	10.64
April	2,510	133	739	1.89	2.11
May	7,260	158	1,090	2.79	3.22
June	1,340	61	341	.874	.98
July	1,200	22	213	.546	.63
August	182	12	44.7	.115	.13
September	540	14	84.2	.216	.24
The year	20,000	12	831	2.13	28.94

TYGART RIVER AT FETTERMAN, W. VA.

LOCATION.—At highway bridge at Fetterman, Taylor County, three-fourths mile above mouth of Otter Creek.

DRAINAGE AREA.—1,340 square miles.

RECORDS AVAILABLE.—June 3, 1907, to September 30, 1917.

GAGE.—Chain gage attached to downstream side of highway bridge; read by Joseph Weaver. Sea-level elevation of zero of gage, 957.86 feet.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 21.1 feet at 7 a. m. January 22 (discharge about 36,000 second-feet); minimum stage, 3.13 feet August 24 and morning of August 25 (discharge, 54 second-feet).

No records of floods previous to installation of gage; highest stage recorded since station was established, 29.1 feet, in July, 1912.

ICE.—Ice probably affects stage-discharge relation for short periods in severe winters.

ACCURACY.—Stage-discharge relation practically permanent. Affected by ice December 17-20 and February 4–19. Rating curve well defined between 100 and 23,000 second-feet, poorly defined below 100 second-feet; above 23,000 second-feet the curve is an extension. Gage read twice daily to half-tenths. Discharge ascertained by applying mean daily gage heights to rating table. Estimates of daily discharge during periods stage-discharge relation was affected by ice are poor; the records for other periods are good.

The following discharge measurement was made by Peterson and Hopkins: September 21, 1917: Gage height, 3.26 feet; discharge, 79.4 second-feet.

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,440	315	1,030	2,610	2,970	9,120	1,450	2,440	4,670	760	402	380
2	1,450	315	1,030	2,180	2,610	5,240	1,230	2,020	3,530	578	334	665
3	920	285	920	3,720	2,440	6,000	1,030	1,530	3,530	402	303	455
4	665	285	865	8,530	2,000	13,000	920	1,300	2,970	303	244	303
5	495	255	1,300	6,580	1,700	13,200	975	1,160	2,180	244	244	244
6	418	255	2,270	8,140	1,400	9,700	1,770	1,160	2,440	191	216	191
7	367	211	1,930	9,500	1,200	6,780	3,530	1,030	4,480	168	168	148
8	303	200	1,380	5,240	1,000	20,500	7,560	920	2,790	168	148	273
9	267	200	1,160	3,340	900	24,100	7,750	1,160	2,100	273	168	920
10	328	267	1,160	2,440	800	9,310	6,000	2,020	2,180	367	200	1,160
11	395	315	1,100	1,770	700	10,700	3,340	2,180	2,790	303	425	710
12	455	315	1,030	1,380	600	29,400	3,530	1,930	2,180	244	303	479
13	440	315	920	920	600	31,400	3,530	1,770	1,450	191	244	334
14	395	328	810	1,930	600	25,100	2,970	1,530	975	216	191	244
15	328	380	710	3,150	550	17,800	2,270	1,300	810	2,970	148	191
16	1,030	455	620	2,160	550	8,340	1,770	1,100	760	1,610	148	148
17	2,440	418	600	2,270	550	5,620	1,380	920	710	1,100	114	114
18	2,020	380	600	2,610	750	6,000	1,160	865	620	760	114	114
19	2,970	380	600	2,270	1,000	4,860	1,100	760	535	578	90	99
20	2,970	367	600	1,770	4,480	3,720	1,030	665	440	535	72	85
21	2,610	315	1,230	1,930	8,920	3,340	920	620	367	760	62	88
22	1,930	315	10,700	35,800	5,050	4,290	810	578	303	535	62	78
23	1,450	380	12,400	20,500	3,150	6,000	710	665	303	479	62	78
24	1,030	1,300	6,000	7,940	8,140	5,620	710	810	273	665	54	65
25	810	2,270	3,340	4,100	14,500	7,360	620	760	273	760	65	65
26	710	2,270	2,610	2,790	7,160	5,430	620	665	244	1,690	114	65
27	620	1,450	2,970	2,020	5,430	3,720	620	8,530	216	1,850	85	65
28	495	1,160	10,900	1,850	11,100	2,790	665	26,000	255	1,300	72	65
29	455	1,030	16,900	2,270	.....	2,440	1,030	24,600	760	975	72	65
30	418	1,030	8,530	3,720	.....	2,020	2,610	18,600	535	760	80	65
31	367	.....	4,100	3,910	.....	1,690	.....	8,140	.....	578	120	.....

NOTE.—Daily discharge estimated because of ice Dec. 17–20 and Feb. 4–19.

Monthly discharge of Tygart River at Fetterman, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 1,340 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,970	267	1,030	0.769	0.89
November	2,270	200	592	.442	.49
December	16,900	600	3,240	2.42	2.79
January	35,800	920	5,150	3.84	4.43
February	14,500	620	3,240	2.42	2.52
March	31,400	1,690	9,830	7.34	8.46
April	7,750	620	2,120	1.58	1.76
May	26,600	578	3,820	2.85	3.29
June	4,670	216	1,520	1.13	1.26
July	2,970	168	720	.537	.62
August	425	54	165	.123	.14
September	1,160	65	265	.198	.22
The year	35,800	54	2,650	1.98	26.87

MONONGAHELA RIVER AT LOCK 15, HOULT, W. VA.

LOCATION.—At Lock 15, at Hoult, 2½ miles below county highway bridge at Fairmont, Marion County, and 4 miles below mouth of West Fork. Buffalo Creek enters on left three-fourths mile above station.

DRAINAGE AREA.—2,430 square miles (measured on topographic maps).

RECORDS AVAILABLE.—April 7, 1915, to September 30, 1917. Upper and lower gages at Lock 15 have been read under direction of United States Engineer Corps since May 1, 1904.

GAGE.—Upper gage at lock; lower section is set in recess in left lock wall just above upper gate; upper section is 61.5 feet from face of right lock wall, directly opposite lower section. Read by Charles R. Hall, lockmaster.

DISCHARGE MEASUREMENTS.—Made from bridge at Fairmont or by wading on crest of dam. Flow of Buffalo Creek is added to discharge measured at bridge.

CHANNEL AND CONTROL.—One channel at all stages; straight half a mile above and below bridge. Control of station is crest of dam; permanent. Point of zero flow, gage height 6.9 feet, elevation of crest of dam. Leakage through lock and occasional opening of valves of lock may affect stage at which flow would be zero.

EXTREMES OF DISCHARGE.—Maximum stage recorded during 1917, 21.0 feet at 11 a. m. January 22 (discharge, 90,300 second-feet); minimum stage, 6.60 feet at 7 p. m. August 24, 1916, due to opening the valves. Flood of 1888, before dam No. 15 was built, reached a stage represented by gage height about 26 feet.

ICE.—Stage-discharge relation affected by ice when ice in pool above dam forms close to crest of dam.

DIVERSIONS.—Leakage through lock and water used for lockages. See "Accuracy."

REGULATION.—None under normal conditions. Pool No. 15 may be lowered at times in the interest of navigation.

ACCURACY.—Stage-discharge relation permanent except for effect of operations at lock and change in leakage through lock, the change depending on which gates are open; affected by ice December 17–20 and February 7–18. Rating curve well defined to 62,000 second-feet. Gage read twice daily to hundredths, beginning April 7, 1915; prior to that date, at 8 a. m. daily to tenths. Daily discharge ascertained by applying mean daily gage heights to rating table, and adding amount of water used for lockage. Rating table makes allowance based on measurement for leakage through upper gates, for under normal conditions upper gates are closed; gage reader records number of lockages and length of time upper gates are open. Daily discharge April 7, 1915, to September 30, 1917, corrected for effect of lockage and change in leakage when upper gates at lock are open. Data for correcting earlier records nor available.

Discharge August 23, 24, and 25 interpolated because valves at lock were open for considerable periods with little or no flow over the dam. Results considered good except for periods when daily discharge was estimated because of ice or interpolated because of opening valves at lock and lowering pool.

COOPERATION.—Station maintained in cooperation with United States Engineer Corps.

The following measurement of leakage through the lower gates, Lock 15, was made by Peterson and Hopkins:

October 3, 1917: Gage height, 7.10 feet; discharge, 120 second-feet. The lower gates were shut and upper gates open.

Discharge measurements of Monongahela River at Lock 15, Hoult, W. Va., during the year ending Sept. 30, 1917.

[Made by B. E. Jones.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 13	16.4	48,100	Mar. 15	13.94	29,000
Mar. 14	15.92	44,600	15	13.40	25,100

Daily discharge, in second-feet, of Monongahela River at Lock 15, Hoult, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,420	497	1,780	4,180	5,520	15,000	2,140	3,630	7,870	783	649	695
2	2,020	489	1,900	3,420	4,340	11,500	1,790	2,760	7,440	728	449	1,090
3	1,280	434	1,570	5,520	3,420	8,710	1,810	2,090	6,670	505	473	815
4	915	409	1,370	15,600	2,350	18,400	1,500	1,860	5,580	422	400	614
5	684	392	1,280	11,500	1,780	20,800	1,490	1,510	3,620	315	359	424
6	557	369	2,860	14,500	1,570	16,100	6,620	1,670	4,540	279	333	330
7	442	340	3,420	14,000	1,350	11,000	14,500	1,430	10,600	253	251	287
8	394	347	2,360	8,260	1,150	35,200	13,500	1,350	7,020	236	226	305
9	362	305	1,890	5,170	1,050	43,200	10,600	1,500	4,520	265	263	622
10	364	456	1,780	4,180	1,000	20,200	6,680	2,190	6,660	460	340	1,580
11	410	564	1,690	3,000	900	17,800	5,220	2,660	7,030	540	583	1,090
12	452	508	1,570	2,230	900	38,400	4,560	2,400	5,030	339	519	671
13	533	464	1,570	1,680	850	46,500	4,560	2,150	3,280	304	358	468
14	497	457	1,280	2,600	800	41,600	3,910	1,760	2,010	306	292	380
15	444	530	1,050	5,520	800	26,600	3,190	1,640	1,500	3,870	263	304
16	512	486	830	5,000	800	12,500	2,430	1,350	1,380	5,200	225	246
17	3,720	564	800	4,020	900	9,630	1,860	1,200	1,190	2,880	193	204
18	4,020	558	800	4,020	1,100	10,600	1,750	999	930	1,690	182	208
19	5,520	551	800	3,280	2,350	8,270	1,650	792	761	1,370	160	184
20	7,820	486	800	2,230	4,340	5,910	1,550	672	583	1,480	148	172
21	5,890	478	1,370	2,470	7,820	5,010	1,340	676	538	1,400	114	140
22	3,720	464	18,400	80,800	6,620	5,180	1,150	631	468	1,030	105	141
23	2,620	464	20,800	35,200	4,660	7,820	1,010	714	428	1,100	110	113
24	1,780	2,000	10,100	12,500	11,500	9,640	920	971	382	914	113	120
25	1,370	4,180	5,520	6,280	20,200	11,500	845	953	321	1,030	116	100
26	1,050	3,870	4,020	4,700	11,000	8,720	945	820	336	1,460	119	118
27	866	2,600	7,000	3,200	7,820	5,530	967	8,260	268	3,220	137	77
28	734	1,890	19,600	3,190	15,600	4,500	1,050	48,200	243	2,670	142	162
29	653	1,570	28,000	4,850	.....	3,760	1,600	40,800	692	2,010	140	133
30	560	1,580	13,500	8,280	.....	3,000	2,790	27,300	945	1,450	154	110
31	513	.....	6,250	7,000	.....	2,480	.....	12,000	.....	855	157	.....

NOTE.—Daily discharge estimated because of ice Dec. 17–20, Feb. 7–18.

Monthly discharge of Monongahela River at Lock 15, Hoult, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 2,430 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	7,820	362	1,750	0.720	0.83
November	4,180	305	943	.388	.43
December	28,000	.....	5,350	2.20	2.54
January	80,800	1,680	9,300	3.83	4.42
February	20,200	.....	4,370	1.80	1.87
March	46,500	2,480	15,600	6.42	7.40
April	14,500	845	3,460	1.42	1.58
May	48,200	631	5,710	2.35	2.71
June	10,600	243	3,090	1.27	1.42
July	5,200	236	1,270	.523	.60
August	649	105	260	.107	.12
September	1,580	77	397	.163	.18
The year	80,800	77	4,320	1.78	24.10

MIDDLE FORK AT MIDVALE, W. VA.

LOCATION.—About one-third mile above Midvale railroad station on Coal & Coke Railroad, two-thirds mile below post office at Ellamore, Randolph County. Laurel Creek enters river on right about 1¾ miles above station.

DRAINAGE AREA.—122 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 3, 1915, to September 30, 1917.

GAGE.—Vertical and inclined staff on right bank; read by Anna Riley.

DISCHARGE MEASUREMENTS.—Made from cable or by wading short distance below gage.

CHANNEL AND CONTROL.—One channel at all stages; straight 300 feet above and 100 feet below cable section. Both banks are high and in most places wooded. Control probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.67 feet at 7 a. m. March 12, 1917 (discharge, about 4,590 second-feet); minimum stage, 1.12 feet at 7 a. m. August 29, 1917 (discharge, 2.6 second-feet). Floods of 1888 and 1912 reached gage height of about 18 feet.

ICE.—Stage-discharge relation affected by ice for short periods in severe winters.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice to slight extent December 19–21, January 12–15, and considerably February 2–17. Rating curve well defined below 1,600 second-feet; above this point, curve is an extension. Gage read twice daily to hundredths. Discharge ascertained by applying mean daily gage heights to rating table. Daily discharge for periods in December and January affected by ice are probably in error to a small extent. Estimated mean flow February 2–17 may be considerably in error; records for rest year are excellent.

COOPERATION.—Station maintained in cooperation with United States Engineer Corps.

The following discharge measurements were made during the year by B. E. Jones and by Peterson and Hopkins, respectively:

April 7, 1917: Gage height, 2.97 feet; discharge, 261 second-feet.

September 27, 1917: Gage height, 1.22 feet; discharge, 5.1 second-feet.

Daily discharge, in second-feet, of Middle Fork at Midvale, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	138	44	112	322	410	784	178	308	474	36	25	10
2	104	36	101	220	365	474	168	232	442	25	23	11
3	71	34	94	474		1,020	158	138	322	20	18	8.2
4	57	33	92	658		1,460	120	168	158	16	15	7.4
5	46	31	158	698		1,290	129	168	198	14	13	5.8
6	40	32	220	1,510		784	268	129	188	13	11	5.8
7	35	27	178	828		618	294	120	198	14	9	38
8	34	28	158	380		2,960	658	138	168	30	35	178
9	38	28	148	365		1,630	544	380	148	21	21	120
10	86	38	120	268	290	828	474	294	148	20	31	62
11	67	44	120	178		2,250	658	281	148	20	27	42
12	55	36	120	158		4,000	658	244	112	18	20	30
13	50	39	104	198		2,380	580	188	92	17	13	20
14	49	43	95	508		2,380	380	178	83	14	12	18
15	46	46	98	580		1,290	294	158	89	18	10	17
16	61	49	112	544		740	220	138	81	70	9	11
17	96	46	112	442		658	178	120	65	54	9	10
18	104	49	112	350	442	580	168	104	57	44	8.2	8.2
19	148	48	112	220	658	474	148	98	47	44	6.6	6.6
20	256	46	112	138	1,760	380	129	89	60	36	5.0	6.6
21	158	42	256	1,510	874	508	120	89	52	40	3.8	6.6
22	129	40	1,340	3,740	544	922	112	78	42	158	3.5	10
23	104	48	698	1,180	442	698	94	138	36	104	4.1	22
24	86	268	410	740	2,070	740	95	120	33	88	5.0	13
25	74	268	322	410	1,120	740	86	92	33	72	9.6	9
26	67	198	256	308	658	410	86	83	28	112	6.2	7.8
27	58	158	268	148	1,240	410	81	3,020	25	94	4.4	6.6
28	48	120	2,000	232	1,120	336	104	2,250	46	75	3.2	7.4
29	46	112	1,070	268	.....	294	178	2,830	42	50	2.6	14
30	44	120	618	380	.....	244	410	1,400	46	36	3.2	13
31	40	.....	365	336	.....	209	.....	698	.....	33	5.8	.....

NOTE.—Daily discharge Feb. 3–17 estimated because of ice from study of climatic data, gage readings, and gage observer's notes. Braced figures show mean discharge for period included.

Monthly discharge of Middle Fork at Midvale, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 122 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	256	34	78.5	0.643	0.74
November	268	27	71.7	.588	.66
December	2,000	92	325	2.66	3.07
January	3,740	138	590	*4.84	5.58
February	2,070	.....	573	4.70	4.89
March	4,000	209	1,050	8.61	9.93
April	658	81	259	2.12	2.36
May	3,020	78	467	3.83	4.42
June	474	25	122	1.00	1.12
July	158	13	45.4	.372	.43
August	35	2.6	12.0	.098	.11
September	178	5.8	24.2	.198	.22
The year	4,000	2.6	301	2.47	33.53

BUCKHANNON RIVER AT HALL, W. VA.

LOCATION.—About 500 feet below ruins of an old milldam, one-fourth mile above post office and county highway bridge at Hall, Barbour County, 1 mile from Baltimore & Ohio Railroad station. Pecks Run enters river on left 1 mile below station.

DRAINAGE AREA.—277 square miles (measured on topographic maps).

RECORDS AVAILABLE.—April 15, 1915, to September 30, 1917. June 7, 1907, to May 25, 1909, chain gage at county highway bridge.

GAGE.—Vertical and inclined staff on right bank; read by James Newcomb.

DISCHARGE MEASUREMENTS.—Made from county highway bridge. Stay wire used for measurements at high stages.

CHANNEL AND CONTROL.—Gage is about midway between beginning and end of rapids, having approximately 10 feet fall. Bed of stream in rapids composed of boulders, rocks, and gravel; should be fairly permanent. Both banks are high and wooded and are not overflowed except into an old mill race on left bank.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11.70 feet at 5 p. m. March 12, 1917 (discharge, 9,630 second-feet); minimum stage, 1.70 feet at 6 a. m. September 27, 1917 (discharge, 8.5 second-feet).

Highest flood known reported to have reached a gage height of about 14 feet in 1888.

ICE.—Stage-discharge relation affected by ice during severe winters.

DIVERSIONS.—No water diverted above station except small quantity which may flow around gage in abandoned mill race above ordinary low stages and which is included in flow measured at county highway bridge.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice February 4–15. Rating curve well defined between 40 and 4,500 second-feet; extended beyond these limits. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage heights to rating table. Record excellent except for period February 4–15, for which daily discharge was estimated because of ice.

COOPERATION.—Station maintained in cooperation with United States Engineer Corps.

The following discharge measurement was made by Peterson and Hopkins:

September 28, 1917: Gage height, 1.77 feet; discharge, 11.7 second-feet.

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	770	104	403	675	675	2,180	403	426	970	98	138	69
2	450	101	338	580	770	1,500	352	367	1,020	88	104	104
3	297	93	297	970	490	1,840	311	297	1,170	69	78	61
4	218	88	265	2,180	460	3,500	277	265	820	50	65	53
5	175	83	490	1,500	430	3,400	249	260	580	37	51	40
6	124	73	920	2,620	400	2,180	474	265	474	34	40	29
7	104	71	580	2,180	370	1,610	1,020	228	450	26	69	50
8	98	63	450	1,220	340	6,000	2,180	218	403	37	93	180
9	88	69	403	770	270	6,220	1,440	284	338	26	78	338
10	114	73	396	675	220	2,620	1,020	418	490	19	71	213
11	204	88	331	490	160	1,960	870	410	535	53	83	114
12	180	104	311	381	130	8,640	920	403	410	55	57	78
13	138	93	311	304	120	8,420	920	352	304	51	45	55
14	117	93	297	675	120	5,580	770	318	213	40	36	43
15	111	101	208	1,070	120	3,500	580	284	208	63	36	43
16	150	117	166	920	138	1,610	458	249	218	270	31	37
17	374	117	170	770	208	1,390	374	213	180	244	23	26
18	403	117	218	628	396	1,500	331	189	138	244	22	22
19	535	101	338	490	722	1,120	297	175	124	442	22	24
20	675	98	270	426	1,170	870	265	158	96	284	19	26
21	535	96	628	628	1,960	770	228	142	83	194	15	19
22	450	96	3,220	7,540	1,170	1,390	204	166	73	134	12	13
23	338	98	3,220	4,870	770	1,340	184	199	65	374	11	15
24	270	410	1,390	1,500	3,020	1,390	166	249	57	442	31	15
25	228	920	870	920	3,500	1,720	158	208	51	1,220	30	11
26	199	628	675	675	1,500	1,170	162	175	47	970	19	10
27	180	426	580	490	1,500	870	154	3,220	86	675	12	8
28	154	345	2,400	490	2,720	770	180	5,790	104	580	12	11
29	130	297	4,370	628	.....	628	244	6,330	96	410	12	13
30	111	352	1,720	870	.....	535	490	4,470	104	270	13	18
31	111	.....	870	770	.....	474	.....	1,720	.....	189	17	.....

NOTE.—Daily discharge Feb. 4–15 estimated, because of ice from study of gage readings and climatic data.

Monthly discharge of Buckhannon River at Hall, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 277 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	770	88	259	0.935	1.08
November	920	63	184	.664	.74
December	4,370	166	874	3.16	3.64
January	7,540	304	1,250	4.51	5.20
February	3,500	120	852	3.08	3.21
March	8,640	474	2,470	8.92	10.28
April	2,180	154	523	1.89	2.11
May	6,330	142	918	3.31	3.82
June	1,170	47	330	1.19	1.33
July	1,220	19	248	.895	1.03
August	138	11	43.4	1.57	.18
September	338	8	57.9	.209	.23
The year	8,640	8	671	2.42	32.85

WEST FORK AT BUTCHERVILLE, W. VA.

LOCATION.—At Weston & Clarksburg Electric Railway Co.'s trolley bridge, one-fourth mile upstream from Butcherville, Lewis County, about 3 miles north of Weston. Freemans Creek enters river on left about a mile below station.

DRAINAGE AREA.—181 square miles (measured on topographic maps).

RECORDS AVAILABLE.—April 8, 1915, to September 30, 1917.

GAGE.—Chain gage fastened to upstream side of trolley bridge near center of span; read by Bess Ervin.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—One channel except at extreme high stages, when river overflows right bank and a little water passes through two small culverts in trolley embankment; straight for 500 feet above and curved for 1,000 feet below station. Stream bed is sand and gravel, but is solid rock at riffle below gage. Control probably permanent. Growth of aquatic plants may cause backwater at gage during summer months.

EXTREMES OF STAGE.—Maximum stage recorded during year, 20.01 feet at 8.30 a. m. March 12, 1917; minimum stage, 3.52 feet at 9.30 a. m. August 22, 1917.

Highest flood known is reported to have reached a stage represented by gage height of about 27 feet in 1888. Dam since washed out may have increased height of this flood.

ICE.—Stage-discharge relation affected by ice in severe winters.

ACCURACY.—Stage-discharge relation probably permanent, probably affected by ice in December and February. Measurements of flow do not indicate serious backwater from growth of aquatic plants. Gage read twice daily to hundredths. Records excellent. Data inadequate for determining daily discharge.

COOPERATION.—Station maintained in cooperation with United States Engineer Corps.

Discharge measurements of West Fork at Butcherville, W. Va., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 23	B. J. Peterson	7.52	706
Mar. 13	B. E. Jones	9.59	1,610
Sept. 29	Peterson and Hopkins	3.80	5.4

Daily gage height, in feet, of West Fork at Butcherville, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.46	4.32	5.60	5.50	6.19	8.75	5.07	4.87	6.10	4.26	4.30	6.07
2	5.00	4.30	5.46	5.48	5.62	7.90	5.01	4.71	7.61	4.18	4.16	5.75
3	4.60	4.28	5.14	10.43	5.19	9.45	4.93	4.67	7.81	4.10	4.06	5.49
4	4.48	4.26	5.03	8.35	5.22	11.72	4.79	4.66	6.13	4.00	3.96	5.47
5	4.38	4.21	6.36	7.44	5.16	12.60	4.85	4.76	5.55	3.94	3.86	5.37
6	4.30	4.18	7.30	8.86	5.02	8.55	10.38	4.66	5.38	3.89	3.77	5.23
7	4.21	4.14	5.96	7.06	4.97	8.91	10.58	4.62	7.24	3.85	4.00	5.27
8	4.15	4.13	5.44	6.08	.....	17.29	8.53	4.58	5.59	3.92	4.72	5.51
9	4.18	4.14	5.33	5.66	5.45	13.06	6.66	4.60	6.20	4.00	4.70	5.50
10	4.44	4.36	5.39	5.46	5.09	7.79	5.95	4.66	7.45	4.06	4.54	4.99
11	4.92	4.50	5.29	5.26	4.93	7.83	5.48	4.68	7.03	4.16	4.37	4.71
12	4.60	4.66	5.28	4.92	4.71	19.16	5.33	4.64	6.05	4.20	4.19	4.49
13	4.43	4.52	5.19	5.38	4.57	10.34	5.17	4.58	5.37	4.12	4.05	4.24
14	4.34	4.40	4.99	7.64	4.65	11.00	5.03	4.52	5.17	4.04	3.93	4.11
15	4.32	4.48	4.69	6.74	4.76	8.14	4.90	4.47	5.07	4.27	3.81	4.01
16	4.79	4.54	4.89	6.25	4.81	6.52	4.77	4.46	5.45	4.51	3.73	3.90
17	6.51	4.58	4.76	5.76	4.95	7.58	4.67	4.34	4.73	4.92	3.66	3.77
18	5.20	4.48	5.00	5.62	6.53	7.50	4.74	4.28	4.54	5.81	3.61	3.71
19	8.23	4.38	5.03	5.45	6.83	7.33	4.73	4.26	4.47	5.74	3.57	3.69
20	8.34	4.34	5.03	5.35	6.59	6.00	4.67	4.22	4.35	5.14	3.53	3.67
21	6.90	4.35	9.49	6.76	6.01	5.95	4.57	4.20	4.23	4.78	3.53	3.65
22	6.34	4.27	11.74	19.90	5.77	6.40	4.49	4.20	4.18	4.60	3.53	3.61
23	5.36	4.59	8.49	8.29	5.93	6.55	4.55	4.52	4.18	4.42	3.71	3.57
24	5.07	6.90	6.23	6.42	12.25	8.37	4.47	4.55	4.17	4.33	4.10	3.55
25	4.86	6.42	5.93	5.57	7.81	7.14	4.47	4.45	4.08	4.26	4.19	3.54
26	4.80	5.64	5.57	5.53	6.55	6.21	4.51	4.40	4.02	4.69	4.09	3.53
27	4.64	5.22	5.85	5.26	8.29	5.94	4.47	15.02	4.00	5.68	4.01	3.53
28	4.50	5.00	16.71	6.23	10.53	6.02	4.75	16.85	4.27	5.59	3.87	3.65
29	4.44	4.94	11.61	6.83	.....	5.66	5.11	13.45	4.44	4.90	3.83	3.73
30	4.40	5.64	6.62	7.27	.....	5.45	5.27	8.12	4.38	4.63	4.32	3.84
31	4.36	.....	5.50	6.57	.....	5.21	.....	6.19	.....	4.43	6.26	.....

NOTE.—Gage heights Dec. 16, Feb. 5, 6, 7 to top of ice.

WEST FORK AT ENTERPRISE, W. VA.

LOCATION.—At highway bridge at Enterprise, Harrison County, three-fourths mile above mouth of Bingamon Creek.

DRAINAGE AREA.—750 square miles.

RECORDS AVAILABLE.—June 2, 1907, to September 30, 1917.

GAGE.—Chain gage attached to bridge; read by C. M. Tetrick. Sea-level elevation of zero of gage, 869.91 feet.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Channel at measuring section broken by one pier; smooth rock bottom. Straight above and below. Control practically permanent.

EXTREMES OF STAGE.—Maximum stage recorded during year, 25.35 feet at 8 a. m. January 22, 1917; minimum stage, 0.7 foot July 2, 1917.

1907–1917: Maximum stage recorded, January 22, 1917. Flood of 1888 reached stage represented by about 33 feet referred to datum of present gage.

ICE.—Stage-discharge relation may be affected by ice for short periods during December, January, and February.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice the first half of February and parts of December and January. A measurement made October 2, 1917, indicates a marked change in the rating curve or that the operation of the mill at the dam at Worthington about 3 miles below the gage affects the gage readings. The gates of the mill dam were open December 5–12, 1908, in order to drain the pond, but no effect was apparent on the gage readings, which may have been due to unreliable gage readings. The low-water discharge, as published in previous Water-Supply Papers, for this station may at times be in error; this condition should be observed in using the data. Gage read once daily to half-tenths. Comparison with the flow at other gaging stations in the Monongahela basin apparently indicates gage readings are unreliable at times.

The following discharge measurement was made by Peterson and Hopkins: October 2, 1917: Gage height, 1.08 feet; discharge, 10.3 second-feet.

Daily gage height, in feet, of West Fork at Enterprise, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.90	2.45	3.45	3.70	4.70	7.20	.....	2.75	4.40	.....	1.75	1.85
2	2.65	1.95	3.25	3.50	4.65	6.70	2.90	2.60	4.90	0.70	1.65	.....
3	2.25	1.92	2.20	4.25	4.50	5.95	2.75	2.55	.....	.90	1.55	2.20
4	2.15	1.85	2.75	9.30	4.55	6.60	2.50	2.25	4.55	1.15	1.45	2.70
5	2.25	2.10	3.30	7.75	4.60	6.85	2.60	2.40	3.35	1.40	.....	3.00
6	2.65	2.45	5.35	7.40	4.55	7.20	7.65	.....	3.20	1.30	1.35	2.80
7	2.50	1.90	4.70	.....	4.45	6.40	10.15	2.65	3.90	1.25	1.30	2.30
8	2.60	1.95	4.30	4.80	4.25	14.55	.....	2.35	5.00	.....	1.25	2.15
9	2.95	1.90	3.80	3.75	3.95	10.00	8.25	2.20	4.30	1.30	1.55	.....
10	2.35	2.35	3.45	3.60	3.60	7.80	3.65	2.15	.....	1.60	1.60	2.00
11	2.15	2.30	3.05	3.35	3.35	.....	3.55	2.05	6.50	1.55	1.75	1.80
12	2.10	2.20	2.90	3.05	3.00	9.60	3.40	2.05	4.60	1.45	.....	1.60
13	2.15	2.45	2.80	2.70	.....	11.85	3.20	.....	3.50	1.45	1.65	1.50
14	2.45	2.35	2.80	.....	.....	12.75	2.90	2.00	2.90	1.50	1.45	1.35
15	2.25	2.30	2.70	3.75	.....	9.15	.....	1.95	2.80	6.85	1.35	1.20
16	2.95	2.25	2.75	4.05	3.00	5.90	2.50	1.95	2.50	5.10	1.25	.....
17	4.10	2.20	2.85	6.35	2.95	5.10	2.45	1.90	.....	3.65	1.35	1.10
18	4.60	2.15	2.95	7.30	3.30	.....	2.40	1.85	2.15	2.85	1.25	1.05
19	6.65	2.20	3.00	7.15	3.70	4.55	2.35	1.85	2.00	2.65	.....	1.05
20	6.30	2.15	2.90	6.40	5.05	4.30	2.30	.....	1.90	2.65	1.10	1.00
21	6.10	2.15	3.15	6.80	4.55	4.15	2.15	2.00	1.90	2.55	1.05	1.10
22	4.10	2.05	10.00	25.35	4.00	3.95	.....	1.90	1.80	.....	1.00	1.05
23	3.35	2.05	9.10	11.80	3.35	4.10	2.10	1.85	1.80	2.35	1.10	.....
24	2.95	4.80	6.00	5.45	6.35	4.05	2.20	1.95	.....	2.05	1.45	.95
25	2.80	5.05	4.40	5.05	7.05	.....	2.05	1.90	1.70	1.85	1.30	.95
26	2.60	3.95	3.70	4.65	5.05	3.90	2.05	1.95	1.60	2.45	.....	1.00
27	2.35	4.05	4.20	4.95	5.35	3.75	2.10	9.55	1.50	2.85	1.10	.95
28	2.30	4.40	10.45	4.75	5.75	3.70	2.60	14.80	1.65	2.65	1.00	1.00
29	2.20	4.85	8.05	5.40	.....	3.60	.....	9.50	2.65	.....	.95	1.05
30	2.15	4.30	6.10	5.25	.....	3.45	2.95	7.85	2.20	2.35	1.10	.....
31	2.02	.....	4.55	4.95	.....	3.20	.....	4.80	.....	2.10	1.90	.....

NOTE.—Gage readings probably affected by backwater from ice portions of December, January, and February 1–15.

ELK CREEK NEAR CLARKSBURG, W. VA.

LOCATION.—At a footbridge near Clarksburg, Harrison County, 300 feet above Turkey Run and about 6 miles above mouth of creek.

DRAINAGE AREA.—107 square miles (determined by Pittsburgh Flood Commission).

RECORDS AVAILABLE.—October 11, 1910, to September 30, 1917.

GAGE.—Wooden staff gage fastened to a tree near right abutment of footbridge; read by E. H. Smith. Sea-level elevation of zero of gage, 955.01 feet.

DISCHARGE MEASUREMENTS.—Made from footbridge or by wading at section about 200 feet below bridge.

CHANNEL AND CONTROL.—Rocky and practically permanent; banks high and not subject to overflow. Point of zero flow, about gage height 0.9 foot.

EXTREMES OF STAGE.—Maximum stage recorded during year, 11.26 feet at 10 a. m. January 22, 1917; minimum stage recorded, 1.11 feet at 10 a. m. September 24–25. The flood of July, 1912, reached stage represented by 15 feet on the present gage.

ICE.—Stage-discharge relation may be affected by ice for short periods in December, January, and February.

ACCURACY.—Stage-discharge relation practically permanent, probably affected by ice a portion of February, 1917. Gage read daily in the morning to half-tenths. Records good. Data inadequate for determination of daily discharge.

The following discharge measurements were made by B. J. Peterson and B. E. Jones, respectively:

January 23, 1917: Gage height, 3.30 feet; discharge, 500 second-feet.

March 14, 1917: Gage height, 4.21 feet; discharge, 1,010 second-feet.

Daily gage height, in feet, of Elk Creek near Clarksburg, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.01	1.66	2.11	2.36	2.46	3.56	1.96	1.91	3.76	1.66	1.51	2.56
2	1.76	1.66	2.01	2.26	2.36	3.36	1.96	1.86	2.86	1.56	1.46	1.86
3	1.66	1.66	1.96	4.36	2.36	2.96	1.91	1.76	2.66	1.51	1.56	1.76
4	1.61	1.66	1.91	3.46	2.16	3.56	1.86	1.76	2.46	1.46	1.46	1.66
5	1.56	1.61	2.01	2.96	2.06	4.66	1.91	1.76	2.26	1.41	1.46	1.56
6	1.56	1.61	2.56	2.76	2.01	3.36	4.06	1.76	3.26	1.41	1.41	1.56
7	1.51	1.56	2.26	2.56	1.96	2.96	3.86	1.71	2.96	1.36	1.36	1.56
8	1.46	1.56	2.56	2.46	1.96	7.26	3.36	1.86	2.71	1.36	1.76	1.56
9	1.46	1.51	2.36	2.36	1.91	4.76	2.86	1.81	2.86	1.36	1.66	1.71
10	1.66	1.86	2.16	2.26	1.91	4.36	2.46	1.76	3.16	1.56	1.76	1.66
11	1.61	1.81	2.06	2.06	1.86	4.56	2.26	1.71	3.36	1.46	1.61	1.56
12	1.56	1.66	2.06	1.96	1.86	4.96	2.16	1.71	2.66	1.46	1.51	1.51
13	1.56	1.66	2.01	1.86	1.86	3.46	2.06	1.66	2.36	1.46	1.46	1.46
14	1.61	1.66	1.96	4.06	1.86	4.96	1.96	1.66	2.16	1.46	1.41	1.41
15	1.56	1.86	1.91	3.86	1.86	3.36	1.91	1.61	2.06	3.36	1.36	1.36
16	2.71	1.81	1.86	3.56	1.81	2.76	1.86	1.61	2.06	2.96	1.36	1.36
17	3.76	1.76	1.86	3.36	1.81	3.06	1.81	1.56	1.86	2.06	1.31	1.31
18	2.66	1.71	1.81	2.86	1.86	2.86	1.86	1.56	1.81	1.86	1.26	1.26
19	4.56	1.66	1.81	2.36	2.36	2.66	1.86	1.51	1.76	1.96	1.26	1.26
20	3.76	1.66	1.76	1.86	2.56	2.46	1.81	1.51	1.71	1.76	1.26	1.26
21	2.91	1.61	3.86	1.86	2.46	2.36	1.81	1.46	1.66	1.91	1.26	1.26
22	2.46	1.61	6.26	11.26	2.26	2.26	1.76	1.46	1.61	1.86	1.26	1.21
23	2.16	1.56	3.36	3.26	2.26	2.26	1.71	1.66	1.56	1.66	1.36	1.16
24	1.96	2.96	2.56	2.76	3.76	3.56	1.66	1.71	1.56	1.61	1.31	1.11
25	1.86	2.76	2.36	2.56	2.96	2.96	1.66	1.66	1.56	2.66	1.26	1.11
26	1.81	2.36	2.26	2.36	2.56	2.56	1.61	1.61	1.56	1.86	1.26	1.16
27	1.76	2.06	2.71	2.16	2.96	2.36	1.61	5.56	1.56	2.16	1.21	1.16
28	1.76	1.86	5.96	2.06	4.46	2.36	1.76	7.46	1.51	2.11	1.16	1.26
29	1.71	1.96	3.36	2.56	.....	2.26	2.06	5.06	1.96	1.81	1.16	1.26
30	1.66	2.16	2.86	2.96	.....	2.06	1.96	3.16	1.76	1.66	1.31	1.21
31	1.66	.....	2.56	2.66	.....	2.01	.....	3.56	.....	1.61	1.36	.....

BUFFALO CREEK AT BARRACKVILLE, W. VA.

LOCATION.—At steel highway bridge about 1,000 feet above covered highway bridge at Barrackville, Marion County, 2¾ miles northwest of Fairmont. Finch's Run enters on left about 1,600 feet below station.

DRAINAGE AREA.—115 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 8, 1915, to September 30, 1917; June 3, 1907, to December 31, 1908.

GAGE.—Chain gage fastened to downstream hand rail of bridge; read by E. M. Beall.

DISCHARGE MEASUREMENTS.—Made from highway bridge or by wading. Stay wire is used for measurements at high stages.

CHANNEL AND CONTROL.—One channel at all stages; straight about 100 feet above and below station. Both banks high. Stream bed rocky, some gravel. Control changes during severe floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 14.22 feet at 7.45 a. m. January 22, 1917 (discharge about 6,800 second-feet); minimum discharge, 0.4 second-foot Sept. 22–30.

Flood of July, 1912, reached a stage represented by about 16 feet on present gage.

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—Stage-discharge relation not permanent, changed during the flood of January 22, 1917. Rating curve used October 1, 1916, to January 21, 1917, and curve used January 22 to September 30, 1917, well defined below 1,600 second-feet; above 1,600 second-feet, the curve is an extension. Gage read twice daily to hundredths except Sunday, when gage is read once. Daily discharge ascertained by applying mean daily gage heights to rating table except as follows: October 27, December 3, 4, 5, July 16, discharge interpolated because of missing gage readings. December 15–20, and February 4–19, estimated because of ice. Records good except those interpolated or estimated, which are poor.

COOPERATION.—Station maintained in cooperation with United States Engineer Corps.

The following discharge measurement was made by B. J. Peterson and B. L. Hopkins: October 3, 1917: Gage height, 0.67 foot; discharge, 0.55 second-foot.

Daily discharge, in second-feet, of Buffalo Creek at Barrackville, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.9	4.1	47	58	222	176	48	87	1,420	8.0	7.2	330
2	4.6	3.8	42	47	132	184	48	73	1,260	4.5	4.6	49
3	3.8	3.8	40	720	76	167	47	59	258	3.8	4.0	40
4	3.5	5.4	38	672		184	37	54	159	3.1	3.4	22
5	3.0	4.3	36	873		271	108	61	98	2.8	3.1	16
6	2.5	3.8	34	821		193	1,260	49	1,530	2.1	2.9	5.4
7	2.0	3.8	27	409		271	873	42	1,090	2.1	2.6	6.5
8	1.5	3.4	23	143		2,370	426	49	345	2.2	2.1	5.4
9	1.1	3.3	21	108		821	212	48	330	2.8	2.1	23
10	1.6	4.6	26	79		582	143	43	720	4.1	1.7	15
11	1.4	34	21	35	30	1,360	102	37	315	12.0	1.6	7.2
12	1.1	26	28	31		873	88	36	151	6.5	1.6	4.6
13	1.0	14	34	31		1,750	76	32	95	4.5	2.1	4.0
14	.9	17	30	30		1,310	64	31	44	8.0	1.7	3.1
15	1.0	26		114		481	59	28	50	28	1.6	2.6
16	2.2	34		159		234	47	24	42	75	2.2	2.1
17	8.0	30	20	102		672	40	22	30	130	1.7	1.7
18	76	23		79		360	37	20	26	111	1.1	1.1
19	167	19		64		176	42	18	20	81	1.4	1.1
20	212	15		53	95	143	43	15	17	40	1.7	1.1
21	184	12	58	77	84	132	37	12	14	24	1.4	.6
22	132	8.0	770	3,750	72	167	34	9.8	11	74	1.1	.4
23	42	20	212	409	90	184	30	36	8.9	99	3.3	.4
24	28	330	159	184	1,260	770	28	40	5.9	43	60	.4
25	23	392	123	135	481	540	35	24	4.8	23	28	.4
26	19	481	81	84	167	167	47	19	4.5	18	13	.4
27	15	167	2,250	52	176	123	64	286	4.1	47	5.0	.4
28	9.8	42	1,750	54	222	105	79	2,080	4.0	37	4.0	.4
29	7.2	40	444	345	.....	87	108	1,200	4.6	27	2.9	.4
30	4.3	47	167	582	.....	64	120	300	14.0	18	2.1	.4
31	3.1	.....	105	271	.....	52	.....	143	.....	12	2.6	.....

Monthly discharge of Buffalo Creek at Barrackville, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 115 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	212	0.9	31.2	0.271	0.31
November	481	3.3	60.6	.527	.59
December	2,250		216	1.88	2.17
January	3,750	30	341	2.97	3.42
February	1,260		127	1.10	1.14
March	2,370	52	483	4.20	4.84
April	1,260	28	146	1.27	1.42
May	2,080	9.8	161	1.40	1.61
June	1,530	4.0	269	2.34	2.61
July	130	2.1	30.8	.268	.31
August	60	1.1	5.61	.049	.06
September	330	.4	18.2	.158	.18
The year	3,750	.4	158	1.37	18.66

CHEAT RIVER NEAR PARSONS, W. VA.

LOCATION.—At Moss highway bridge, 2 miles north of Parsons, Tucker County, 2 miles below junction of Shavers Fork, and 5 miles below junction of Dry Fork and Blackwater River.

DRAINAGE AREA.—716 square miles (determined by Hydroelectric Co. of West Virginia).

RECORDS AVAILABLE.—January 1, 1913, to September 30, 1917.

GAGE.—Chain gage near center of bridge on downstream guard rail; read by Mrs. E. C. Linger.

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

CHANNEL AND CONTROL.—Rocky and probably permanent. Water is swift and turbulent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 17.98 feet at 7 a. m. March 12 (discharge about 40,000 second-feet); minimum stage, 1.52 feet at 7 a. m. November 1 (discharge, 29 second-feet).

ICE.—Stage-discharge relation affected by ice during severe winters.

REGULATION.—Some regulation above at various pulp mills and sawmills. Effect probably compensating, so that two gage readings per day give correct basis for determining discharge.

ACCURACY.—Stage-discharge relation practically permanent; probably affected by ice for short periods in December, January and February. Rating curve fairly well defined between 65 and 5,500 second-feet. Beyond these limits the curve is an extension and may be in considerable error. Gage read twice daily to quarter tenths. Daily discharge ascertained by applying mean daily gage heights to rating table. Discharge December 10–22, 29–31, January 12–20, and February 2–17, may be somewhat large due to not correcting discharge for effect of ice on gage readings. Records fair except for those periods effected by ice, which are poor.

COOPERATION.—Station maintained in cooperation with the Hydroelectric Co. of West Virginia.

The following discharge measurement was made by B. J. Peterson and B. L. Hopkins:

September 25: Gage height, 1.88 feet, discharge, 74 second-feet.

Daily discharge, in second-feet, of Cheat River near Parsons, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5,480	865	310	2,670	1,600	4,550	820	1,290	3,000	290	207	262
2	4,020	552	240	4,370	1,180	4,190	865	960	2,590	300	207	231
3	2,830	452	163	5,880	960	3,680	820	865	1,890	253	207	120
4	1,060	363	127	7,660	960	3,340	517	1,060	1,350	215	155	43
5	433	262	93	13,200	865	2,830	1,010	1,120	1,120	187	191	32
6	363	203	117	10,400	778	2,350	1,960	865	865	187	248	35
7	310	175	85	6,090	865	2,430	2,350	695	910	240	207	695
8	325	330	152	5,100	695	6,520	2,040	1,010	865	235	330	3,680
9	320	258	191	4,190	820	7,200	1,540	865	778	253	559	910
10	300	385	148	3,340	655	5,680	1,670	778	2,040	187	510	865
11	271	305	102	2,510	566	11,200	2,670	695	2,120	187	330	439
12	227	310	70	1,670	552	35,900	2,430	618	1,960	187	248	315
13	195	320	65	1,120	484	15,900	2,120	820	1,600	171	207	266
14	159	276	58	1,060	421	10,900	1,740	820	1,180	300	191	235
15	271	253	330	910	421	10,600	1,540	735	910	203	183	199
16	2,040	227	330	1,060	484	8,860	1,350	640	778	409	144	171
17	3,850	244	231	865	497	7,200	1,230	588	595	458	105	215
18	3,340	203	820	1,120	655	6,300	1,350	545	380	910	90	144
19	3,000	163	2,270	1,120	1,010	5,680	1,290	478	290	820	82	90
20	4,190	141	2,270	960	3,850	5,100	1,180	427	203	510	63	80
21	6,300	148	1,890	1,540	4,020	6,740	960	421	148	865	54	65
22	5,290	195	1,890	32,700	2,590	6,090	778	433	124	478	47	248
23	4,370	421	2,190	9,600	2,190	5,100	573	439	93	695	42	102
24	3,850	1,120	1,670	1,670	3,000	3,850	497	820	510	458	99	88
25	3,340	910	1,180	1,410	2,590	3,340	415	655	341	655	72	78
26	2,830	778	865	1,180	3,000	3,170	397	566	244	1,290	49	68
27	2,510	573	2,830	960	4,730	3,680	439	8,380	735	1,060	35	56
28	2,190	545	4,020	820	5,480	2,830	865	8,860	497	625	54	271
29	1,820	504	3,680	1,010	.....	2,190	1,540	15,300	695	510	102	735
30	1,470	391	2,670	960	.....	1,600	1,230	5,880	655	403	258	1,120
31	1,120	.....	1,010	1,740	.....	1,230	.....	4,370	.....	248	305	.....

Monthly discharge of Cheat River near Parsons, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 716 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	6,300	159	2,200	3.07	3.54
November	1,120	141	396	.553	.62
December	4,020	58	1,030	1.44	1.66
January	32,700	820	4,160	5.81	6.70
February	5,480	421	1,640	2.29	2.38
March	35,900	1,230	6,460	9.02	10.40
April	2,670	397	1,270	1.77	1.98
May	15,300	421	2,000	2.79	3.22
June	3,000	93	982	1.37	1.53
July	1,290	171	445	.622	.72
August	559	35	180	.251	.29
September	3,680	32	395	.552	.62
The year	35,900	32	1,780	2.49	33.66

CHEAT RIVER AT ROWLESBURG, W. VA.

LOCATION.—At Baltimore & Ohio Railroad bridge at Rowlesburg, Preston County, about 300 feet above mouth of Salt Lick Creek.

DRAINAGE AREA.—960 square miles (includes drainage area of Salt Lick Creek).

RECORDS AVAILABLE.—July 19, 1912, to September 30, 1917. The United States Weather Bureau has collected gage-height records since 1884.

GAGE.—Mott tape gage attached to upstream side of bridge; read by J. F. Pierce.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge. Salt Lick Creek is measured separately and the discharge added to that measured at the bridge.

CHANNEL AND CONTROL.—Stream is curved above and below bridge; control consists of small boulders; probably permanent. Salt Lick Creek enters between the control and the gage. Stage at which flow would be zero was about 0.45 foot in September, 1917.

EXTREMES OF STAGE.—Maximum stage recorded during year, 12.8 feet March 12; minimum stage, 2.0 feet August 20, 22, 23, 29, and September 23.

The highest stage of which there is any record occurred, according to the United States Weather Bureau, July 10, 1888, when the water reached a stage of 22 feet.

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—Stage-discharge relation probably permanent; affected by ice December 16-21, January 15-21, and February 4-18. Data inadequate for determining daily discharge. Gage read daily in the morning to tenths.

COOPERATION.—Gage-height record furnished by the United States Weather Bureau.

The following measurements were made by B. J. Peterson and B. L. Hopkins September 20, 1917: Gage height, 2.23 feet; discharge, 161 second-feet. Gage height, 2.22 feet; discharge, 155 second-feet.

Daily gage height, in feet, of Cheat River at Rowlesburg, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.1	2.3	3.0	3.8	4.2	5.2	3.6	4.0	4.6	3.1	2.6	2.6
2	3.4	2.5	3.0	3.6	4.5	4.5	3.5	3.8	4.3	2.8	2.5	2.7
3	3.0	2.4	2.9	3.4	4.3	4.3	3.5	3.5	4.2	2.6	2.4	2.4
4	2.8	2.4	2.8	5.8	3.4	4.9	3.5	3.3	3.9	2.9	2.9	2.3
5	2.5	2.4	2.8	4.9	3.4	4.8	3.4	3.3	3.6	2.6	2.7	2.2
6	2.5	2.3	3.5	6.1	3.2	4.3	3.9	3.3	3.4	2.5	2.5	2.2
7	2.4	2.3	3.3	5.6	3.4	4.0	4.6	3.3	3.8	2.5	2.7	2.3
8	2.3	2.2	3.1	4.6	3.4	6.0	4.9	3.2	3.7	2.9	2.4	3.5
9	2.3	2.3	3.0	4.0	3.4	6.9	4.6	3.2	3.4	2.6	3.2	4.8
10	2.5	2.6	2.9	3.8	3.4	5.2	4.2	3.9	3.3	2.5	3.0	3.5
11	2.7	2.5	2.8	3.6	3.4	5.5	4.3	3.8	3.7	2.5	2.9	3.1
12	2.6	2.4	2.8	3.2	3.4	12.8	5.2	3.6	3.6	2.4	2.7	2.8
13	2.4	2.3	2.9	2.9	3.4	9.6	5.2	3.5	3.4	2.3	3.5	2.6
14	2.2	2.6	2.7	3.2	3.4	8.7	4.7	3.4	3.1	2.3	2.4	2.5
15	2.4	2.5	2.5	3.8	3.4	8.5	4.2	3.3	2.9	2.2	2.4	2.4
16	2.9	2.4	2.5	3.8	3.4	6.2	3.9	3.2	2.9	3.0	2.3	2.4
17	4.8	2.4	2.5	3.8	3.4	5.3	3.6	3.1	2.9	2.9	2.3	2.3
18	4.0	2.3	2.5	3.8	3.4	6.3	3.4	3.0	2.8	2.7	2.3	2.2
19	4.1	2.3	2.5	3.8	3.5	5.3	3.5	2.9	2.7	3.0	2.1	2.2
20	4.6	2.2	2.5	3.8	3.9	4.7	3.4	2.8	2.6	3.1	2.0	2.2
21	4.0	2.3	2.5	3.8	4.9	4.6	3.3	2.8	2.6	2.8	2.1	2.2
22	3.9	2.2	5.4	12.0	4.4	5.4	3.3	2.8	2.6	3.0	2.0	2.1
23	3.5	2.2	4.9	7.2	3.9	5.3	3.1	2.8	2.5	2.9	2.0	2.0
24	3.2	2.6	4.4	5.2	4.6	5.1	3.0	2.9	2.5	2.8	2.2	2.1
25	3.0	4.0	3.7	4.3	6.2	6.2	2.9	2.8	2.5	2.7	2.3	2.1
26	2.9	3.4	3.4	3.8	4.8	5.0	2.9	2.7	2.6	2.9	2.2	2.1
27	2.7	3.0	3.4	3.5	4.4	4.5	3.0	4.2	2.4	3.7	2.1	2.1
28	2.7	2.9	6.5	3.4	6.3	4.3	3.0	8.0	2.4	3.6	2.1	2.1
29	2.6	2.8	7.0	3.4	.....	4.0	3.5	7.9	2.8	3.1	2.0	2.1
30	2.5	2.9	5.5	4.5	.....	3.9	4.4	7.4	3.3	2.9	2.1	2.2
31	2.4	.....	4.2	4.7	.....	3.7	.....	5.5	.....	2.7	2.2	.....

CHEAT RIVER NEAR MORGANTOWN, W. VA.

LOCATION.—At highway bridge at Uneva, Monongalia County, 10 miles above mouth of river. Parallel of 39° 40′ crosses the river at this bridge.

DRAINAGE AREA.—1,380 square miles.

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 September 30, 1917.

GAGE.—Chain gage attached to bridge; read by C. F. Baker.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge or by wading.

CHANNEL AND CONTROL.—Probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 13.67 feet at 5 p. m. March 12 (discharge about 51,000 second-feet); minimum stage, 1.97 feet August 30 and several days the latter part of September (discharge, 162 second-feet).

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

ACCURACY.—Stage-discharge relation practically permanent; affected by ice portions of December, January, and February. Rating curve used for 1917 fairly well defined above 175 second-feet. Discharge measurements made November 30, 1914, October 4 and 5, 1917, indicate a marked change in the stage-discharge relation below gage height 2.4 feet (discharge, 410 second-feet) and a new rating curve was drawn for 1917. Change from the former rating curve ranges from 0 at discharge 445 second-feet to 30 per cent at discharge 163 second-feet, the rating curve for 1917 giving smaller results. Date of change not known, but may have been some time during 1914. In view of the uncertainty in the date of this change in stage-discharge relation, estimates of daily discharge for the years 1914 to 1916 may be subject to considerable error below 410 second-feet. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage heights to the rating table. Discharge interpolated because of missing gage readings, October 28, November 4, 6, 12, 23, December 12, 25, January 13, February 28, April 5, May 10, 26, July 29, September 9, 16; estimated because of ice from climatic data and observer's notes, December 15–21, January 15, 16, 19, 20, February 11, 18. Results good except for periods probably affected by ice, December 10–22, January 15, 16, and February 6–20, for which they are probably poor.

The following discharge measurements were made by Peterson and Hopkins:
October 4, 1917: Gage height, 2.06 feet; discharge, 192 second-feet.
October 5, 1917: Gage height, 2.06 feet; discharge, 196 second-feet.

Daily discharge, in second-feet, of Cheat River near Morgantown, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,860	600	1,530	3,150	4,900	8,530	1,960	3,150	8,020	1,010	520	600
2	1,530	560	1,360	2,580	5,110	5,550	1,840	2,580	7,510	782	480	685
3	950	560	1,220	3,620	2,200	4,510	1,840	1,960	5,110	600	892	480
4	730	925	1,080	11,600	2,080	6,500	1,840	1,530	3,460	480	685	345
5	560	1,290	1,080	9,040	1,630	6,500	2,650	1,630	2,450	410	685	303
6	480	965	1,530	13,600	1,360	3,790	3,460	1,840	2,450	345	560	560
7	520	640	1,730	10,100	1,840	3,460	5,330	1,630	14,100	315	431	640
8	473	560	1,290	6,020	1,530	14,100	8,020	1,630	6,020	321	520	1,730
9	424	520	1,140	3,960	1,220	16,700	6,020	1,630	3,620	466	730	2,020
10	520	892	1,140	3,300	950	9,550	4,140	2,170	3,300	452	1,010	2,320
11	560	950	1,010	2,450	743	14,100	4,140	2,710	3,150	445	730	1,220
12	640	840	922	1,730	520	45,800	7,510	2,450	2,710	384	600	782
13	600	730	835	2,290	480	28,400	7,000	2,080	1,960	384	466	640
14	452	950	782	2,860	520	26,900	5,110	1,730	1,530	358	404	520
15	431	835	651	2,640	520	24,300	3,460	1,630	1,290	2,080	410	452
16	685	835	520	2,420	520	13,600	2,450	1,450	1,140	2,710	520	396
17	4,900	835	520	2,200	560	10,600	2,080	1,290	1,010	1,840	397	339
18	3,790	730	520	1,360	726	13,600	1,730	1,080	835	1,080	384	309
19	4,700	560	520	1,310	892	8,020	1,630	1,010	782	950	279	279
20	6,020	600	520	1,270	1,840	6,020	1,630	1,220	835	1,140	243	255
21	4,140	560	520	1,220	7,510	5,330	1,450	892	560	892	220	255
22	3,150	520	8,020	42,700	5,110	10,100	1,360	782	600	892	200	231
23	1,960	1,240	9,040	18,200	3,150	8,020	1,220	730	560	950	200	185
24	1,630	1,960	4,140	9,550	10,100	8,020	1,220	892	480	892	782	171
25	1,220	3,620	3,230	5,110	11,600	12,100	1,220	782	459	640	438	180
26	1,080	2,710	2,320	3,620	7,000	7,000	1,220	4,660	600	892	327	167
27	782	1,530	12,600	3,000	6,500	4,700	1,220	8,530	473	2,450	291	167
28	498	1,220	21,800	2,200	7,520	3,790	1,290	22,800	431	1,630	225	157
29	215	1,080	17,200	2,320	.....	3,150	2,080	23,300	600	1,290	195	200
30	640	1,290	8,530	3,790	.....	2,710	3,790	18,700	892	950	163	195
31	640	.....	4,700	6,500	.....	2,320	.....	10,100	.....	640	200	.....

Monthly discharge of Cheat River near Morgantown, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 1,380 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	6,020	215	1,540	1.12	1.29
November	3,620	520	1,040	.754	.84
December	21,800	520	3,610	2.62	3.02
January	42,700	1,220	5,990	4.34	5.00
February	11,600	480	3,170	2.30	2.40
March	45,800	2,320	10,900	7.90	9.11
April	8,020	1,220	3,000	2.17	2.42
May	23,300	730	4,150	3.01	3.47
June	14,100	431	2,560	1.86	2.08
July	2,710	315	925	.670	.77
August	1,010	163	458	.332	.38
September	2,320	167	560	.406	.45
The year	45,800	163	3,180	2.30	31.23

BLACKWATER RIVER AT HENDRICKS, W. VA.

LOCATION.—At highway bridge at Hendricks, Tucker County, about one-eighth mile above mouth of river.

DRAINAGE AREA.—148 square miles (deterimined by West Virginia Development Co.).

RECORDS AVAILABLE.—October 13, 1911, to September 30, 1917.

GAGE.—Chain gage attached to upstream side of bridge; read by French Shaffer.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Coarse gravel and stones.

EXTREMES OF STAGE.—Maximum stage recorded during year, 8.37 feet at 7 a. m. March 12; minimum stage, 1.49 feet at 5 p. m. October 15.

1911–1917: Extremes of stage are those recorded above.

Maximum flood occurred July 10, 1888, stage unknown.

ICE.—Stage-discharge relation probably affected by ice during extremely cold weather.

ACCURACY.—Station was first visited by engineers of the Survey in March, 1916. Discharge measurements made at gage heights 3.42 and 4.27 during these visits plot respectively 17 and 30 per cent below rating curve used from 1911 to 1914. Monthly discharge for 1914 as published in Water-Supply Paper 383 probably as accurate as indicated. Discharge data subsequent to 1914 withheld for additonal information. Gage read twice daily to tenths to April 1, then to hundredths. Gage readings probably affected by ice January 17 to February 20. Records good.

COOPERATION.—Station maintained and records furnished by the Hydro-Electric Co. of West Virginia.

The following discharge measurement was made by Peterson and Hopkins:
September 24: Gage height, 1.64 feet, discharge, 9.1 second-feet.

Daily gage height, in feet, of Blackwater River at Hendricks, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.75	1.86	2.37	3.10	3.04	3.08	2.40	2.52	3.48	2.14	1.94	2.12
2	2.54	1.82	2.33	3.37	2.54	2.90	2.56	2.48	2.74	2.07	1.90	2.06
3	2.21	1.88	2.20	3.64	3.52	2.72	2.49	2.46	2.44	1.98	1.89	2.10
4	2.09	1.92	2.15	3.57	5.85	3.25	2.48	2.46	2.36	1.93	1.88	2.14
5	1.97	1.87	2.56	3.80	6.43	3.26	2.88	2.46	2.32	1.90	1.86	2.10
6	1.92	1.84	2.78	3.32	6.43	2.88	2.88	2.42	2.68	1.90	1.86	2.06
7	1.60	1.82	2.50	3.04	6.43	2.71	2.74	2.40	2.58	2.16	1.85	2.22
8	1.57	1.86	2.46	2.95	6.43	5.08	2.72	2.43	2.44	2.24	1.86	2.50
9	1.66	1.92	2.44	2.84	6.43	4.77	2.62	2.44	2.46	2.06	2.42	2.38
10	2.20	1.94	2.40	2.74	6.43	3.00	2.52	2.42	2.50	2.00	2.18	2.13
11	1.66	1.92	2.38	2.49	6.43	4.80	3.00	2.40	2.54	1.97	1.97	2.00
12	1.84	1.95	2.36	2.46	6.12	7.69	3.49	2.36	2.48	1.96	1.90	1.87
13	1.66	2.27	2.34	3.04	6.12	5.61	3.06	2.34	2.46	1.97	1.84	1.82
14	1.58	2.10	2.38	2.90	6.11	4.88	2.80	2.32	2.42	2.01	1.86	1.82
15	1.52	2.00	2.41	2.76	5.94	4.32	2.70	2.29	2.30	2.08	1.92	1.79
16	3.46	1.96	2.42	2.56	5.80	3.72	2.69	2.26	2.26	2.17	1.88	1.92
17	4.34	2.00	2.44	2.46	5.73	3.70	2.65	2.24	2.24	2.26	1.82	1.90
18	3.14	1.90	2.40	2.39	5.72	3.58	2.65	2.23	2.12	2.24	1.79	1.90
19	3.84	1.88	2.58	2.29	5.39	3.36	2.60	2.22	2.09	2.20	1.78	1.86
20	3.60	1.74	2.46	2.26	3.38	3.23	2.59	2.22	2.06	2.15	1.76	1.82
21	3.27	1.72	2.86	4.20	3.05	3.62	2.54	2.22	2.04	2.12	1.74	1.80
22	2.80	1.70	2.55	6.74	2.70	3.60	2.52	2.20	2.02	2.16	1.74	1.78
23	2.60	1.88	2.42	4.23	3.01	3.60	2.46	2.34	2.02	2.18	1.76	1.78
24	2.52	2.26	2.38	3.48	4.92	3.76	2.39	2.26	1.99	2.16	1.76	1.63
25	2.42	2.42	2.36	2.88	3.38	3.36	2.54	2.16	1.98	2.18	1.74	1.68
26	2.31	2.37	2.39	2.66	2.84	2.95	2.60	2.08	1.96	2.22	1.76	1.68
27	2.29	2.58	3.39	2.48	3.76	2.86	2.37	3.36	1.96	2.18	1.79	1.68
28	2.16	2.78	4.12	2.60	3.66	2.78	2.78	4.38	2.16	2.16	1.78	1.77
29	2.11	2.69	3.68	3.57	.....	2.67	2.85	4.67	2.30	2.15	1.74	1.78
30	2.06	2.46	3.47	3.38	.....	2.54	2.62	3.66	2.22	2.11	1.84	1.75
31	1.97	.....	3.29	3.00	.....	2.50	.....	3.38	.....	2.02	2.20	.....

SHAVERS FORK AT PARSONS, W. VA.

LOCATION.—At steel highway bridge 600 feet northwest of railroad station at Parsons, Tucker County, and half a mile above confluence with Dry Fork.

DRAINAGE AREA.—210 square miles (determined by Pittsburgh Flood Commission).

RECORDS AVAILABLE.—October 14, 1910, to September 30, 1917.

GAGE.—Standard chain gage attached to bridge, read by R. W. Evans. Sea-level elevation of zero of gage, 1,631.70 feet.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge or by wading.

CHANNEL AND CONTROL.—Channel rocky. Control, coarse gravel and rocks; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.90 feet at 8 a. m. March 12 (discharge, 12,300 second-feet); minimum stage, 2.15 feet September 8 (discharge, 3 second-feet).

High waters of 1868 and 1907 reached a stage represented by approximately 12.5 feet, referred to present gage datum.

ICE.—Stage-discharge relation affected by ice during severe winters.

REGULATION.—The flow at low stages may be affected by the storage of water at a pulp mill dam about three-fourths mile above the station.

ACCURACY.—Stage-discharge relation practically permanent, affected by ice December 13–20, and February 6–16. A discharge measurement made in September, 1917, indicated a change in the stage-discharge relation below 300 second-feet. It was assumed that the change in relation occurred during the high water of March. Rating curve used to March 11, and curve used March 12 to September 30, well defined between 40 and 10,000 second-feet; beyond these limits curve is an extension. Gage read twice daily to tenths. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good except for periods affected by ice, for which they are poor.

The following discharge measurement was made by Peterson and Hopkins: September 24: Gage height 2.82 feet, discharge, 48 second-feet.

Daily discharge, in second-feet, of Shavers Fork at Parsons, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	520	78	183	402	960	1,320	260	562	1,020	30	61	30
2	440	88	183	295	1,140	1,200	440	520	960	104	54	22
3	183	52	183	1,020	1,260	1,200	402	365	750	54	46	22
4	183	88	128	1,260	1,140	2,510	365	260	480	54	50	15
5	144	52	183	1,080	905	2,000	562	199	480	54	54	15
6	113	52	144	3,350		750	800	199	365	46	40	54
7	88	52	144	1,020		750	700	199	260	199	25	480
8	88	60	144	800		2,510	852	750	199	330	154	1,460
9	88	39	164	520		1,720	800	852	199	54	199	652
10	113	52	144	365		960	605	750	260	54	199	652
11	144	52	128	295	60	2,510	652	480	480	225	260	120
12	100	46	128	144		12,300	905	480	295	54	154	120
13	88	52		138		3,900	852	480	260	54	46	120
14	78	78		113		4,090	700	365	225	54	61	120
15	88	68		295		3,530	562	365	154	70	40	154
16	144	60	100	520		1,590	562	330	154	104	40	154
17	233	60		330	100	1,590	440	260	135	104	46	22
18	295	68		295	144	2,220	402	199	80	562	40	3
19	440	52		264	144	1,020	402	199	75	154	30	30
20	520	52		295	537	852	330	199	70	154	25	23
21	605	52	183	520	1,520	852	330	120	70	330	22	25
22	605	52	1,260	6,330	1,260	2,670	330	120	61	199	30	15
23	365	88	1,790	1,660	562	1,390	225	154	61	199	18	22
24	695	144	1,930	800	1,930	3,000	199	154	54	199	15	22
25	520	144	365	605	2,000	2,000	199	135	40	440	15	40
26	520	113	295	365	1,020	1,790	199	154	30	1,590	22	38
27	440	113	233	264	1,260	800	173	3,350	40	1,520	15	41
28	183	113	3,900	233	1,720	750	173	3,170	54	1,390	15	40
29	183	113	2,510	309	.....	605	800	4,670	520	1,320	15	36
30	88	100	905	652	.....	480	800	3,170	480	1,080	22	36
31	88	.....	520	905	.....	225	.....	1,260	.....	135	40	.....

NOTE.—Daily discharge estimated because of ice from climatic data and observer's notes Dec. 13–20, Feb. 6–16, braced figures show the mean discharge for the period. Discharge interpolated June 19, Aug. 4.

Monthly discharge of Shavers Fork at Parsons, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 210 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	605	78	267	1.27	1.46
November	144	39	74.4	.354	.40
December	3,900	.....	534	2.54	2.93
January	6,330	113	821	3.91	4.51
February	2,000	.....	652	3.11	3.24
March	12,300	225	2,030	9.67	11.15
April	905	173	501	2.39	2.67
May	4,670	120	789	3.76	4.34
June	1,020	30	277	1.32	1.47
July	1,590	30	352	1.68	1.94
August	260	15	59.8	.285	.33
September	1,460	3	153	.729	.81
The year	12,300	3	545	2.60	35.25

BIG SANDY CREEK AT ROCKVILLE, W. VA.

LOCATION.—At the highway bridge at Rockville, in Preston County, about 5 miles above mouth of creek and 6 miles below Bruceton Mills.

DRAINAGE AREA.—202 square miles (determined by West Virginia Development Co.).

RECORDS AVAILABLE.—May 7, 1909, to September 30, 1917.

GAGE.—Chain gage attached to downstream side of bridge; read by A. A. Christopher and Levi Zweyer.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Channel bed consists of boulders and bed rock. Control practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 14.98 feet at 6 a. m. January 22 (discharge about 17,500 second-feet); minimum stage, 3.10 feet October 9 (discharge, 8.1 second-feet).

ICE.—Stage-discharge relation affected by ice during periods of extremely cold weather.

REGULATION.—Gristmills at Rockville, Clifton Mills, and Bruceton Mills operated by water power, may produce fluctuations in stage during low water.

ACCURACY.—Stage-discharge relation practically permanent. Affected by ice December 13–20 and probably to some extent during parts of January and February. Rating curve well defined between 10 and 8,000 second-feet; beyond these limits curve is an extension. Gage read twice daily to tenths. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good except for periods affected by ice for which they are poor.

Daily discharge, in second-feet, of Big Sandy Creek at Rockville, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	31	68	299	739	1,310	684	299	330	1,430	48	23	45
2	27	52	269	465	633	633	284	269	1,690	24	35	65
3	18	47	215	429	330	523	203	241	1,310	31	203	33
4	12	299	203	1,010	447	465	169	215	633	18	142	46
5	12	931	255	1,310	346	412	447	299	447	17	81	30
6	12	395	180	1,690	299	412	684	362	484	16	61	87
7	12	228	160	1,010	269	330	931	314	6,920	22	50	77
8	11	180	142	739	299	1,950	1,430	299	1,430	16	50	395
9	8.1	191	150	543	255	1,560	739	465	1,200	33	96	412
10	16	465	133	447	180	931	523	633	1,010	70	78	228
11	13	586	133	346	150	4,230	586	465	862	61	50	150
12	28	284	150	203	150	7,340	543	412	633	41	31	133
13	22	255		269	150	2,080	447	330	378	32	29	96
14	16	299		684	150	3,720	395	284	314	60	27	80
15	17	395		503	142	3,550	330	228	241	484	314	54
16	50	330	100	586	133	1,820	255	215	215	633	126	49
17	314	241		412	133	2,080	284	191	160	314	88	43
18	215	215		465	215	1,560	203	169	142	203	77	45
19	586	169		378	299	1,200	215	150	126	142	42	27
20	633	169		314	543	1,200	203	142	118	110	41	41
21	523	150	412	330	447	739	180	126	103	110	30	22
22	330	118	1,950	13,400	264	684	169	133	88	103	22	30
23	215	133	1,200	2,930	255	931	142	150	68	96	314	16
24	169	1,200	633	1,310	4,060	798	160	126	65	84	447	24
25	133	633	543	798	1,200	739	299	110	50	88	169	26
26	126	447	378	523	798	684	362	103	42	160	49	13
27	103	362	6,920	330	1,200	484	314	255	32	126	60	10
28	88	269	6,710	378	1,010	465	330	3,390	40	81	33	19
29	88	269	2,220	412	.....	378	412	3,080	56	50	47	24
30	71	395	1,100	1,690	.....	314	346	1,430	56	68	87	27
31	71	.....	920	798	.....	284	.....	931	.....	25	215	.....

NOTE.—Daily discharge estimated because of ice from climatic data December 13–20, interpolated December 31 on account of missing gage reading

Monthly discharge of Big Sandy Creek at Rockville, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 202 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	633	8.1	128	0.634	0.73
November	1,200	47	326	1.61	1.80
December	6,920	.....	841	4.16	4.80
January	13,400	203	1,140	5.64	6.50
February	4,060	133	560	2.77	2.88
March	7,340	284	1,390	6.88	7.93
April	1,430	142	396	1.96	2.19
May	3,390	103	511	2.53	2.92
June	6,920	32	678	3.36	3.75
July	633	16	109	.540	.62
August	447	22	101	.500	.58
September	412	10	78.2	.387	.43
The year	13,400	8.1	524	2.59	35.13

LITTLE BEAVER RIVER BASIN.

LITTLE BEAVER RIVER NEAR EAST LIVERPOOL, OHIO.

LOCATION.—At steel highway bridge known as Grimms Bridge, about 4 miles above mouth of river and about 4 miles northeast of East Liverpool, Columbiana County. North Fork enters river on left about 3 miles above station.

DRAINAGE AREA.—505 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 17, 1915, to September 30, 1917.

GAGE.—Chain gage fastened to downstream side of highway bridge; read by C. W. Garn.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—One channel at all stages; at extremely high stages water flows around both bridge abutments. Channel straight for 100 feet above and 300 feet below station. Rapids about 600 feet below bridge act as primary control, probably permanent. Point of zero flow, gage height, 0.1 ± 0.2 foot.

EXTREMES OF STAGE.—Maximum stage recorded during year, 9.25 feet at 5.00 p. m. January 5; minimum stage, 2.07 feet at 7 a. m. September 26. Highest known flood reached a stage represented by gage height about 20 feet.

ICE.—Stage-discharge relation affected by ice and by ice jams.

ACCURACY.—Stage-discharge relation probably permanent; affected by ice December 14–26, January 12–21, and February 2 to March 1. Data inadequate for determining rating curve. Gage read twice daily to hundredths. Records excellent.

COOPERATION.—Station maintained in cooperation with United States Engineer Corps.

Daily gage height, in feet, of Little Beaver River near East Liverpool, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.14	2.39	3.39	3.62	6.08	3.94	3.86	2.24	5.44	3.50	2.88	2.42
2	2.12	2.39	3.25	3.64	4.85	3.70	3.89	3.18	4.80	3.78	2.74	2.40
3	2.19	2.38	3.12	4.10	5.13	3.59	3.90	3.05	4.31	3.50	2.66	2.46
4	2.11	2.48	3.05	4.44	5.15	3.72	3.69	3.25	3.88	3.20	2.57	2.31
5	2.10	2.76	3.12	7.52	4.82	4.31	3.99	4.94	3.72	3.01	2.50	2.26
6	2.08	2.60	3.06	7.93	4.70	4.54	5.82	4.34	5.19	2.92	2.46	2.73
7	2.10	2.54	2.93	6.08	4.68	4.04	6.15	4.06	6.12	2.84	2.68	2.66
8	2.07	2.50	2.88	5.12	4.55	5.50	5.50	3.96	5.50	2.79	3.10	3.40
9	2.10	2.47	2.88	4.63	4.29	5.27	4.70	3.54	5.10	2.80	2.53	3.08
10	2.16	2.64	2.93	4.62	4.16	4.88	4.28	3.56	6.58	4.06	2.50	3.80
11	2.18	2.75	2.92	3.91	4.48	6.89	4.12	3.46	6.23	3.54	2.46	2.60
12	2.14	2.68	2.96	5.38	.....	7.48	3.96	3.30	5.10	3.24	2.40	2.47
13	2.18	2.58	3.12	5.25	3.26	6.00	3.80	3.25	4.38	3.52	2.38	2.40
14	2.44	2.74	2.95	4.96	.....	5.64	3.68	3.23	4.02	3.69	2.84	2.34
15	2.38	2.98	3.05	4.80	.....	5.36	3.58	3.12	3.95	3.43	2.82	2.28
16	2.40	2.92	2.85	5.00	3.48	4.85	3.56	3.05	3.76	3.18	2.74	2.31
17	2.36	2.80	2.86	4.84	3.52	4.73	3.42	3.00	3.56	4.10	2.50	2.26
18	2.29	2.69	2.74	4.73	3.92	4.65	3.36	2.99	3.38	4.40	2.39	2.20
19	3.35	2.66	2.79	4.70	4.00	4.28	3.88	3.61	3.28	3.82	2.33	2.19
20	3.67	2.58	2.79	4.70	4.81	4.24	3.74	3.36	3.23	3.40	2.26	2.20
21	3.36	2.55	2.82	4.38	4.44	4.18	3.55	3.27	3.10	3.16	2.20	2.20
22	2.98	2.52	3.12	6.90	4.10	4.22	3.43	3.86	2.98	2.96	2.22	2.14
23	2.74	2.64	3.45	5.54	4.34	4.18	3.32	4.22	3.04	2.84	2.86	2.10
24	2.62	3.40	3.45	4.92	5.56	7.09	3.26	3.94	3.81	2.89	3.22	2.08
25	2.51	3.32	3.50	4.61	5.08	5.98	3.24	3.63	3.45	2.93	2.83	2.12
26	2.48	3.44	.....	4.10	4.55	5.65	3.48	3.42	3.13	3.34	2.60	2.09
27	2.44	3.22	6.15	3.62	6.89	4.71	3.38	3.34	4.30	6.24	2.48	2.09
28	2.42	2.98	6.84	3.98	4.92	4.53	3.26	3.38	3.44	4.38	2.40	2.15
29	2.37	3.72	5.48	4.44	.....	4.38	3.16	4.02	5.29	3.66	2.32	2.18
30	2.35	3.58	4.44	7.02	.....	4.20	3.15	3.86	2.94	3.26	2.36	2.13
31	2.36	.....	3.38	6.22	.....	3.98	.....	3.52	.....	3.08	2.39	.....

YELLOW CREEK BASIN.

YELLOW CREEK AT HAMMONDSVILLE, OHIO.

LOCATION.—At covered highway bridge on Steubenville pike about one-fifth mile southwest of Hammondsville, Jefferson County. North Fork enters on left 1,000 feet below station.

DRAINAGE AREA.—169 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 13, 1915, to September 30, 1917.

GAGE.—Chain gage on downstream side of bridge about 25 feet from left end; read by W. J. Sprague.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL—One channel, but at extreme high stages, stream flows around both abutments; straight 1,000 feet above and curved 100 feet below station. Control practically permanent. Point of zero flow, gage height about 1.4 feet September, 1915, and 1916, and October, 1917.

EXTREMES OF STAGE.—Maximum stage recorded during year, 8.63 feet at 4.30 p. m. January 5; minimum stage recorded 1.80 feet at 5 p. m. October 8.

Highest known flood reached a stage represented by gage height about 16 feet.

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice December 18-27 and February 2-27. Data inadequate for determining rating curve. Gage read twice daily to hundredths. Records excellent.

COOPERATION.—Station maintained in cooperation with United States Engineer Corps.

Daily gage height, in feet, of Yellow Creek at Hammondsville, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.02	2.04	3.16	3.08	4.72	3.40	3.38	2.84	4.38	3.29	2.55	2.39
2	1.96	2.03	2.86	3.08	4.57	3.23	3.38	2.76	3.74	4.56	2.47	2.34
3	1.94	2.01	2.74	3.52	5.41	3.14	3.31	2.70	3.72	3.64	2.42	2.51
4	1.91	2.50	2.72	3.48	5.92	3.20	3.16	3.28	3.38	3.10	2.37	2.34
5	1.90	2.44	2.76	8.02	5.94	3.22	3.62	4.01	3.24	2.70	2.33	2.20
6	1.88	2.35	2.72	5.36	.....	3.20	5.20	3.77	4.36	2.46	2.30	2.40
7	1.85	2.26	2.64	4.81	.....	3.32	4.90	3.52	4.33	3.17	2.28	2.36
8	1.82	2.18	2.58	4.26	.....	4.60	4.40	3.33	3.88	2.88	2.32	2.58
9	1.90	2.16	2.68	3.72	5.80	4.20	4.15	3.19	3.56	2.79	2.53	2.87
10	1.88	2.42	2.64	3.40	.....	4.12	3.90	3.08	4.92	2.93	2.44	2.55
11	1.86	2.38	2.55	3.24	.....	5.45	3.62	2.94	4.50	2.75	2.34	2.37
12	1.82	2.33	2.46	3.09	5.41	6.89	3.50	2.84	4.19	2.68	2.30	2.30
13	2.02	2.48	2.38	3.17	4.80	6.00	3.32	2.78	3.66	2.66	2.22	2.28
14	2.02	2.69	2.40	2.97	3.85	4.91	3.24	2.70	3.26	3.00	2.34	2.26
15	1.98	2.62	2.41	2.98	3.68	4.90	3.16	2.62	3.17	2.80	2.62	2.24
16	2.04	2.46	2.38	3.13	3.68	4.52	3.07	2.59	3.13	2.68	2.37	2.24
17	2.01	2.34	2.34	3.19	3.85	4.26	2.98	2.58	2.92	2.73	2.27	2.19
18	1.98	2.27	2.33	3.20	3.99	4.16	2.91	2.78	2.82	4.70	2.20	2.16
19	2.74	2.22	2.32	3.07	4.09	3.88	3.10	2.72	2.76	3.58	2.12	2.15
20	2.90	2.16	.....	2.96	4.08	3.78	3.01	3.01	2.70	3.14	2.12	2.14
21	2.68	2.14	.....	2.94	4.14	3.64	2.94	2.96	2.65	2.91	2.16	2.14
22	2.42	2.13	2.35	7.86	4.15	3.53	2.91	3.00	2.58	2.74	2.40	2.12
23	2.28	2.10	2.54	4.98	4.28	3.41	2.86	3.21	2.60	2.96	2.64	2.10
24	2.22	2.42	2.86	4.52	6.05	5.44	2.82	3.26	3.80	2.85	3.28	2.09
25	2.18	2.82	2.67	4.04	5.25	4.58	2.75	3.23	3.09	3.00	2.78	2.08
26	2.14	2.62	4.44	3.50	5.14	4.28	3.04	3.13	2.66	4.17	2.50	2.06
27	2.12	2.39	5.58	2.98	5.08	4.08	2.94	2.98	3.36	3.68	2.39	2.06
28	2.10	2.50	4.79	3.67	3.69	3.90	2.88	2.82	3.00	3.11	2.33	2.09
29	2.06	3.66	4.09	3.94	.....	3.84	2.84	3.23	4.70	2.86	2.29	2.08
30	2.03	3.88	3.52	5.04	.....	3.62	2.90	3.12	3.82	2.73	2.32	2.08
31	2.03	.....	3.20	4.64	.....	3.48	.....	3.01	.....	2.64	2.40	.....

MIDDLE ISLAND CREEK BASIN.

MIDDLE ISLAND CREEK AT LITTLE, W. VA.

LOCATION.—At highway bridge at Little, about 6 miles southeast of Friendly, Tyler County. Stewart Run enters on left about 500 feet below station.

DRAINAGE AREA.—458 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 7, 1915, to September 30, 1917.

GAGE.—Vertical and inclined staff on left bank immediately below the bridge; read by J. R. Bowles.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading. Stay wire is used for measurements at high stages.

CHANNEL AND CONTROL.—One channel at all stages; straight for about 400 feet above and 250 feet below station. Primary control is at foundation of old mill dam 250 feet below station; composed of bed rock, foundation timbers, small deposit of rock and sand; probably permanent. Point of zero flow, gage height 1.4 feet ± 0.2 foot.

EXTREMES OF STAGE.—Maximum stage recorded during year, 22.22 feet at 5 p. m. January 22; minimum stage, 1.90 feet at 6 p. m. August 22.

Highest flood known occurred in August, 1875; gage height about 33.5 feet.

ICE.—Stage-discharge relation affected by ice during winter months.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice February 3–18. Gage not checked since August, 1916; therefore record of daily discharge is withheld. Gage read twice daily to hundredths.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Middle Island Creek at Little, W. Va., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 20	L. C. Leasure	5.82	2,210
Dec. 27	United States Army Engineers	10.45	5,710
Jan. 22	.....do	22.20	18,200

Daily gage height, in feet, of Middle Island Creek at Little, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.28	2.33	3.10	3.34	4.18	6.02	2.95	3.50	4.28	2.60	2.54	7.43
2	2.20	2.31	3.07	3.29	3.66	5.02	2.92	3.27	6.57	2.56	2.44	3.90
3	2.15	2.29	2.97	6.42	3.20	5.56	2.96	3.01	5.39	2.38	2.35	3.19
4	2.13	2.27	2.85	7.50	3.30	5.50	2.90	2.95	4.00	2.34	2.27	3.19
5	2.09	2.25	3.15	6.47	3.36	5.04	3.08	3.14	3.24	2.29	2.19	3.23
6	2.05	2.27	3.17	7.28	3.18	4.04	13.37	3.08	3.46	2.23	2.14	3.24
7	2.03	2.25	3.05	4.67	2.93	5.04	10.34	2.95	3.62	2.18	2.12	3.40
8	2.00	2.21	2.91	3.63	2.97	12.04	5.63	2.86	3.51	2.17	2.12	3.48
9	2.09	2.19	2.87	3.50	2.98	9.50	4.43	2.81	4.31	2.13	2.10	3.17
10	2.08	2.25	2.89	3.38	3.06	6.02	3.87	2.75	7.52	2.12	2.04	2.93
11	2.16	2.87	2.86	3.38	3.02	7.50	3.55	2.71	5.33	2.39	2.02	2.73
12	2.31	2.77	2.89	3.37	2.92	9.00	3.38	2.65	3.96	2.21	2.00	2.59
13	2.29	2.73	2.87	3.36	2.81	8.50	3.23	2.59	3.44	2.12	1.99	2.46
14	2.23	2.73	2.87	3.36	2.66	8.50	3.12	2.55	3.17	2.28	2.18	2.35
15	2.17	2.80	2.75	3.34	2.62	6.04	3.03	2.52	2.99	3.24	2.52	2.29
16	2.22	2.83	2.65	3.34	2.68	4.08	2.94	2.49	2.86	4.94	2.33	2.20
17	2.85	2.74	2.64	3.34	2.72	4.05	2.85	2.45	2.76	4.14	2.17	2.25
18	2.43	2.69	2.61	3.33	3.00	4.53	2.82	2.40	2.68	3.39	2.09	2.25
19	5.54	2.63	2.60	3.34	3.34	4.00	2.87	2.37	2.60	3.16	2.02	2.20
20	5.22	2.55	2.57	3.34	3.76	3.36	2.85	2.34	2.56	3.20	1.98	2.15
21	4.27	2.49	2.77	3.78	3.70	3.60	2.79	2.30	2.44	3.06	1.93	2.00
22	3.67	2.47	7.49	21.61	3.46	2.71	2.74	2.27	2.40	2.75	2.44	2.00
23	3.53	2.49	5.28	8.24	3.56	3.57	2.69	2.27	2.39	3.12	5.13	2.00
24	2.97	3.22	3.89	4.24	7.22	8.32	2.68	3.11	2.41	3.58	4.36	2.00
25	2.85	4.02	3.65	3.86	4.90	5.84	2.69	2.87	2.38	2.81	3.66	2.00
26	2.73	3.44	3.40	5.41	4.01	4.38	2.95	2.69	2.33	3.53	3.32	2.00
27	2.65	3.14	8.43	3.92	3.74	3.70	2.97	7.17	2.29	4.50	2.91	2.00
28	2.57	3.07	9.66	4.20	5.50	3.50	3.20	14.08	2.32	3.57	2.54	2.00
29	2.50	3.08	7.76	6.44	.....	3.31	3.59	10.44	2.31	3.21	2.41	2.00
30	2.43	3.11	4.57	6.50	.....	3.18	3.80	5.32	2.30	2.91	2.69	2.00
31	2.37	.....	3.68	4.58	.....	3.04	.....	3.91	.....	2.71	2.65	.....

LITTLE MUSKINGUM RIVER BASIN.

LITTLE MUSKINGUM RIVER AT FAY, OHIO.

LOCATION.—About a mile northwest of Fay, Washington County, Ohio, 7 miles from St. Marys, W. Va., and 12 miles from Marietta, Ohio. Bear Run enters on left about half a mile above station. Covered highway bridge crosses river just above Bear Run.

DRAINAGE AREA.—259 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 14, 1915, to September 30, 1917.

GAGE.—Inclined and vertical staff on right bank about 400 feet below suspension footbridge; read by G. I. Smith.

DISCHARGE MEASUREMENTS.—Made from suspension bridge or by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight several hundred feet above and below bridge. Overflow at gage height about 13 feet; wide overflow at maximum stages. Bed of stream mud, sand, rock, and gravel; primary control at ford 50 feet below gage compact sand and gravel; fairly permanent. Point of zero flow, gage height 0.7±0.2 foot May, 1915.

EXTREMES OF STAGE.—Maximum stage recorded during the year, 21.5 feet at 5 p. m. January 22; minimum stage, 1.19 feet at 8 a. m. September 27.

Highest flood known reached a stage represented by gage height about 23 feet.

ICE.—Stage-discharge relation affected by ice in severe winters.

ACCURACY.—Stage-discharge relation probably permanent; probably affected to some extent by ice. Data inadequate for determining rating curve. Gage read twice daily to hundredths. Records excellent.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Little Muskingum River at Fay, Ohio, during the year ending Sept. 30, 1917.

[Made by U. S. Army Engineers.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Dec. 28	10.33	3,490	Dec. 28	11.00	3.500	Dec. 28	12.90	2,670
28	10.45	3,260	28	12.05	2,840	Apr. 7	6.77	1,570
28	10.55	3,090	28	12.40	2,600	7	6.95	1,600

Daily gage height, in feet, of Little Muskingum River at Fay, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.35	1.54	2.97	3.01	4.09	3.53	2.49	3.14	6.04	1.96	1.52	2.65
2	1.34	1.45	2.61	2.84	3.44	3.47	2.70	3.09	7.12	1.78	1.46	2.24
3	1.32	1.41	2.38	6.04	2.75	3.43	2.58	2.78	5.69	1.86	1.41	2.47
4	1.29	1.38	2.23	4.79	3.13	4.02	1.84	2.68	3.77	1.82	1.35	2.26
5	1.25	1.41	2.50	7.95	2.85	4.20	4 44	2.77	3.18	1.67	1.35	2.03
6	1.23	1.43	2.95	8.20	2.65	3.47	18.15	2.71	3.81	1.55	1.31	1.90
7	1.23	1.36	2.57	.....	2.39	4.17	9.39	2.58	4.61	1.46	1.75	1.79
8	1.21	1.33	2.39	3.54	2.33	10.60	4.75	2.49	4.18	1.48	2.14	2.52
9	1.24	1.41	2.40	3.21	2.53	6.77	3.71	2.42	4.75	1.42	2.26	2.80
10	1.23	1.59	2.64	3.08	2.60	4.99	3.41	2.32	7.60	1.59	2.07	2.30
11	1.25	1.53	2.61	2.85	2.29	8.65	3.13	2.23	5.70	2.52	1.73	1.98
12	1.27	1.51	2.61	2.42	2.20	7.20	2.96	2.14	3.81	1.93	1.55	1.79
13	1.23	1.57	2.49	2.32	1.94	7.30	2.84	2.10	3.19	1.73	1.43	1.69
14	1.25	1.61	2.39	2.45	1.78	12.70	2.68	2.07	3.07	3.40	1.50	1.55
15	1.25	1.77	2.20	3.29	1.81	5.20	2.58	1.99	2.76	4.55	3.25	1.50
16	1.37	1.83	2.11	3.05	1.93	4.05	2.45	1.90	2.54	3.46	2.28	1.48
17	1.44	1.79	2.03	2.76	1.90	3.70	2.36	1.85	2.26	4.04	1.81	1.44
18	1.42	1.73	1.99	2.55	1.96	3.67	2.33	1.81	2.09	4.59	1.61	1.36
19	3.57	1.66	1.86	2.55	2.46	3.34	2.32	1.75	2.07	3.37	1.50	1.38
20	3.74	1.61	1.87	2.43	2.67	3.17	2.25	1.67	2.05	2.71	1.41	1.29
21	3.26	1.57	2.54	3.41	2.69	3.43	2.18	1.66	1.95	2.30	1.36	1.29
22	2.59	1.57	8.55	19.75	2.48	3.85	2.12	1.67	1.86	.....	1.57	1.31
23	2.27	1.65	4.83	6.80	3.73	3.53	2.05	1.69	1.96	2.44	3.92	1.25
24	2.00	2.83	3.57	3.85	8.20	10.00	2.04	1.71	1.92	2.02	3.49	1.22
25	1.85	3.00	3.33	3.32	4.16	4.80	2.11	1.75	1.87	1.86	2.57	1.21
26	1.75	2.47	3.10	3.04	3.54	3.77	4.70	1.64	1.74	2.46	2.07	1.20
27	1.65	2.26	12.80	2.73	3.58	3.34	3.46	4.60	1.68	3.04	1.85	1.20
28	1.60	2.18	12.27	3.85	3.67	3.14	3.33	8.15	1.65	2.34	1.71	1.23
29	1.57	2.95	5.58	6.33	.....	2.87	3.36	6.68	2.67	1.92	1.64	1.26
30	1.51	3.63	3.69	8.35	.....	2.74	3.20	3.75	2.30	1.74	1.88	1.23
31	1.48	.....	3.09	4.60	.....	2.59	.....	3.09	.....	1.62	3.36	.....

MUSKINGUM RIVER BASIN.

MUSKINGUM RIVER AT FRAZIER, OHIO.

LOCATION.—At highway bridge at Frazier, Muskingum County, 4½ miles below Zanesville. Brush Creek enters on right about one-third mile below the gage.

DRAINAGE AREA.—6,980 square miles (United States Engineer Corps).

RECORDS AVAILABLE.—June 1, 1915, to September 30, 1917.

GAGE.—Staff near upper corner of right abutment of bridge; read by D. A. Burns. Sea-level elevation of zero of gage, 663.29 feet.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge or by wading on crest of dam No. 9, about 5½ miles below gage. Leakage past dam, through lock and power plants, should be included with flow over crest.

CHANNEL AND CONTROL.—River straight above and below. Control is crest of dam No. 9, about 5½ miles below gage. Except for leakage through lock and dam and leakage and flow through power plants at the dam, the gage height of the crest of the dam, 9.0 feet, is the point at which flow would be zero.

EXTREMES OF STAGE.—Maximum mean daily stage recorded during year, 18.25 feet March 14; minimum stage, 9.3 feet September 21–30.

Flood of March, 1913, reached a stage of 49.1 feet; highest stage ever recorded.

ICE.—Stage-discharge relation affected by ice jams at times.

REGULATION.—Leakage through the lock and the power plants at dam No. 9 and the operation of power plants at dams Nos. 9 and 10 may affect the low-water flow to some extent.

ACCURACY.—Stage-discharge relation permanent, except as the relation may be affected by leakage through dam No. 9, through the gates of the power plants and through the lock, and by the operation of the power plants at dam No. 9; probably not affected by ice. The flow from the area between the measuring section and the crest of dam No. 9 may be sufficient at times to affect the stage-discharge relation. This area, however, is small, and such conditions would be of rare occurrence and of small effect. Gage read twice daily to tenths. Records good.

COOPERATION.—Base data furnished by the United States Engineer Corps.

Discharge measurements of Muskingum River at Frazier, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 12	H. E. Frye	9.6	672	Apr. 6	W. H. Dial	17.00	34,300
Mar. 24	W. H. Dial	15.18	26,300	7	do	18.11	39,400
26	do	14.59	21,300	23	Dial and Moeser	10.31	4,070

Daily gage height, in feet, of Muskingum River at Frazier, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	9.6	9.6	10.5	12.2	15.45	11.95	11.1	10.56	10.9	11.95	9.7	9.5
2	9.6	9.6	10.5	11.45	14.6	11.45	11.15	10.6	11.4	11.6	9.7	9.5
3	9.6	9.6	10.4	11.0	13.2	11.3	11.75	10.4	11.2	10.9	9.7	9.4
4	9.5	9.6	10.4	11.0	12.3	11.15	11.95	10.4	10.95	10.55	9.6	9.6
5	9.5	9.6	10.4	13.7	11.75	10.9	11.95	10.85	10.65	10.2	9.6	9.75
6	9.5	9.7	10.0	18.15	11.1	10.7	17.0	11.5	10.5	10.0	9.5	9.7
7	9.5	9.9	10.0	17.25	10.75	10.6	18.05	11.65	11.2	10.0	9.5	9.65
8	9.5	9.8	10.1	16.6	10.55	11.3	17.35	11.4	12.1	11.0	9.5	9.5
9	9.5	9.8	9.95	15.6	10.45	12.0	16.6	11.25	11.65	10.7	9.4	9.5
10	9.5	9.8	9.8	14.35	10.35	12.75	15.5	10.85	11.3	11.15	9.45	9.7
11	9.6	9.7	9.8	13.35	9.95	13.1	13.75	10.65	11.3	10.6	9.5	9.7
12	9.6	9.7	9.75	11.8	9.85	14.3	12.7	10.45	11.95	10.45	9.5	9.7
13	9.6	9.7	9.7	11.45	9.7	15.45	12.0	10.4	12.1	10.3	9.5	9.5
14	9.6	9.8	9.7	10.95	9.55	18.25	11.55	10.4	11.3	12.15	9.5	9.5
15	9.6	9.8	9.7	10.85	9.45	17.45	11.45	10.3	10.7	12.3	9.7	9.5
16	9.6	9.8	9.6	10.75	9.35	16.2	11.15	10.25	10.5	11.45	9.9	9.4
17	9.6	9.8	9.6	10.45	9.25	15.4	10.95	10.0	10.4	11.4	9.8	9.4
18	9.6	9.8	9.6	10.3	9.15	14.55	10.85	10.0	10.3	13.1	9.65	9.4
19	9.5	9.8	9.6	10.0	9.05	13.5	10.8	9.9	10.1	13.21	9.5	9.4
20	9.5	9.8	9.6	9.9	9.35	12.2	10.7	9.9	10.1	12.5	9.5	9.4
21	9.4	9.8	9.6	9.8	11.2	12.05	10.7	9.8	10.0	11.75	9.5	9.3
22	9.4	9.8	9.7	14.35	11.7	11.7	10.45	9.9	9.9	11.2	9.4	9.3
23	9.9	9.8	9.7	15.05	11.9	11.6	10.4	10.0	10.15	10.85	9.4	9.3
24	9.8	9.9	9.6	14.0	12.65	14.6	10.45	10.0	10.1	10.4	9.6	9.3
25	9.7	9.9	9.9	13.75	13.05	15.2	10.5	10.2	10.2	10.2	9.6	9.3
26	9.6	10.4	10.3	13.5	12.9	14.6	10.4	10.1	10.3	10.2	9.55	9.3
27	9.6	10.3	12.25	12.6	12.65	13.65	10.3	10.0	10.3	10.1	9.6	9.3
28	9.6	10.3	13.9	12.55	12.55	12.65	10.6	10.1	10.4	10.0	9.55	9.3
29	9.6	10.3	14.2	12.45	.....	11.9	10.45	10.5	11.0	10.0	9.45	9.3
30	9.6	10.4	13.75	13.75	.....	11.55	10.4	10.75	12.05	9.9	9.45	9.3
31	9.6	.....	13.33	14.75	.....	11.35	.....	10.95	.....	9.85	9.45	.....

MUSKINGUM RIVER AT BEVERLY, OHIO.

LOCATION.—At Lock 4 at Beverly, Washington County. Wolf Creek enters on right immediately above station.

DRAINAGE AREA.—7,700 square miles (United States Engineer Corps).

RECORDS AVAILABLE.—June 1, 1915, to September 30, 1917.

GAGE.—Ceramic tile gage, graduated to tenths of a foot, on lower buttress of river wall of Lock 4, about 1,000 feet above the measuring section. Sea-level elevation of zero of gage, 602.60 feet (United States Engineer Corps).

DISCHARGE MEASUREMENTS.—Made from upstream side of highway bridge 1,000 feet below gage.

CHANNEL AND CONTROL.—Bed of stream gravel and masonry débris of old bridge piers; probably permanent. Stream curves slightly to the left from 1,000 feet above to 1,000 feet below the section. Control is crest of dam No. 3, 10.8 miles below. At gage height 5.2 feet or crest of dam No. 3, flow would be zero provided there was no leakage through dam, lock, or power plant at dam.

EXTREMES OF STAGE.—Maximum mean daily stage recorded during year, 20.3 feet April 6; minimum stage, 3.0 feet October 1–13.

Flood of March, 1913, reached a stage of 46.55, the highest stage ever recorded.

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

REGULATION.—Leakage through dam No. 3, lock, and the power plant at the dam may affect the low-water flow to some extent.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice. Dam No. 3, about 11 miles below, the control for the gage, leaks so that the water falls below the crest during low water. Change in this leakage, leakage and flow through the power plant, leakage through lock, and inflow into pool 3 below the measuring section may all affect the stage-discharge relation at low and medium stages. When the stage of the Ohio at Marietta is about 39 feet or more, the stage-discharge relation is affected by backwater. Records of daily discharge withheld for additional information. Gage read twice daily to tenths. Records good, except as may be affected by described conditions at low and medium stages.

COOPERATION.—Base data furnished by United States Engineer Corps.

Daily gage height, in feet, of Muskingum River at Beverly for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.0	5.1	6.1	10.25	14.95	10.15	8.35	7.0	9.6	9.9	6.0	5.05
2	3.0	5.1	6.4	8.7	14.15	9.2	8.4	6.9	9.35	9.65	5.85	4.85
3	3.0	5.1	6.35	8.65	11.95	8.6	9.0	6.9	9.6	8.6	5.7	5.4
4	3.0	5.1	6.15	8.35	10.0	8.5	9.7	6.9	8.2	7.55	5.6	5.5
5	3.0	5.1	6.15	12.7	9.05	8.25	10.15	7.2	7.75	6.95	5.6	5.6
6	3.0	5.4	6.1	18.4	8.75	7.85	20.3	7.9	7.5	6.5	5.5	5.7
7	3.0	5.8	6.1	17.7	8.55	7.7	19.1	8.9	7.5	6.3	5.75	5.6
8	3.0	5.85	6.35	16.35	9.05	9.5	18.0	8.45	9.85	7.6	5.6	5.5
9	3.0	5.65	6.35	15.45	9.2	10.2	16.9	7.85	9.6	7.55	5.5	5.4
10	3.0	5.5	6.1	13.4	8.95	11.15	15.5	7.5	8.9	8.2	5.45	5.3
11	3.0	5.5	5.95	12.05	8.3	12.65	13.6	7.3	8.8	7.8	5.25	5.4
12	3.0	5.5	5.8	10.05	8.0	13.75	11.8	7.15	9.2	7.1	5.2	5.4
13	3.0	5.5	5.8	8.45	7.95	16.2	10.1	6.9	9.95	6.8	5.2	5.2
14	3.25	5.5	5.7	7.45	7.7	19.35	9.15	6.8	9.25	9.1	5.45	4.7
15	3.45	5.5	5.55	7.65	7.5	18.2	8.5	6.7	8.0	11.6	5.6	4.35
16	3.5	5.5	5.5	7.65	7.45	16.35	8.2	6.55	7.35	9.4	5.95	4.2
17	3.5	5.5	5.4	7.5	7.25	15.25	7.95	6.5	7.05	9.5	5.7	3.85
18	3.5	5.5	5.4	7.75	7.25	14.0	7.65	6.4	6.85	11.95	5.4	3.6
19	4.05	5.5	5.4	7.8	7.4	12.4	7.45	6.3	6.7	12.3	5.4	3.5
20	4.95	5.5	5.4	7.7	7.75	10.75	7.4	6.25	6.6	10.95	5.25	3.5
21	5.45	5.5	5.5	7.8	8.35	10.0	7.35	6.2	6.5	9.9	5.1	3.4
22	5.6	5.4	6.4	16.4	9.0	9.55	7.2	6.25	6.4	9.05	5.15	3.4
23	6.0	5.4	6.05	15.0	9.75	9.3	7.1	6.45	6.8	8.35	5.05	3.4
24	5.85	5.55	5.85	13.1	12.45	14.35	7.0	6.35	6.6	7.35	5.5	3.3
25	5.7	5.65	6.15	12.45	11.35	14.45	7.0	6.45	6.6	6.8	5.5	3.3
26	5.55	6.2	6.8	11.85	11.25	13.8	7.0	6.5	6.85	6.7	5.4	3.3
27	5.4	6.5	11.3	11.3	11.0	12.6	7.0	7.75	6.65	6.7	5.35	3.3
28	5.3	6.25	13.2	11.45	10.9	11.4	7.35	9.05	7.35	6.55	5.3	3.35
29	5.2	6.0	12.95	11.75	.....	10.0	7.45	8.15	9.7	6.35	5.15	3.4
30	5.1	5.9	12.15	12.95	.....	9.25	7.05	7.55	10.15	6.1	5.2	3.4
31	5.1	.....	11.55	13.65	.....	8.65	.....	7.7	.....	6.0	5.2	.....

LITTLE KANAWHA RIVER BASIN.

LITTLE KANAWHA RIVER AT GLENVILLE, W. VA.

LOCATION.—At three-span steel highway bridge at Glenville, Gilmer County. Stewart Creek enters on right about 1½ miles above station.

DRAINAGE AREA.—385 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 1, 1915, to September 30, 1917.

GAGE.—Vertical and inclined staff attached to upstream side of right pier of bridge; read by Hollie Gainor. Gage was established by the United States Weather Bureau September 10, 1900 (read daily to tenths at 8 a. m.), repaired and its datum lowered 2.5 feet on June 1, 1915.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and 150 feet below station. Bed of river composed of mud, rock, sand, and gravel; control is probably fairly permanent. Point of zero flow, gage height about 1.0 foot June and September, 1915.

EXTREMES OF STAGE.—Maximum stage recorded during year, 28.3 feet at 7.15 a. m. January 22; minimum stage, 1.50 feet September 21 and 27.

Highest flood known reached a stage represented by gage height about 29 feet, referred to present datum.

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—Stage-discharge relation probably permanent; probably not affected by ice. Data inadequate for determining rating curve. Gage read twice daily to hundredths. Records excellent.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Little Kanawha River at Glenville, W. Va., during the year ending Sept. 30, 1917.

[Made by F. Conklin.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Dec. 22	13.95	5,620
23	9.41	3,060
23	7.42	2,270

Daily gage height, in feet, of Little Kanawha River at Glenville, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.07	2.50	4.00	4.10	4.53	10.47	3.77	4.07	5.10	2.80	2.60	3.45
2	3.67	2.43	3.70	4.05	4.25	7.10	3.62	3.85	6.37	2.70	2.42	3.17
3	3.10	2.37	3.45	8.35	3.97	11.35	3.47	3.72	6.85	2.40	2.27	3.02
4	2.80	2.30	3.33	6.53	3.93	12.45	3.32	3.62	4.72	2.23	2.17	2.85
5	2.57	2.25	5.65	6.15	3.83	12.35	3.35	3.47	4.37	2.12	2.07	2.72
6	2.35	2.17	5.10	8.83	3.67	7.20	10.75	3.37	4.02	2.02	1.97	2.62
7	2.23	2.15	4.35	6.40	3.63	7.15	10.25	3.30	4.55	1.90	4.02	2.52
8	2.43	2.13	4.17	4.90	3.77	19.00	6.70	3.45	4.52	1.82	3.05	2.42
9	2.37	2.17	4.10	4.40	3.73	14.00	5.75	3.42	4.87	1.82	4.15	2.37
10	2.60	2.35	3.97	4.15	3.58	6.35	4.52	3.32	6.27	2.85	3.32	2.27
11	2.95	2.47	3.87	4.15	3.43	7.45	4.27	3.37	5.72	2.37	2.55	2.17
12	2.87	2.67	3.90	3.93	3.27	25.45	4.07	3.47	4.60	2.22	2.35	2.07
13	2.73	2.67	3.80	3.83	3.13	16.08	3.97	3.45	4.07	2.12	2.20	1.97
14	2.63	2.67	3.53	5.00	3.10	15.48	3.90	3.37	3.80	2.17	2.07	1.95
15	2.57	2.60	3.25	4.55	3.17	7.80	3.77	3.27	3.57	2.32	1.92	1.77
16	2.63	2.55	3.05	4.70	3.13	5.60	3.62	3.17	3.35	2.40	1.82	1.67
17	2.70	2.50	3.13	4.55	3.47	6.95	3.52	3.07	3.15	2.47	1.72	1.67
18	2.13	2.45	3.30	4.20	5.35	5.95	3.47	2.95	2.92	2.77	1.62	1.62
19	5.77	2.53	3.27	4.13	5.55	4.90	3.37	2.77	2.75	3.97	1.62	1.62
20	5.05	2.47	3.23	4.13	5.45	4.65	3.27	2.70	2.57	3.47	1.62	1.57
21	4.90	2.53	8.10	8.10	5.23	4.88	3.20	3.50	2.47	3.22	1.57	1.52
22	4.10	2.53	12.15	27.15	4.57	5.75	3.12	3.47	2.40	3.12	1.70	1.57
23	3.67	2.63	8.45	9.35	5.93	5.30	3.02	3.67	2.35	3.02	2.07	1.62
24	3.50	4.93	5.15	5.17	14.15	7.70	2.97	3.45	2.27	3.02	1.95	1.57
25	3.27	4.80	4.15	4.65	8.10	6.00	2.97	3.25	2.22	3.27	1.82	1.62
26	3.05	4.23	4.07	4.23	5.70	5.05	2.95	3.05	2.17	4.32	1.67	1.57
27	2.83	3.93	4.87	4.03	7.10	4.60	2.92	17.37	2.17	4.02	1.57	1.52
28	2.73	3.77	13.25	4.73	10.65	4.48	2.97	21.02	2.27	3.82	1.57	1.72
29	2.57	3.63	9.57	5.03	.....	4.25	3.27	17.05	2.85	3.55	1.60	1.65
30	2.47	4.40	5.55	5.25	.....	4.05	4.50	9.20	2.82	3.17	1.67	1.60
31	2.43	.....	4.15	4.60	.....	3.88	.....	5.42	.....	2.87	2.17	.....

LITTLE KANAWHA RIVER AT LOCK 4, PALESTINE, W. VA.

LOCATION.—At Lock 4, Palestine, Wirt County, 30 miles from Parkersburg via Little Kanawha Railroad. Reedy Creek enters on left 1 mile above gage.

DRAINAGE AREA.—1,500 square miles (measured on map of West Virginia, scale 1:500,000).

RECORDS AVAILABLE.—April 25, 1915, to September 30, 1917. The upper and lower gages at the lock have been read under the direction of the Corps of Engineers, United States Army, as follows: November 5, 1905, to July 14, 1906; September 1–30, 1906; October 25, 1906, to date.

GAGE.—Upper gage at lock; vertical staff on right bank bolted to right side of river wall of lock just above upper gates; an inclined section of gage extends above top of lock wall; read by James Burton, lockmaster.

DISCHARGE MEASUREMENTS.—Made at cable about 1,200 feet below gage or by wading on crest of dam.

CHANNEL AND CONTROL.—One channel at all stages. Crest of dam No. 4 is the control for the gage; lowest point in crest of dam is at 9.4 feet gage height, which is the point of zero flow except for leakage through dam, lock gates and valves. Backwater submerges dam No. 4 during extreme floods on Ohio River.

EXTREMES OF STAGE.—Maximum stage recorded during year, 21.9 feet at 8 a. m. January 22; minimum stage, 9.48 feet at 6 p. m. September 20.

Highest headwater as reported by lockmaster occurred in 1897, and was equivalent to a gage height of about 30 feet on the lower gage, which corresponds to a reading of about 24.4 on upper gage, assuming 1 foot fall at dam. Highest backwater was during the flood of 1913, when crest was at 19.2 feet on upper gage.

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

REGULATION.—Flow may be affected at times by the manipulation of the pool above dam No. 5, about 9.5 miles above dam No. 4, and the occasional use of flash boards on dam No. 4.

ACCURACY—Stage-discharge relation practically permanent; not affected by ice during year. Variable leakage through lock and dam may affect the stage-discharge relation at low stages. Data inadequate for determining daily discharge. Gage read twice daily to hundredths. Previous to April 25, 1915, gage read once daily to tenths. Records excellent.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Little Kanawha River at Lock 4, Palestine, W. Va., during the year ending Sept. 30, 1917.

[Made by U. S. Army Engineers.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Feb. 25	15.30	15,500	Mar. 13	18.83	28,600
26	12.72	6,900	13	18.77	28,800

Daily gage height, in feet, of Little Kanawha River at Lock 4, Palestine, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	10.08	9.73	10.50	10.83	11.39	15.37	10.47	10.84	11.56	10.02	9.99	10.61
2	10.27	9.73	10.48	10.67	11.15	14.09	10.41	10.66	12.70	9.92	9.87	10.09
3	10.05	9.72	10.29	12.05	11.81	13.77	10.38	10.49	13.12	9.85	9.93	9.85
4	9.93	9.65	10.21	14.79	10.49	16.12	10.32	10.33	12.20	9.80	9.82	9.79
5	9.82	9.65	10.30	12.66	10.33	14.88	10.66	10.21	11.16	9.73	9.71	9.79
6	9.75	9.65	11.79	13.29	10.31	14.43	15.83	10.16	10.74	9.66	9.62	9.71
7	9.69	9.61	11.26	12.89	10.38	13.58	16.23	10.18	10.97	9.66	9.59	9.79
8	9.65	9.61	10.68	11.80	10.37	17.24	13.82	10.14	11.19	10.33	9.55	10.22
9	9.60	9.59	10.50	11.13	10.49	17.90	12.21	10.14	11.02	10.00	9.69	10.13
10	9.58	9.63	10.41	11.85	10.52	14.58	11.50	10.28	12.72	9.87	9.75	10.15
11	9.59	9.65	10.40	10.65	10.52	12.81	11.08	10.35	12.27	9.66	9.72	10.08
12	9.59	9.70	10.34	10.47	10.28	20.60	10.85	10.34	11.54	9.83	9.80	9.93
13	9.60	9.71	10.29	10.24	10.14	19.05	10.74	10.23	10.92	9.90	9.60	9.86
14	9.70	9.75	10.23	10.33	10.15	18.67	10.60	10.16	10.57	9.75	9.66	9.77
15	9.71	9.77	10.10	10.72	10.12	15.24	10.49	10.15	10.36	10.23	9.68	9.71
16	9.67	9.75	9.95	10.87	10.12	12.63	10.34	10.10	10.22	10.23	9.61	9.67
17	9.60	9.73	10.08	10.77	10.18	12.22	10.29	10.02	10.13	10.27	9.59	9.61
18	9.60	9.73	10.06	10.78	11.22	12.66	10.20	9.99	10.06	10.27	9.54	9.58
19	10.18	9.73	9.99	10.74	11.98	12.00	10.48	9.95	10.00	10.09	9.54	9.55
20	11.76	9.73	10.00	10.63	11.98	11.46	10.27	9.89	9.94	10.62	9.52	9.51
21	11.47	9.72	10.61	11.70	11.64	11.40	10.19	9.94	9.84	10.38	9.52	9.56
22	11.17	9.70	13.71	21.80	11.24	11.86	10.12	9.92	9.82	10.30	9.52	9.95
23	10.59	9.73	14.17	18.54	11.42	11.90	10.09	10.95	9.85	10.27	10.47	9.69
24	10.29	9.75	12.35	13.20	15.25	14.14	10.05	10.54	9.84	10.13	10.33	9.61
25	10.15	10.46	11.27	11.51	15.16	13.31	10.05	10.30	9.80	10.09	10.17	9.61
26	10.06	10.84	10.93	11.12	12.60	12.07	10.16	10.15	9.71	10.45	10.01	9.62
27	9.95	10.51	10.62	10.80	12.25	11.47	10.12	15.77	9.69	11.37	9.82	9.58
28	9.83	10.29	13.15	11.96	14.13	11.17	10.12	20.62	9.67	10.83	9.74	9.60
29	9.80	10.20	15.46	11.87	.....	10.99	10.50	19.42	9.75	10.56	9.65	9.60
30	9.77	10.32	13.04	11.27	.....	10.77	10.82	15.65	10.02	10.24	9.76	9.60
31	9.73	.....	11.35	11.91	.....	10.63	.....	12.50	.....	10.05	10.61	.....

SOUTH FORK OF HUGHES RIVER AT MACFARLAN, W. VA.

LOCATION.—About 80 feet above highway bridge half a mile east of Macfarlan, Ritchie County. Dutchman Run enters river on left 3,000 feet below station.

DRAINAGE AREA.—210 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 17, 1915, to September 30, 1917.

GAGE.—Vertical staff on right bank; read by A. H. Reynolds.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight 300 feet above and 1,500 feet below bridge. Bed of stream rock and mud. Control probably fairly permanent.

EXTREMES OF STAGE.—Maximum stage recorded during the year, 25.7 feet at 8 a. m. January 22; minimum stage, 1.90 feet October 4–8.

Highest flood known reached a stage represented by gage height about 29 feet.

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—Stage-discharge relation practically permanent; probably affected by ice part of February. Rating curve well defined between 100 and 2,660 second-feet and fairly well defined at other stages. Gage read twice daily to hundredths.

Record of daily discharge withheld because gage was not checked during 1917.

COOPERATION.—Base data furnished by United States Engineer Corps.

Daily gage height, in feet, of South Fork of Hughes River at Macfarlan, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.96	2.10	2.70	3.30	3.90	7.35	2.80	3.42	4.80	2.72	2.62	6.20
2	1.90	2.12	2.82	3.31	3.49	5.59	2.80	2.90	7.35	2.59	2.55	4.13
3	1.92	2.12	2.66	7.95	3.00	5.10	2.80	2.75	6.08	2.43	2.65	3.67
4	1.90	2.15	2.62	5.85	3.00	7.30	2.78	2.70	4.40	2.35	2.57	3.52
5	1.90	2.20	2.83	4.56	2.96	6.28	3.85	2.70	3.86	2.33	2.45	3.36
6	1.90	2.05	3.30	5.50	2.96	5.08	15.45	2.69	3.54	2.29	2.39	3.38
7	1.90	2.00	3.05	4.10	2.96	7.20	9.85	2.61	3.43	2.26	2.34	5.78
8	1.90	2.00	2.86	3.69	2.96	14.05	5.15	2.55	3.51	2.27	2.31	3.68
9	2.00	2.00	2.83	3.45	2.90	7.10	4.23	2.58	3.33	2.26	2.36	3.90
10	2.55	2.07	2.80	3.23	2.90	5.30	3.79	2.63	5.96	2.29	2.58	3.40
11	2.60	2.16	2.80	2.89	2.90	5.65	3.48	2.58	5.03	2.30	2.45	3.36
12	3.10	2.38	2.80	2.67	2.90	15.95	3.32	2.50	3.78	2.30	2.38	3.20
13	2.10	2.35	2.78	2.74	2.90	9.15	3.14	2.48	3.40	2.28	2.30	3.20
14	2.00	2.30	2.68	2.90	2.90	7.65	2.83	2.31	3.05	2.34	2.30	3.00
15	2.20	2.30	2.43	3.40	2.90	5.69	2.28	2.30	2.95	6.60	2.30	2.90
16	2.34	2.30	2.46	2.34	2.90	4.39	2.83	2.26	2.86	6.40	2.33	2.84
17	2.40	2.40	2.40	3.20	2.95	4.25	2.68	2.25	3.68	4.15	2.40	2.73
18	2.80	2.40	2.35	3.21	3.93	4.29	2.62	2.23	2.69	3.57	2.20	2.65
19	5.00	2.40	2.34	3.18	3.99	4.25	2.61	2.20	2.59	3.65	2.38	2.60
20	5.20	2.40	2.34	2.70	4.15	3.80	2.66	2.23	2.54	3.39	2.27	2.62
21	3.95	2.35	2.82	6.33	3.70	3.73	2.60	2.92	2.50	3.00	2.20	2.68
22	3.30	2.20	6.05	22.85	3.35	3.90	2.54	3.05	2.48	2.95	2.22	2.60
23	2.03	2.12	4.35	7.55	4.20	3.70	2.54	6.22	2.37	3.40	2.68	2.58
24	2.62	2.45	3.65	4.08	8.90	8.38	2.49	3.95	2.20	3.10	4.23	2.54
25	2.40	2.74	3.46	3.69	4.37	4.80	2.44	3.10	2.35	3.12	3.33	2.52
26	2.35	3.35	3.10	3.39	3.97	3.23	2.51	3.16	2.34	3.90	2.82	2.45
27	2.29	3.35	3.22	3.31	5.80	3.69	2.57	18.88	2.33	3.05	2.53	2.45
28	2.23	2.60	10.35	5.33	7.28	3.52	2.87	14.25	2.38	4.22	2.47	2.60
29	2.20	2.80	6.50	5.20	.....	3.30	3.48	8.30	3.10	3.48	2.47	2.60
30	2.13	3.10	3.89	5.32	.....	3.10	3.72	5.10	2.87	3.04	2.82	2.60
31	2.10	.....	3.30	4.15	.....	2.95	.....	4.16	.....	2.78	7.33	.....

HUGHES RIVER AT CISKO, W. VA.

LOCATION.—At Cisko, about 1 mile below junction of North and South forks and 6 miles south of Petroleum, Ritchie County.

DRAINAGE AREA.—453 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 29, 1915, to September 30, 1917.

GAGE.—Vertical and inclined staff on right bank; read by S. J. Enoch.

DISCHARGE MEASUREMENTS.—Made from cable 40 feet below gage or by wading at the same section.

CHANNEL AND CONTROL.—One channel at all stages; straight for about 150 feet above and 500 feet below cable section. Bed of river is sand, gravel, mud, and boulders; control is probably permanent.

EXTREMES OF STAGE.—Maximum stage recorded during year, 30.25 feet at 3 p. m. January 22; minimum, 2.14 feet October 14 and 15.

Highest known flood previous to January, 1917, reached a stage represented by gage height about 30 feet.

ICE.—Stage-discharge relation affected by ice during winter months.

ACCURACY.—Stage-discharge relation probably permanent; probably affected by ice December, January, and February. Stages of Ohio River at Parkersburg of about 40 feet or more will probably cause backwater at the gage. Records of daily discharge withheld because gage has not been checked since installation. Gage read twice daily to hundredths. Records excellent except for possible errors in gage.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Hughes River at Cisko, W. Va., during the year ending Sept. 30, 1917.

[Made by U. S. Army Engineers.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 9	11.30	4,880	Mar. 9	9.87	3,840	Mar. 14	12.17	5,720
9	10.60	4,420	13	8.3	2,620	14	11.65	5,000

Daily gage height, in feet, of Hughes River at Cisko, W. Va., for the year ending Sept 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.33	2.63	3.99	4.50	5.14	8.77	3.71	4.45	5.69	3.18	3.19	8.37
2	2.45	2.69	3.70	4.15	4.62	7.00	3.70	4.06	9.43	3.00	3.40	4.72
3	2.38	2.65	3.49	8.78	3.98	6.40	3.77	3.79	7.73	2.81	3.33	4.15
4	2.37	2.73	3.33	9.01	3.90	8.69	3.69	3.59	5.58	2.67	2.94	3.89
5	2.30	2.57	3.37	7.83	3.86	7.62	5.06	3.69	4.68	2.56	2.76	3.87
6	2.25	2.59	3.97	7.76	3.76	6.42	19.80	3.70	4.26	2.49	2.75	3.56
7	2.26	2.57	3.88	5.56	3.57	7.49	13.12	3.57	4.35	2.45	2.66	5.15
8	2.28	2.53	3.59	4.76	3.50	16.50	6.87	3.48	4.29	2.50	2.49	4.83
9	2.17	2.49	3.49	4.35	3.73	11.51	5.60	3.47	4.50	2.46	2.40	4.15
10	2.25	2.61	3.53	4.14	3.94	7.50	4.95	3.45	9.48	2.69	2.61	3.74
11	2.17	2.86	3.51	3.94	3.66	8.65	4.53	3.37	7.36	2.81	2.70	3.46
12	2.17	2.89	3.50	3.64	3.46	16.00	4.30	3.27	4.96	2.83	2.55	3.18
13	2.24	3.07	3.49	3.37	6.24	8.53	4.15	3.19	4.30	2.68	2.50	3.01
14	2.15	2.95	3.30	3.49	3.15	11.05	3.94	3.11	3.92	2.63	2.49	2.93
15	2.15	2.99	3.17	4.40	3.20	7.10	3.77	3.06	3.67	6.76	2.62	2.82
16	2.29	3.07	3.16	4.72	3.31	5.48	3.64	2.99	3.48	8.03	2.56	2.69
17	2.62	3.13	3.07	4.42	3.34	6.14	3.53	2.93	3.34	4.92	2.55	2.72
18	3.37	3.07	2.98	4.16	4.46	6.75	3.45	2.86	3.21	4.27	2.48	2.56
19	5.95	2.97	3.01	4.03	5.04	5.41	3.48	2.80	3.13	4.34	2.41	2.48
20	7.02	2.90	2.95	3.88	5.15	4.88	3.48	3.25	3.08	4.04	2.41	2.48
21	5.13	2.82	3.35	7.69	4.92	4.82	3.38	4.88	2.94	3.77	2.36	2.42
22	4.39	2.78	8.65	28.32	4.37	4.97	3.30	3.89	2.87	3.59	2.25	2.60
23	3.81	2.79	6.25	9.27	5.67	5.14	3.21	6.43	2.85	3.76	2.75	2.61
24	3.48	3.11	4.73	5.45	10.20	13.57	3.16	4.73	2.69	3.73	5.02	2.59
25	3.24	4.28	4.43	4.82	615	7.06	3.15	3.95	2.72	3.37	4.24	2.43
26	3.12	3.95	4.12	4.49	5.08	5.36	3.62	3.61	2.55	3.57	3.61	2.35
27	2.94	3.59	5.39	4.12	5.82	4.80	3.57	19.65	2.60	5.01	3.23	2.35
28	2.93	3.35	12.40	6.78	7.75	4.61	4.29	20.38	2.63	6.03	2.96	2.33
29	2.77	3.35	9.03	7.00	.....	4.32	5.07	12.86	3.30	4.30	2.87	2.37
30	2.76	3.75	5.39	7.55	.....	4.06	4.77	6.44	3.34	3.78	3.02	2.38
31	2.80	.....	4.55	5.61	.....	3.85	.....	5.13	.....	3.44	6.62	.....

HOCKING RIVER BASIN.

HOCKING RIVER AT ATHENS, OHIO.

LOCATION.—At single-span highway bridge at Mill Street, about three-fourths of a mile from business section of Athens, Athens County. Margaret Creek enters on right, 3½ miles above station.

DRAINAGE AREA.—944 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 3, 1915, to September 30, 1917.

GAGE.—Vertical and inclined staff at downstream end of right abutment; read by Paul B. Casley.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Channel straight about 700 feet above and below station. Left bank overflows at gage height 17 feet and water passes around bridge. Bed of stream rocky with sand deposits near both banks. Ruins of old mill dam 300 feet below gage act as control. Stage-discharge relations will shift as dam decays.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 16.4 feet at 8 a. m. January 23 (discharge, 10,900 second-feet); minimum stage, 2.80 feet several days in October (discharge, 65 second-feet).

Highest flood known reached a stage represented by gage height about 26 feet.

ICE.—Stage-discharge relation probably not materially affected by ice except during extremely cold weather.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice December 18–19, January 14–20, and February 15–17. Rating curve well defined to 12,000 second-feet; above this point curve is an extension. Gage read twice daily to hundredths. Daily discharge obtained by applying mean daily gage height to rating table except for periods affected by ice. Records excellent.

COOPERATION.—Base data furnished by United States Engineer Corps.

Daily discharge, in second-feet, of Hocking River at Athens, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	79	85	131	598	2,320	910	598	850	5,160	2,780	260	140
2	71	79	125	495	1,480	850	910	625	8,540	1,750	280	194
3	71	88	125	970	970	790	1,610	520	6,750	970	260	170
4	71	79	113	1,220	708	1,280	970	470	2,030	570	205	110
5	83	85	161	4,660	625	1,160	850	680	1,220	445	194	102
6	71	88	348	8,140	520	625	7,470	598	1,090	370	260	131
7	83	83	219	5,160	545	970	10,100	545	970	495	240	240
8	77	81	174	3,000	570	3,860	4,500	495	762	4,990	222	155
9	83	92	161	1,480	545	3,300	2,480	570	850	1,220	280	131
10	71	92	125	1,030	570	2,180	1,540	445	1,420	735	240	125
11	75	92	143	850	545	4,180	1,160	520	1,750	625	202	125
12	83	98	137	598	470	6,930	970	470	1,090	545	302	170
13	79	92	119	495	420	5,850	910	348	680	545	348	128
14	83	98	85		280	8,040	708	445	545	652	240	131
15	88	100	79			6,930	652	420	545	2,400	260	75
16	85	95	75		280	4,340	570	370	470	2,180	194	79
17	79	88	67	400		2,480	520	420	395	1,750	205	85
18	88	92	60		280	1,540	970	348	470	1,890	177	79
19	208	95	60		370	1,030	910	260	348	2,620	170	116
20	370	85	110		545	970	680	325	302	1,030	140	90
21	280	88	280	470	625	1,090	520	545	325	625	131	98
22	216	92	470	10,100	495	1,350	520	520	240	520	98	146
23	149	119	445	10,700	652	1,220	420	520	395	545	302	194
24	131	155	495	3,940	5,160	6,660	470	420	545	470	280	170
25	108	167	276	2,550	2,620	4,180	652	280	395	445	131	170
26	92	146	302	1,540	1,420	2,320	598	325	268	445	140	155
27	85	134	5,080	970	1,220	1,350	570	4,180	268	625	131	161
28	79	122	8,240	1,960	970	1,160	790	6,750	280	850	194	161
29	83	113	3,380	3,860	.....	910	910	9,050	2,100	520	205	116
30	81	137	1,350	6,030	.....	762	790	3,080	3,220	348	161	85
31	88	.....	680	3,220	.....	680	.....	1,480	.....	240	212	.....

NOTE.—Daily discharge estimated, because of ice from climatic data: Dec. 18–19, Jan. 14–20, Feb. 15–17. Braced figures show mean for the periods.

Monthly discharge of Hocking River at Athens, Ohio, for the year ending Sept. 30, 1917.

[Drainage area, 944 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	370	71	109	0.115	0.13
November	167	79	102	.108	.12
December	8,240	.....	762	.807	.93
January	10,700	.....	2,480	2.63	3.03
February	5,160	.....	920	.975	1.02
March	8,040	625	2,580	2.73	3.15
April	10,100	420	1,510	1.60	1.78
May	9,050	260	1,190	1.26	1.45
June	8,540	240	1,450	1.54	1.72
July	4,990	240	1,100	1.17	1.35
August	348	98	215	.228	.26
September	240	75	134	.142	.16
The year	10,700	.....	1,050	1.11	15.10

KANAWHA RIVER BASIN.

NEW RIVER AT EGGLESTON, VA.

LOCATION.—At highway bridge at Eggleston, Giles County.

DRAINAGE AREA.—2,920 square miles.

RECORDS AVAILABLE.—October 1, 1914, to September 30, 1917.

GAGE.—Chain gage attached to downstream side of bridge, read by J. A. Bishop.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge.

CHANNEL AND CONTROL.—Stream bed composed of rock covered with silt. Primary control is rock ledge about 1¼ miles below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11.86 feet at 8 a. m.; March 5 (discharge, 28,400 second-feet); minimum stage, 2.37 feet at 5 p. m., August 29 (discharge, 652 second-feet). The flood of 1878 reached a stage of about 40 feet on present gage.

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—Stage-discharge relation practically permanent; see foot-notes to tables of daily discharge for effect of ice. Rating curve well defined between 1,200 and 45,000 second-feet; extended beyond these limits. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table, except as noted. Records excellent.

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

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Dec. 9	Lee and Walters	3.84	2,310
June 26	B. E. Jones	3.19	1,370

Daily discharge, in second-feet, of New River at Eggleston, Va., for the years ending Sept. 30, 1915–1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1914–15.												
1	911	1,670	7,120	7,750	5,690	5,220	3,510	3,120	3,310	2,120	1,970	4,990
2	971	1,280	12,700	6,430	25,400	4,990	3,510	2,940	5,690	1,970	1,460	4,330
3	911	1,400	14,000	5,450	17,400	4,990	3,510	2,770	6,690	1,530	1,530	3,510
4	1,030	1,400	9,750	4,770	12,000	4,990	3,310	2,940	5,450	1,530	1,530	3,910
5	1,360	1,670	33,000	4,550	9,160	4,990	3,310	2,940	4,550	2,120	2,120	10,700
6	2,390	1,600	22,100	4,550	8,580	4,990	3,510	2,940	3,710	2,940	2,280	25,400
7	1,990	1,400	13,000	30,100	8,300	5,450	3,510	2,940	3,310	2,940	1,970	13,000
8	2,120	1,400	10,000	20,500	7,480	5,690	3,310	2,770	3,120	2,940	1,670	5,930
9	2,250	1,220	7,120	11,000	6,690	4,990	3,310	3,120	2,940	2,600	1,400	5,450
10	1,610	1,280	6,180	4,770	5,930	4,770	3,310	3,120	3,120	2,120	1,530	4,550
11	911	1,460	5,450	6,690	5,690	4,990	3,310	2,940	2,770	1,970	1,970	3,910
12	1,030	1,670	5,220	8,020	5,450	4,990	3,710	2,770	2,600	1,530	2,280	3,910
13	1,320	1,460	4,990	12,000	5,220	5,220	4,120	2,940	2,600	1,820	3,710	4,330
14	1,070	1,400	4,330	9,160	4,990	4,550	3,910	3,310	2,120	1,970	3,310	4,990
15	1,190	1,740	3,810	7,750	4,990	4,330	3,710	3,310	3,120	1,670	3,120	4,330
16	7,720	4,770	2,690	7,750	5,690	4,330	3,510	2,770	3,310	1,670	2,120	3,910
17	11,700	4,990	2,990	8,300	6,180	5,220	3,310	2,600	4,120	1,970	4,120	3,510
18	5,170	3,710	3,150	8,580	5,690	4,990	3,120	3,310	3,510	1,970	4,330	3,510
19	3,310	2,940	3,480	11,300	5,220	4,990	2,940	2,940	3,120	1,530	2,770	3,120
20	2,830	2,770	4,830	11,300	4,770	4,330	3,120	2,280	2,600	1,820	2,440	2,940
21	2,600	2,120	6,620	9,160	5,220	4,330	2,940	2,440	2,280	1,970	2,440	3,120
22	2,120	1,740	8,890	7,120	4,550	4,120	2,940	2,600	2,440	2,280	6,430	2,940
23	1,970	1,820	7,350	6,430	4,550	4,120	2,940	3,310	2,600	2,440	3,710	2,600
24	1,820	1,970	5,900	6,430	5,450	3,910	2,940	3,510	1,970	2,940	2,940	2,440
25	1,970	1,970	5,900	6,690	9,750	3,910	2,940	4,120	1,970	2,120	2,600	2,280
26	1,970	1,970	10,500	7,480	8,020	3,710	2,940	3,710	1,970	1,820	2,280	2,120
27	2,280	1,820	9,290	7,480	6,430	3,710	3,120	2,940	1,820	2,120	2,120	1,670
28	1,970	2,120	6,620	6,430	5,690	3,710	2,770	2,940	1,400	1,820	2,940	2,440
29	1,820	1,820	6,620	5,930	.....	3,510	2,940	2,770	1,400	1,530	3,310	2,280
30	1,670	1,670	8,890	5,450	.....	4,550	3,120	3,310	1,970	1,400	5,220	2,280
31	1,670	.....	9,160	5,220	.....	3,710	.....	3,310	.....	1,400	5,220	.....
1915–16.												
1	5,450	2,360	3,120	9,750	6,430	5,220	4,330	2,770	2,200	2,520	5,450	4,550
2	20,500	2,940	2,770	7,480	11,000	4,990	3,910	3,510	2,600	2,600	7,120	3,710
3	8,300	2,360	3,120	7,480	20,100	5,450	3,910	2,600	2,520	1,970	9,750	3,710
4	5,930	2,040	3,120	6,180	13,000	6,950	3,910	2,600	2,280	2,940	6,690	3,510
5	4,990	2,280	2,200	5,690	9,750	6,430	4,120	2,600	1,740	2,200	8,580	4,120
6	5,690	2,770	2,200	5,220	7,480	5,690	4,120	3,310	2,770	2,360	7,120	3,710
7	6,430	2,360	3,120	5,450	6,950	5,690	4,550	3,710	2,200	2,040	8,870	3,310
8	5,690	2,360	2,360	18,100	5,930	5,930	5,220	1,900	3,120	1,740	9,750	3,310
9	4,990	2,520	2,440	13,000	5,450	6,430	5,930	2,940	2,600	1,740	10,700	4,550
10	4,990	2,280	2,200	7,480	5,450	5,930	4,770	2,440	2,440	2,440	6,180	2,940
11	3,910	2,770	2,120	7,480	5,220	5,220	4,550	2,440	2,440	19,700	7,120	2,940
12	3,710	2,600	2,940	6,690	4,990	5,450	4,990	2,440	1,900	11,600	6,430	3,710
13	3,510	2,280	2,770	7,120	4,770	5,690	4,120	2,200	2,520	5,930	6,180	2,940
14	3,510	2,120	2,860	5,690	4,770	5,220	5,690	2,600	2,200	4,770	4,990	2,770
15	3,510	1,900	2,800	5,450	4,330	4,990	5,220	2,280	2,360	5,220	5,220	3,310
16	3,710	2,940	2,800	4,990	4,330	4,550	4,550	3,120	2,940	108,000	13,000	8,300
17	3,510	2,600	3,100	4,770	4,120	3,910	4,120	2,360	4,990	72,500	11,000	4,120
18	3,120	2,520	3,400	4,330	4,330	3,910	4,120	2,280	5,930	34,700	9,160	3,310
19	3,120	2,770	25,000	4,300	4,330	3,910	3,710	2,200	3,910	20,900	6,180	3,310
20	3,310	7,120	13,000	4,200	4,330	3,710	3,510	2,040	3,710	14,000	5,450	3,120
21	2,940	5,450	6,430	3,910	3,910	4,120	3,510	1,820	3,120	13,000	4,990	2,770
22	3,910	4,770	5,930	4,770	4,120	4,120	3,510	1,670	3,120	12,700	4,990	2,940
23	3,510	3,310	4,990	5,690	3,910	3,910	3,510	1,970	2,360	12,700	6,950	2,940
24	3,310	3,510	4,550	5,690	4,550	3,910	3,120	3,310	2,280	11,000	7,750	2,770
25	3,120	3,120	4,120	5,690	13,700	3,710	3,310	4,770	2,770	9,160	5,220	2,440
26	3,120	2,770	5,690	4,550	10,000	3,510	3,310	4,120	1,900	8,300	4,550	2,940
27	2,940	3,120	5,930	6,950	7,750	3,710	3,310	3,120	3,120	8,020	4,120	2,940
28	2,940	3,310	5,450	5,690	6,180	4,990	3,510	4,120	2,940	7,480	4,550	2,600
29	3,120	3,310	6,950	6,430	5,450	5,930	3,310	2,440	2,440	7,120	6,430	3,510
30	2,520	3,310	22,500	6,180	.....	4,990	2,940	3,310	2,520	7,480	5,220	7,120
31	3,710	.....	14,400	5,930	.....	4,550	.....	2,600	.....	6,180	4,120	.....

Daily discharge, in second-feet, of New River at Eggleston, Va., for the years ending Sept. 30, 1915–1917—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916–17.												
1	4,330	3,120	2,440	3,710	4,990	4,770	4,330	3,910	1,970	1,530	1,530	1,400
2	3,310	3,120	2,600	3,310		7,480	4,120	4,120	1,900	1,530	1,530	1,970
3	3,310	2,940	2,600	3,710		12,000	3,510	3,910	2,600	1,120	1,460	1,970
4	2,770	2,770	2,600	4,550		15,500	3,120	3,710	2,280	1,400	1,530	2,600
5	2,770	2,600	2,280	10,400		27,100	3,910	3,310	2,600	1,460	2,280	2,200
6	2,600	1,900	2,360	11,000		17,400	6,690	3,120	2,040	1,530	1,900	1,900
7	2,940	2,200	2,360	8,580		11,000	7,210	3,120	1,740	1,530	1,820	1,820
8	2,770	2,200	2,120	6,950		8,870	5,690	3,910	1,820	1,600	1,530	1,900
9	2,280	2,520	2,280	5,690		7,480	5,220	3,710	1,820	1,340	1,460	1,670
10	3,120	2,600		4,770	3,500	6,690	5,220	3,910	1,970	1,400	1,530	1,600
11	3,120	2,360		3,310		6,180	4,990	3,910	2,040	1,820	1,740	1,340
12	2,440	2,200		4,120		5,450	4,770	3,910	2,280	1,530	1,970	1,280
13	2,200	1,740		3,310		6,180	4,770	3,710	1,740	1,740	2,040	1,340
14	2,360	2,520		2,940		6,950	4,770	2,600	1,670	1,820	1,900	1,460
15	2,600	2,520		3,120		6,950	4,330	3,510	1,740	1,530	1,530	1,340
16	1,900	2,120		4,770		6,430	3,910	3,120	1,670	1,400	1,340	1,400
17	2,600	2,360		3,710	7,480	6,950	4,120	2,600	1,740	2,040	1,530	1,400
18	3,510	2,440		4,120	7,750	10,000	4,120	2,520	1,900	3,310	1,340	1,400
19	3,910	2,360		4,120	6,690	8,870	3,710	2,360	1,600	3,310	1,670	1,400
20	13,000	1,970		4,330	4,990	7,210	3,510	2,120	1,460	3,120	1,600	1,340
21	5,930	2,520	2,600	4,120	6,180	6,430	3,310	1,900	1,530	2,040	1,280	1,340
22	4,770	2,440		3,910	5,930	5,930	3,120	1,900	1,600	2,360	1,340	1,280
23	3,910	2,440		4,990	4,990	5,930	3,120	2,360	1,600	3,310	1,530	1,220
24	2,520	2,600		6,180	6,430	6,950	3,710	2,360	1,670	4,990	1,600	1,170
25	2,770	3,120		5,220	7,210	8,300	3,310	2,040	1,900	6,430	1,400	1,280
26	3,120	2,770		4,770	5,930	8,580	3,120	1,970	1,400	6,180	1,400	1,340
27	2,940	1,900		4,330	4,990	6,950	3,120	2,040	1,530	4,770	1,020	1,280
28	2,940	2,360		3,910	4,550	5,930	2,200	2,120	1,820	3,510	684	1,280
29	2,440	2,440		3,710	.....	5,450	3,120	2,600	1,460	2,600	670	1,340
30	2,280	2,200		4,550	.....	4,990	3,510	2,940	1,460	2,120	1,460	1,460
31	3,120	.....		7,210	.....	4,550	.....	2,280	.....	1,970	1,170	.....

NOTE.—Daily discharge estimated, because of ice, from observer's notes, climatic data, and by comparison with discharge at Radford as follows: 1914–15, Dec. 15–30; 1915–16, Dec. 14–18, and Jan. 19–20; 1916–17, Dec. 10–31, Feb. 2–16. Daily discharge Oct. 1–20, 1915, estimated from flow at Radford. Determinations of daily and monthly discharge for 1914–15 differ slightly from those published in Water Supply Paper No. 423, owing to revision of rating curve. Braced figures show mean discharge for period included.

Monthly discharge of New River at Eggleston, Va., for the years ending Sept. 30, 1915–1917.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1914–15.					
October	11,700	911	2,380	0.815	0.94
November	4,990	1,220	2,010	.688	.77
December	33,000	2,690	8,440	2.89	3.33
January	30,100	4,550	8,530	2.92	3.37
February	25,400	4,550	7,510	2.57	2.68
March	5,690	3,510	4,590	1.57	1.81
April	4,120	2,770	3,280	1.12	1.25
May	4,120	2,280	3,020	1.03	1.19
June	6,690	1,400	3,050	1.04	1.16
July	2,940	1,400	2,020	.692	.80
August	6,430	1,400	2,800	.959	1.10
September	25,400	1,670	4,810	1.65	1.84
The year	33,000	911	4,360	1.49	20.24

Monthly discharge of New River at Eggleston, Va., for the years ending Sept. 30, 1915–1917—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1915–16.					
October	20,500	2,520	4,610	1.58	1.82
November	7,120	1,900	3,000	1.03	1.15
December	25,000	2,120	5,630	1.93	2.22
January	18,100	3,910	6,530	2.24	2.58
February	20,100	3,910	6,780	2.32	2.50
March	6,950	3,510	4,930	1.69	1.95
April	5,930	2,940	4,090	1.40	1.56
May	4,770	1,670	2,760	.945	1.09
June	5,930	1,740	2,800	.959	1.07
July	108,000	1,740	13,600	4.66	5.37
August	13,000	4,120	6,900	2.36	2.72
September	8,300	2,440	3,610	1.24	1.38
The year	108,000	1,670	5,450	1.87	25.41
1916–17					
October	13,000	1,900	3,370	1.16	1.34
November	3,120	1,740	2,440	.836	.93
December			2,540	.870	1.00
January	11,000	2,940	4,950	1.70	1.96
February			4,660	1.60	1.67
March	27,100	4,550	8,370	2.87	3.31
April	7,210	2,200	4,120	1.41	1.57
May	4,120	1,900	2,950	1.01	1.16
June	2,600	1,400	1,820	.623	.70
July	6,430	1,120	2,460	.843	.97
August	2,280	670	1,510	.517	.60
September	2,600	1,170	1,520	.521	.60
The year	27,100	670	3,400	1.16	15.81

KANAWHA RIVER AT LOCK 2, MONTGOMERY, W. VA.

LOCATION.—At Lock 2, three-fourths of a mile below Chesapeake & Ohio Railway station at Montgomery, Fayette County. Morris Creek enters on left about 300 feet below the gage.

DRAINAGE AREA.—8,470 square miles.

RECORDS AVAILABLE.—June 22, 1915, to September 30, 1917. Upper and lower gages at the lock have been read since December, 1887, under the direction of the Corps of Engineers, United States Army.

GAGE.—Upper gage at lock, vertical and inclined staff on right bank, short distance above upper lock gates; vertical section fastened to land wall of lock, inclined section at upstream end of paved slope; read by George Meyers, lockmaster. A chain gage fastened to downstream handrail near center of toll bridge at Montgomery is used in referring water surface at bridge when making discharge measurements.

DISCHARGE MEASUREMENTS.—Made from bridge at Montgomery or by wading on the crest of the dam.

CHANNEL AND CONTROL.—One channel at all stages; straight for 300 feet above and 800 feet below bridge. Bed of river composed of rock, sand, and mud. The dam at Lock No. 2 is control for all stages, as there is a fall of about 2 feet at the dam at the maximum stage. Except for the leakage through the dam and lock, point of zero flow is at lowest point in crest of dam, which is 17.9 feet above zero of upper gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 36.8 feet at 7 a. m. March 5 (discharge, 138,000 second-feet); minimum stage, 18.40 feet at 7 a. m. September 1 (discharge, 1,270 second-feet).

Highest stage recorded occurred May 23, 1901, at 6 a. m.; upper gage 49.65 lower gage 47.70 (discharge, about 250,000 second-feet).

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

LEAKAGE.—At about gage height 19 feet on upper gage, leakage through the dam amounts to about 500 second-feet. Leakage through the lock gates amounts to about 110 and 260 second-feet, depending upon which of the two gates is closed.

ACCURACY.—Stage-discharge relation practically permanent except as may be affected by change in leakage through lock and dam; not affected by ice. Rating curve well defined throughout. Gage read twice daily to hundredths since June 22, 1915; once daily previous to this date. Daily discharge ascertained by applying mean daily gage height to rating table which is adjusted for leakage through dam and lock gates. Records good.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of leakage through gates at Lock 2, Kanawha River, Montgomery, W. Va., during the year ending Sept. 30, 1917.

[Made by Peterson and Hopkins.]

Date.		Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Sept. 18	Upper gates	18.91	263
18	Lower gates	19.04	106

Discharge measurements of Kanawha River at Lock 2, Montgomery, W. Va., during the year ending Sept. 30, 1917.

[Made by Peterson and Hopkins.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Sept. 17	18.96	1,980
18	18.93	[a] 1,490

[a] Measured on crest of dam No. 2; does not include leakage through dam but does include leakage of 263 second-feet through lock.

Daily discharge, in second feet, of Kanawha River at Lock 2, Montgomery, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	16,300	4,150	4,350	16,800	20,500	43,300	13,300	11,300	14,300	2,860	2,990	1,390
2	11,300	4,580	4,800	13,800	34,800	58,000	12,300	13,300	13,800	2,860	2,860	1,770
3	7,800	4,580	4,800	12,300	23,600	74,900	11,300	13,300	18,800	2,740	2,530	1,770
4	5,800	3,950	5,300	14,800	17,800	111,000	10,800	11,300	14,800	2,740	2,530	1,900
5	4,800	3,950	4,800	33,900	12,800	134,000	9,800	10,300	12,300	2,350	2,990	2,350
6	4,350	3,770	4,150	58,000	9,300	81,200	12,800	11,800	9,800	2,530	2,530	2,640
7	3,950	3,430	4,580	49,300	7,800	48,400	24,300	8,800	8,800	2,530	2,860	2,440
8	3,770	3,130	4,150	32,300	9,300	41,500	27,800	8,300	7,300	2,350	2,640	2,640
9	3,590	3,130	4,150	22,400	10,800	40,700	23,600	12,300	6,300	2,350	2,120	3,270
10	3,590	3,430	4,150	17,800	9,300	35,600	19,900	15,300	6,800	2,350	2,350	3,950
11	3,430	3,590	4,150	14,800	7,800	25,000	16,800	15,300	7,800	2,190	2,530	3,770
12	3,950	3,430	4,580	12,300	8,300	39,000	15,300	13,800	6,800	1,900	2,440	2,860
13	3,430	3,430	4,150	9,800	7,800	62,500	14,300	12,800	5,300	2,530	2,350	2,350
14	3,130	3,430	4,150	8,800	5,800	63,400	13,300	11,800	5,800	2,270	2,270	2,040
15	3,130	3,270	4,350	10,300	7,300	56,300	12,800	10,300	4,800	2,190	2,190	1,970
16	3,130	3,590	3,950	11,800	9,800	39,000	11,800	9,300	4,150	2,740	2,040	1,970
17	3,130	3,590	3,430	12,300	10,300	33,100	10,800	8,300	3,590	2,640	2,040	1,970
18	3,430	3,770	3,590	11,300	10,800	49,300	9,800	7,300	3,270	2,990	1,770	1,970
19	6,800	3,430	3,430	10,300	13,300	40,700	8,800	6,800	3,430	3,950	1,900	1,770
20	9,800	3,590	2,990	10,300	21,100	29,300	8,300	6,300	3,130	5,300	1,900	1,640
21	19,400	3,430	3,130	9,800	45,800	22,400	7,800	5,800	3,590	5,300	1,840	1,510
22	14,300	2,990	10,300	29,300	34,800	30,100	6,800	4,800	4,150	4,580	1,840	1,640
23	10,300	2,860	18,800	44,100	23,600	28,600	7,300	4,150	3,590	5,800	1,840	1,640
24	8,300	3,590	17,800	32,300	45,000	46,700	6,300	4,350	2,990	8,300	1,970	1,640
25	6,800	4,580	14,300	23,600	61,600	66,900	6,300	4,800	2,990	9,800	1,770	1,640
26	5,800	5,800	12,300	17,800	40,700	44,100	6,800	4,580	2,860	10,800	1,840	1,510
27	4,800	5,800	10,800	14,800	26,400	30,100	6,800	12,300	2,640	11,800	1,840	1,510
28	4,800	5,800	19,900	12,800	27,100	23,600	6,800	39,000	2,440	9,800	1,770	1,450
29	4,580	4,150	56,300	11,800	.....	19,900	7,300	41,500	2,740	8,800	1,700	2,040
30	4,150	4,580	37,300	11,800	.....	17,300	8,800	28,600	2,740	5,300	1,580	1,900
31	4,150	.....	23,000	15,800	.....	14,800	.....	18,800	.....	4,350	1,510	.....

Monthly discharge of Kanawha River at Lock 2, Montgomery, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 8,470 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	19,400	3,130	6,320	0.743	0.86
November	5,800	2,860	3,890	.459	.51
December	56,300	2,990	9,930	1.17	1.35
January	58,000	8,800	19,600	2.31	2.66
February	61,600	5,800	20,100	2.37	2.47
March	134,000	14,800	46,800	5.53	6.38
April	27,800	6,300	12,000	1.42	1.58
May	41,500	4,150	12,500	1.48	1.71
June	18,800	2,440	6,390	.754	.84
July	11,800	1,900	4,420	.522	.60
August	2,990	1,510	2,170	.256	.30
September	3,950	1,390	2,100	.248	.28
The year	134,000	1,390	12,200	1.44	19.54

GREENBRIER RIVER AT ALDERSON, W. VA.

LOCATION.—At reinforced concrete arch highway bridge at Alderson, Monroe County, half a mile above mouth of Muddy Creek.

DRAINAGE AREA.—1,340 square miles.

RECORDS AVAILABLE.—July 30, 1895, to July 15, 1906; May 10, 1907, to September 30, 1917.

GAGE.—Chain gage attached to downstream side of bridge near center of second span from left side of river. Read by W. J. Hancock.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—The channel and control are composed of coarse gravel and are practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 14.2 feet at 6 p. m. March 4 (discharge, 34,000 second-feet); minimum stage, 1.60 feet August 31 (discharge, 74 second-feet). Maximum stage since establishment of station, 19.4 feet at 6 p. m. March 27, 1913 (discharge, about 62,000 second-feet).

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

ACCURACY.—Stage-discharge relation practically permanent; affected by ice December 12–14 and February 12 and 13. Rating curve used during 1915, 1916, and 1917, fairly well defined between 100 and 28,000 second-feet; extended beyond these limits. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage heights to rating table. Discharge December 12–14, 1917, interpolated because of ice conditions. Records good except for ice periods, for which they are poor.

Discharge measurements of Greenbrier River at Alderson, W. Va., during the year ending Sept. 30, 1917.

[Made by B. E. Jones.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 29	5.55	8,060
30	4.66	5,470
31	3.94	3,560

Daily discharge, in second-feet, of Greenbrier River at Alderson, W. Va., for the years ending Sept. 30, 1915–1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1914–15.												
1	64	218	169	4,490	4,490	2,500	804	1,250	204	185	137	463
2	66	185	547	3,710	27,800	2,090	777	1,080	516	169	133	394
3	66	169	1,250	2,810	24,800	1,700	725	1,000	626	185	126	345
4	69	158	1,420	1,510	15,200	1,420	686	1,160	7,500	204	536	394
5	72	164	1,990	1,080	6,120	1,420	649	1,160	5,300	268	916	725
6	90	153	5,300	1,510	5,850	1,340	637	1,000	2,810	336	637	1,000
7	92	142	3,030	26,300	7,500	1,420	592	832	1,990	336	536	818
8	92	126	2,190	16,700	6,680	1,510	686	777	1,420	355	394	637
9	97	133	1,790	11,600	5,580	1,340	930	699	1,160	374	311	526
10	92	115	1,700	9,800	3,960	1,340	1,080	649	902	302	302	432
11	100	118	1,700	7,500	3,250	1,600	1,000	581	712	239	253	336
12	118	111	1,890	6,400	2,600	1,790	1,160	526	592	211	246	277
13	111	115	1,890	6,400	2,190	1,790	1,080	526	526	197	260	260
14	122	115	1,890	5,580	1,600	1,510	1,250	484	615	190	364	253
15	239	122	1,890	3,480	3,480	1,420	1,080	484	1,600	185	790	294
16	403	122	1,890	4,220	7,780	1,420	930	463	1,700	197	604	232
17	1,080	218	1,890	5,300	5,300	1,600	874	442	1,510	153	818	190
18	860	311	1,790	11,600	3,480	1,510	777	413	2,090	137	637	174
19	637	253	1,990	14,900	2,600	1,420	725	345	1,990	122	526	158
20	581	286	4,490	13,400	1,990	1,160	673	355	1,340	197	818	164
21	432	253	8,600	9,500	1,700	1,160	660	355	874	260	604	345
22	374	185	8,900	6,680	1,510	1,080	712	336	660	204	463	660
23	311	185	8,050	5,850	1,340	930	764	403	484	185	526	930
24	239	158	7,220	5,300	3,250	860	558	463	452	355	570	738
25	239	118	6,400	5,850	12,800	818	526	442	384	268	442	526
26	268	137	5,580	6,120	6,950	790	604	474	294	204	345	384
27	286	153	4,760	5,850	4,220	832	581	484	246	174	302	374
28	345	142	5,300	5,030	3,030	874	592	463	211	211	277	336
29	320	164	5,850	3,710	.....	860	712	452	190	190	294	294
30	294	190	6,120	3,030	.....	888	1,250	452	179	169	423	268
31	225	.....	6,120	2,810	.....	902	.....	239	.....	158	547	.....
1915–16.												
1	9,800	253	649	5,030	5,850	2,190	3,030	1,890	1,250	516	790	294
2	18,500	253	581	3,710	8,050	2,090	2,290	1,600	1,000	581	7,220	268
3	6,400	239	570	4,490	6,400	2,810	2,090	1,340	1,000	777	3,480	253
4	3,250	211	526	3,710	4,220	2,810	1,890	1,250	1,000	699	1,890	232
5	2,090	197	474	2,600	3,250	2,500	1,700	1,160	1,160	1,000	1,510	204
6	1,600	185	403	2,290	3,030	3,250	1,700	1,080	930	818	1,700	190
7	1,160	190	423	2,090	2,810	5,300	2,090	930	1,000	452	1,700	190
8	1,000	204	328	1,990	3,710	2,390	2,190	860	526	452	2,290	190
9	804	185	294	1,510	3,250	7,500	2,190	790	1,990	423	2,090	204
10	673	190	442	1,340	3,960	4,760	2,190	846	2,810	463	1,890	204
11	626	190	384	463	3,480	3,250	5,300	764	2,500	673	1,510	232
12	547	190	328	13,400	3,030	2,600	6,680	712	2,090	790	1,420	185
13	494	179	311	11,000	3,250	2,190	5,850	660	1,600	615	1,340	169
14	442	185	336	8,600	4,220	2,190	4,220	592	1,250	484	1,250	164
15	423	218	403	5,300	3,710	3,710	1,160	581	3,710	452	902	232
16	384	364	328	3,710	2,810	3,030	2,500	547	6,680	526	1,600	1,250
17	364	738	403	2,810	2,500	3,480	2,090	536	12,200	2,390	2,390	860
18	336	916	902	2,190	2,090	2,600	1,700	558	8,050	3,480	1,990	660
19	364	874	12,500	1,600	1,790	2,090	3,710	558	4,220	2,290	1,340	463
20	403	1,890	5,850	1,160	1,420	1,890	1,340	526	2,810	1,420	1,340	355
21	413	2,090	3,480	1,340	1,340	1,510	1,160	484	1,990	1,080	1,000	277
22	432	1,700	2,290	1,510	1,340	1,600	1,250	452	1,510	1,160	790	225
23	474	1,340	1,790	1,790	1,250	3,710	1,160	686	3,250	3,030	2,810	232
24	432	1,160	1,510	1,890	1,340	5,030	1,160	2,600	1,080	1,890	1,890	232
25	384	1,000	1,160	1,510	6,400	3,480	1,250	2,500	1,080	1,420	1,080	197
26	345	846	1,420	1,600	7,500	2,600	2,390	1,790	1,340	1,080	804	225
27	336	790	1,790	1,990	4,490	2,190	3,250	5,580	930	846	592	232
28	302	754	1,890	2,810	3,250	2,290	3,250	2,500	860	1,160	505	190
29	302	764	7,500	3,030	2,500	6,120	2,810	1,600	686	1,600	452	860
30	294	712	18,500	6,120	.....	5,580	2,290	1,340	592	1,160	394	2,810
31	253	.....	8,320	6,950	.....	3,960	.....	1,420	.....	874	328	.....

Daily discharge, in second-feet, of Greenbrier River at Alderson, W. Va., for the years ending Sept. 30, 1915–1917—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916–17.												
1	2,190	328	558	2,500	6,120	12,800	1,700	3,710	2,600	179	345	82
2	1,250	311	615	1,990	6,400	11,300	1,510	4,490	2,090	218	302	87
3	860	286	649	1,790	4,220	12,500	1,420	3,250	2,090	211	846	82
4	637	277	592	2,390	2,390	27,200	1,340	2,290	2,390	239	374	79
5	536	260	547	5,580	1,790	24,800	1,340	1,990	2,390	225	277	84
6	463	260	547	10,400	1,510	9,800	5,580	1,790	2,090	218	302	90
7	394	246	536	8,600	1,420	6,120	6,950	1,420	1,700	197	277	92
8	345	232	494	5,030	1,420	5,580	5,030	1,420	1,420	174	246	169
9	320	225	526	3,480	1,420	11,600	5,030	1,990	1,160	158	286	218
10	294	218	494	2,600	1,080	7,500	3,480	3,030	930	137	311	338
11	277	232	494	2,090	916	4,760	2,810	2,810	930	137	336	649
12	260	225	479	1,600	888	9,800	2,390	2,390	902	133	345	423
13	260	239	463	1,080	902	20,600	2,390	2,090	764	137	268	311
14	239	253	448	1,890	738	17,600	2,390	1,790	649	122	218	225
15	260	260	432	3,030	777	14,300	2,090	1,510	581	118	185	185
16	225	239	526	2,810	846	8,900	1,790	1,250	526	153	174	158
17	260	204	277	2,190	790	10,100	1,510	1,080	474	246	148	133
18	345	225	442	1,790	930	11,600	1,340	1,000	452	260	133	122
19	505	218	442	1,600	1,420	7,500	1,160	874	413	302	133	118
20	1,420	185	442	1,420	3,710	5,030	1,080	790	384	516	122	104
21	1,420	179	442	1,340	7,500	3,960	1,000	725	442	432	115	100
22	1,080	190	725	6,400	5,300	6,120	930	673	505	374	115	95
23	860	204	2,190	13,700	4,220	6,400	902	686	463	463	107	97
24	712	225	2,190	6,680	12,200	14,600	804	673	364	604	100	92
25	604	328	1,890	4,220	12,800	13,700	777	649	311	874	97	90
26	558	902	1,420	3,030	6,950	7,220	790	615	277	3,030	97	90
27	463	673	1,340	2,390	4,490	4,760	874	1,250	253	1,700	100	95
28	432	526	2,810	1,890	4,220	3,480	818	12,500	232	1,080	97	130
29	394	494	15,200	1,790	.....	2,810	902	8,050	218	738	90	164
30	355	526	8,050	2,290	.....	2,500	2,600	5,580	204	526	84	225
31	355	.....	3,480	3,250	.....	1,990	.....	3,480	.....	423	74	.....

Monthly discharge of Greenbrier River at Alderson, W. Va., for the years ending Sept. 30, 1915–1917.

[Drainage area, 1,340 square miles.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1914–15.					
October	1,080	64	270	0.201	0.23
November	311	111	167	.125	.14
December	8,900	169	3,660	2.73	3.15
January	26,300	1,080	7,030	5.25	6.05
February	27,800	1,340	6,320	4.72	4.92
March	2,500	790	1,330	.993	1.14
April	1,250	526	802	.599	.67
May	1,250	239	606	.452	.52
June	7,500	179	1,300	.970	1.08
July	374	122	223	.166	.19
August	916	126	456	.340	.39
September	1,000	158	431	.322	.36
The year	27,800	64	1,860	1.39	18.84

Monthly discharge of Greenbrier River at Alderson, W. Va., for the years ending Sept. 30, 1915–1917—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1915–16.					
October	18,500	253	1,730	1.29	1.49
November	2,090	179	634	.473	.53
December	18,500	294	2,450	1.83	2.11
January	13,400	463	3,530	2.63	3.03
February	8,050	1,250	3,530	2.63	2.84
March	7,500	1,510	3,250	2.43	2.80
April	6,680	1,160	2,530	1.89	2.11
May	5,580	452	1,250	.933	1.08
June	12,200	526	2,370	1.77	1.98
July	3,480	423	1,120	.836	.96
August	7,220	328	1,620	1.21	1.40
September	2,810	164	409	.305	.34
The year	18,500	164	2,030	1.51	20.67
1916–17.					
October	2,190	225	599	0.447	0.52
November	902	179	306	.228	.25
December	15,200	277	1,600	1.19	1.37
January	13,700	1,080	3,580	2.67	3.08
February	12,800	738	3,480	2.60	2.71
March	27,200	1,990	9,900	7.39	8.52
April	6,950	777	2,090	1.56	1.74
May	12,500	615	2,450	1.83	2.11
June	2,600	204	940	.701	.78
July	3,030	118	462	.345	.40
August	846	74	216	.161	.19
September	649	79	164	.122	.14
The year	27,200	74	2,150	1.60	21.81

LITTLE COAL RIVER AT McCORKLE, W. VA.

LOCATION.—At McCorkle, Lincoln County, on Coal River branch of Chesapeake & Ohio Railway. Cobb Creek enters river on left about 400 feet below station.

DRAINAGE AREA.—375 square miles (measured on topographic maps).

RECORDS AVAILABLE.—July 23, 1915, to September 30, 1917.

GAGE.—Vertical and inclined staff on left bank just below McCorkle Hotel; read by F. M. Priestly.

DISCHARGE MEASUREMENTS.—Made from cable 40 feet above inclined section of gage or by wading.

CHANNEL AND CONTROL.—One channel at all stages; slightly curved above and below cable section. Bed of stream composed of loose sand; but control is probably fairly permanent. Flow of Cobb Creek affects stage at gage and should be included in station.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 13.0 feet at 5 p. m. March 3 (discharge about 8,000 second-feet); minimum stage, 1.50 feet October 6, 7, 8, and September 7 (discharge, 3 second-feet).

Highest known flood August 9, 1916, reached a stage of 28.57 feet (discharge, roughly, 24,000 second-feet).

ICE.—Stage-discharge relation not affected by ice to any extent during record.

ACCURACY.—Stage-discharge relation practically permanent, changed by record flood of August, 1916. Rating curve used to August 10, 1916, well defined between 43 and 4,000 second-feet; curve used after this date well defined between 43 and 5,500 second-feet; both curves extended beyond limits noted. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Little Coal River at McCorkle, W. Va., during the year ending Sept. 30, 1917.

[Made by F. Conklin.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Mar. 14	8.95	4,610
15	6.22	2,440
June 7	3.42	520

Daily discharge, in second-feet, of Little Coal River at McCorkle, W. Va., for the years ending Sept. 30, 1915–1917.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1915.				1915.				1915.			
1	.....	84	5	11	.....	28	17	21	.....	9	8
3	.....	90	4	12	.....	24	12	22	.....	8	12
3	.....	178	6	13	.....	36	8	23	272	7	26
4	.....	492	60	14	.....	29	7	24	191	6	13
5	.....	235	181	15	.....	19	6	25	135	5	8
6	.....	126	178	16	.....	16	5	26	96	5	6
7	.....	96	132	17	.....	43	4	27	78	4	6
8	.....	58	78	18	.....	55	5	28	40	5	34
9	.....	40	46	19	.....	11	5	29	26	5	7
10	.....	29	26	20	.....	10	4	30	22	8	7
								31	58	5	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915-16.												
1	2,320	7	138	750	3,930	470	538	515	63	58	5	22
2	750	6	132	605	2,780	700	492	450	40	43	4	31
3	390	6	120	492	1,330	1,460	515	370	38	43	4	58
4	350	6	111	430	900	1,140	410	450	117	34	5	40
5	228	6	102	390	800	900	370	390	81	25	6	31
6	181	5	87	515	1,530	800	330	370	58	16	43	23
7	138	5	72	750	2,090	2,090	310	370	291	11	164	17
8	102	5	72	605	1,200	3,020	560	410	310	8	132	14
9	78	6	72	650	1,460	1,200	1,740	370	224	8	4,440	29
10	58	6	58	850	1,460	750	1,080	330	191	8	8,150	15
11	40	5	43	4,100	1,080	560	1,460	310	164	7	1,370	10
12	28	6	60	3,420	750	430	1,600	254	142	7	700	8
13	22	15	96	2,860	900	390	1,020	224	102	6	1,510	7
14	19	49	102	1,740	650	390	700	181	78	14	1,370	6
15	13	1,740	58	850	605	370	515	154	81	8	702	330
16	12	900	126	650	560	350	410	148	87	87	2,620	182
17	9	470	1,810	560	515	330	390	142	126	102	5,000	107
18	15	310	6,690	350	450	350	310	126	117	123	1,510	58
19	58	272	2,620	390	470	370	272	93	228	117	620	20
20	72	310	1,020	430	430	350	254	72	254	22	430	15
21	66	310	560	430	430	410	235	66	174	142	330	14
22	43	272	410	515	430	450	272	63	123	81	255	11
23	29	235	330	1,200	430	470	254	72	87	96	220	9
24	22	195	272	1,020	450	390	235	72	55	52	174	7
25	17	167	235	650	960	370	330	52	87	31	129	6
26	16	145	450	515	1,460	350	370	34	55	17	85	5
27	16	132	470	430	960	960	450	34	224	11	72	5
28	11	161	650	390	650	1,880	850	24	164	8	69	5
29	10	164	4,270	430	560	1,400	1,080	58	111	6	60	5
30	9	164	3,100	850	.....	900	700	117	72	6	43	4
31	8	.....	1,260	850	.....	650	.....	117	.....	6	31	.....

Daily discharge in second-feet, of Little Coal River at McCorkle, W. Va., for the years ending Sept. 30, 1915–1917—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916-17.												
1	4.3	14	160	538	850	4,150	455	702	850	38	12	8.6
2	3.8	17	147	455	1,160	3,180	430	565	2,540	29	9.8	5.5
3	3.8	14	129	510	790	7,040	405	455	4,740	103	8.6	4.5
4	3.5	13	116	730	850	5,340	315	405	1,650	125	147	3.8
5	3.4	10	220	2,390	1,370	3,980	355	405	850	57	49	3.8
6	3.2	8	192	4,580	1,370	2,240	2,320	340	620	29	23	3.5
7	3.0	8	174	2,090	1,370	2,860	2,240	310	482	38	18	3.2
8	3.2	7	160	1,100	1,300	5,850	1,790	330	380	205	19	1,230
9	4	6.6	160	760	1,230	3,260	1,300	790	335	148	94	3,500
10	11	11	160	592	675	1,650	850	910	482	103	63	1,650
11	15	63	147	510	850	1,040	648	702	592	49	29	538
12	23	14	116	355	482	4,150	538	790	565	29	15	355
13	15	36	138	355	405	5,170	510	730	430	15	9.5	205
14	10	17	43	510	510	4,660	482	648	380	23	7	147
15	8	23	52	1,040	620	2,320	405	538	330	76	13	72
16	10	26	52	970	1,440	1,370	355	455	240	72	9.5	58
17	10	23	116	790	970	1,510	315	380	192	160	6.4	34
18	26	22	72	592	850	1,940	290	315	147	205	5.2	26
19	160	22	43	565	850	1,230	280	280	129	169	4.4	23
20	240	8	94	538	1,370	850	255	215	151	125	3.8	26
21	220	10	420	702	2,940	1,230	235	182	98	72	3.6	26
22	147	11	1,940	5,000	1,440	1,440	230	160	81	63	3.4	38
23	103	14	1,300	2,700	970	1,440	205	169	66	192	3.8	29
24	72	52	675	1,230	5,170	5,340	192	147	43	245	4.5	17
25	63	116	510	910	3,100	3,020	182	103	116	235	4.2	14
26	58	116	380	675	1,580	1,510	265	81	76	125	4.0	10
27	43	94	380	648	970	1,040	240	2,390	43	60	3.6	11
28	26	94	1,790	510	3,420	790	205	6,700	43	43	3.4	43
29	26	138	3,020	538	.....	675	675	4,660	125	38	5.7	355
30	23	160	1,100	760	.....	620	850	2,020	94	24	10	220
31	17	.....	648	760	.....	510	.....	970	.....	17	8	.....

Monthly discharge of Little Coal River at McCorkle, W. Va., for the years ending Sept. 30, 1915–1917.

[Drainage area, 375 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1915.					
July 23–31	272	22	102	0.272	0.09
August	492	4	57	.152	.18
September	181	4	30.5	.0813	.09
1915–16.					
October	2,320	8	165	0.440	.51
November	1,740	5	203	.541	.60
December	6,690	43	826	2.20	2.54
January	4,100	350	925	2.47	2.85
February	3,930	430	1,040	2.77	2.99
March	3,020	330	795	2.12	2.44
April	1,740	235	602	1.61	1.80
May	515	24	208	.555	.64
June	310	38	131	.349	.39
July	142	6	38.8	.103	.12
August	8,150	4	976	2.60	3.00
September	330	4	36.5	.097	.11
The year	8,150	4	495	1.32	17.99
1916–17.					
October	240	3	43.8	0.117	0.13
November	160	6.6	38.9	.104	.12
December	3,020	43	473	1.26	1.45
January	5,000	355	1,110	2.96	3.41
February	5,170	405	1,390	3.71	3.86
March	7,040	510	2,630	7.01	8.08
April	2,320	182	594	1.58	1.76
May	6,700	81	898	2.39	2.76
June	4,740	43	562	1.50	1.67
July	245	15	93.9	.250	.29
August	147	3.4	19.4	.052	.06
September	3,500	3.2	289	.771	.86
The year	7,040	3	676	1.80	24.45

RACCOON CREEK BASIN.

RACCOON CREEK AT ADAMSVILLE, OHIO.

LOCATION.—About 200 feet above covered highway bridge at Adamsville, Gallia County, 5 miles southwest from Hocking Valley Railroad station at Bidwell. Indian Creek enters on right 1¼ miles above station.

DRAINAGE AREA.—537 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 25, 1915, to September 30, 1917.

GAGE.—Vertical and inclined staff on left bank 200 feet above bridge; read by Irene Call

DISCHARGE MEASUREMENTS.—Made from covered highway bridge or by wading.

CHANNEL AND CONTROL.—Straight for about 500 feet above and 600 feet below bridge. Bed of stream composed of mud, sand, and gravel. Principal control at ruins of old mill dam 1,200 feet below bridge; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 17.9 feet March 14 (discharge, 6,300 second-feet); minimum stage recorded, 1.75 feet at 7 a. m. September 26 (discharge, 18 second-feet).

High-water marks indicate maximum stage of about 24.5 feet.

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—State-discharge relation practically permanent; affected by ice December 15–21, February 5–13, and probably to some extent January 16–20. Rating curve well defined between 70 and 5,800 second-feet; beyond these limits, the curve is an extension. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table, except for ice periods, for which it is estimated from climatic data. Open-water records excellent; ice records poor.

COOPERATION.—Base data furnished by United States Engineer Corps.

Daily discharge, in second-feet, of Raccoon Creek at Adamsville, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	39	46	87	797	2,430	1,150	478	632	3,720	404	109	58
2	37	42	87	552	1,280	1,080	632	527	2,520	208	100	68
3	44	55	80	1,560	742	1,080	1,050	502	3,580	128	73	60
4	44	44	76	2,180	478	1,480	1,310	404	2,790	128	77	52
5	35	49	109	2,520		1,850	1,280	308	2,010	148	84	47
6	35	50	92	2,790		1,560	3,060	308	1,180	109	84	57
7	35	42	118	2,880		1,410	3,430	296	1,020	632	73	84
8	37	42	138	2,260		2,650	3,290	250	909	2,350	71	84
9	36	45	138	1,280	250	3,480	2,740	218	1,020	1,280	64	58
10	39	52	109	527		4,000	1,450	208	1,410	1,020	68	65
11	42	56	109	605		4,390	966	188	1,520	478	66	58
12	39	55	97	478		5,680	797	178	1,380	332	64	55
13	36	52	94	332		5,990	632	158	1,120	228	58	46
14	37	50	84	380	168	6,310	527	158	659	228	49	45
15	39	55		578	188	5,790	429	138	478	1,340	46	49
16	43	58		632	188	4,590	380	158	356	552	50	44
17	62	62		527	188	2,470	356	128	272	332	48	40
18	62	58	50	478	239	2,140	284	100	218	527	56	39
19	332	55		429	356	1,810	380	95	198	714	43	36
20	188	47		356	502	1,480	966	95	198	1,150	45	36
21	188	47		797	429	1,150	687	90	178	502	39	36
22	208	48	478	6,150	380	1,120	478	94	148	687	56	42
23	138	64	578	6,100	797	1,280	356	168	308	502	45	36
24	118	92	632	5,530	2,610	3,720	284	168	453	261	44	30
25	81	92	128	4,750	2,700	3,950	261	118	272	208	45	23
26	73	70	70	3,580	1,820	3,340	332	95	188	178	34	21
27	89	100	2,050	1,280	1,080	1,630	296	3,620	118	218	35	39
28	77	89	3,860	1,150	1,020	1,150	284	5,790	118	332	39	39
29	57	78	4,000	2,010	.....	881	478	5,840	261	332	42	39
30	59	84	3,720	2,880	.....	687	659	5,010	208	188	38	34
31	64	.....	2,930	3,200	.....	552	.....	4,290	.....	178	78	.....

NOTE.—Daily discharge estimated, because of ice, from climatic data, Dec. 15–21, Feb. 5–13. Braced figures show mean discharge for periods included. Daily discharge interpolated because of missing gage readings Mar. 18–20.

Monthly discharge of Raccoon Creek at Adamsville, Ohio, for the year ending Sept. 30, 1917.

[Drainage area, 537 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	332	35	77.8	0.145	0.17
November	100	42	59.3	.110	.12
December	4,000	.....	652	1.21	1.40
January	6,150	332	1,920	3.58	4.13
February	2,700	.....	709	1.32	1.38
March	6,310	552	2,580	4.80	5.53
April	3,430	261	952	1.77	1.98
May	5,840	90	978	1.82	2.10
June	3,720	118	960	1.79	2.00
July	2,350	109	512	.953	1.10
August	109	34	58.8	.109	.13
September	84	21	47.3	.088	.10
The year	6,310	21	796	1.48	20.14

GUYANDOT RIVER BASIN.

GUYANDOT RIVER AT WILBER, W. VA.

LOCATION.—At site of Hutchinson Lumber Co.'s suspension bridge at Wilber, three-fourths mile below Manbar, Logan County. Rich Creek enters river on left about 600 feet above station.

DRAINAGE AREA.—791 square miles (measured on map of West Virginia, scale 1:500,000).

RECORDS AVAILABLE.—July 13, 1915, to September 30, 1917.

GAGE.—Vertical and inclined staff on right bank; read by Allie Smith. Vertical section fastened to downstream corner of right timber crib pier; inclined section is about 10 feet downstream.

DISCHARGE MEASUREMENTS.—Made from cable installed between towers of former bridge in February, 1916, or by wading.

CHANNEL AND CONTROL.—Straight for about 1,000 feet above and 500 feet below station. Bed of river composed of solid rock, boulders, and mud; control probably permanent. Point of zero flow, gage height 0.00 ± 0.5 foot.

EXTREMES OF STAGE.—Maximum stage recorded, 17.0 feet at 5 p. m. March 4; minimum, 1.10 feet September 26.

Highest flood known reached a stage represented by gage height about 24 feet.

ICE.—Stage-discharge relation probably not affected by ice except in severe winters.

ACCURACY.—Stage-discharge relation probably permanent; probably affected by ice to some extent during December and February. Rating curve not yet determined. Gage read twice daily. Records excellent.

COOPERATION.—Base data furnished by United States Engineer Corps.

Daily gage height, in feet, of Guyandot River at Wilber, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.00	2.31	2.60	4.31	6.95	6.80	4.20	3.05	4.05	2.05	2.87	3.10
2	3.55	2.29	2.55	3.81	7.50	6.80	3.85	3.15	5.05	2.02	3.00	2.62
3	2.93	2.25	2.77	3.90	8.45	12.00	3.10	3.07	6.00	1.95	2.50	2.43
4	2.65	2.17	2.77	5.90	7.40	15.25	3.05	3.15	5.05	1.80	2.30	2.42
5	2.48	2.15	2.80	11.50	4.35	13.50	3.20	3.40	5.02	1.75	2.60	2.32
6	2.34	2.07	2.75	10.40	5.30	9.50	5.20	3.12	4.05	1.85	2.85	2.10
7	2.23	2.05	2.70	7.90	5.35	7.30	5.05	3.02	3.80	1.92	2.05	2.30
8	2.14	2.03	2.65	5.86	4.55	6.20	4.80	3.07	3.85	2.02	2.15	4.12
9	2.10	2.00	2.70	4.50	4.30	5.20	6.20	3.06	5.05	1.92	3.02	7.00
10	2.10	2.05	2.75	3.80	3.80	5.10	5.30	3.15	3.65	1.80	2.80	5.85
11	2.08	2.06	2.69	3.80	4.00	5.80	5.05	3.50	4.05	1.92	2.30	4.45
12	2.05	2.18	2.67	3.50	3.30	6.70	4.05	3.70	3.05	1.97	2.05	3.20
13	2.05	2.35	2.60	3.00	3.30	8.30	4.05	3.50	3.02	1.97	2.00	2.70
14	1.99	2.31	2.61	3.80	3.30	9.50	3.70	3.02	2.95	2.05	2.07	2.62
15	1.90	2.31	2.70	3.80	4.30	7.60	3.70	3.25	3.02	2.02	1.95	2.42
16	1.95	2.30	2.61	4.30	4.30	6.45	3.70	3.32	2.95	3.05	1.90	2.45
17	2.44	2.28	2.55	3.80	4.80	7.60	4.05	3.22	3.02	4.05	1.95	2.32
18	3.55	2.23	2.55	4.15	4.45	7.80	3.05	3.35	2.97	4.30	1.82	2.15
19	4.25	2.23	2.65	3.80	4.80	6.55	3.25	3.40	3.05	3.05	1.92	1.90
20	4.53	2.22	2.75	3.80	6.80	6.55	3.30	3.30	2.90	3.02	1.85	1.80
21	4.00	2.18	2.83	3.80	6.30	5.50	3.15	3.42	3.02	3.02	1.87	1.65
22	3.73	2.18	4.95	9.50	4.80	6.30	3.02	3.32	2.80	3.15	1.95	1.45
23	3.39	2.20	7.10	9.25	5.00	11.50	3.05	3.22	2.22	3.10	1.82	1.40
24	2.93	2.21	4.75	6.25	11.50	13.00	3.07	3.21	2.02	4.05	1.42	1.20
25	2.75	2.18	4.25	5.00	12.30	8.90	3.07	3.07	2.05	3.02	1.22	1.20
26	2.63	2.20	3.65	4.50	9.45	8.65	3.02	3.01	2.00	3.00	1.80	1110
27	2.52	2.33	3.40	3.80	8.30	7.30	3.00	3.02	2.07	2.90	1.22	1.65
28	2.43	2.38	7.26	3.30	7.50	6.30	3.05	6.33	2.02	2.20	1.50	4.82
29	2.36	2.40	9.64	4.30	.....	6.05	3.02	6.85	2.03	3.02	1.60	3.80
30	2.30	2.39	6.36	5.00	.....	5.60	3.02	5.30	2.52	3.00	1.87	3.42
31	2.29	.....	5.65	5.50	.....	5.05	.....	4.85	.....	2.80	2.22	.....

GUYANDOT RIVER AT BRANCHLAND, W. VA.

LOCATION.—At highway bridge at Branchland, Lincoln County. Fourmile Creek enters river on left about 20 feet above bridge.

DRAINAGE AREA.—1,230 square miles (measured on map of West Virginia, scale 1:500,000).

RECORDS AVAILABLE.—July 8, 1915, to September 30, 1917.

GAGE.—Chain gage fastened to handrail on upstream side of bridge near center of main span; read by John A. Broaddus.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed of stream is composed of rock, gravel, sand, and mud and is fairly permanent; character of control not determined.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 31.3 feet at noon March 5 (discharge, about 30,000 second-feet); minimum, 2.76 feet August 21 (discharge, about 53 second-feet).

Highest flood known reached a gage height of about 44 feet by present gage.

ICE.—Stage-discharge relation affected by ice during cold winters.

ACCURACY.—Stage-discharge relation may change during floods; affected by ice December 14–20, February 6–16. Rating curve well defined between 280 and 25,000 second-feet; beyond these limits the curve is an extension. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table except for periods affected by ice or missing gage readings. Records good except those estimated, which are poor.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Guyandot River at Branchland, W. Va., during the year ending Sept. 30, 1917.

[Made by F. Conklin.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Dec. 30	12.26	7,140	Mar. 3	24.32	22,800
Jan. 6	21.85	18,100	17	9.96	5,220

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1		176	320	2,220	2,900	8,710	1,590	1,170	3,400	156	212	244
2		168	370	1,520	6,500	15,300	1,520	1,100	5,100	111	141	320
3		172	395	1,590	5,460	20,500	1,310	1,030	6,610	105	126	345
4		168	370	2,140	2,900	24,600	1,100	960	4,760	105	196	248
5		159	530	12,700	2,060	29,100	1,310	960	2,560	126	240	224
6		141	445	18,100		16,200	4,420	960	1,590	100	240	208
7		129	395	11,700		9,020	6,720	890	1,240	85	276	252
8		98	370	5,640		10,800	5,100	830	960	80	220	2,220
9	70	114	370	3,320		8,290	5,020	1,030	770	370	264	5,370
10		141	345	2,220		5,910	3,660	1,740	830	220	268	6,000
11		141	345	1,660	1,500	4,940	2,380	2,140	1,170	179	304	2,640
12		135	320	1,310		7,030	1,740	1,980	1,310	162	260	1,170
13		132	320	960		13,200	1,520	1,590	960	141	216	740
14		156		1,170		15,500	1,310	1,310	770	126	179	530
15		193		1,660		10,200	1,100	1,100	650	135	150	420
16		179		1,900		6,000	960	960	530	272	132	345
17	126	176	225	1,740	4,850	5,370	830	770	445	560	98	280
18	179	176		1,380	2,560	11,300	740	680	395	1,100	85	268
19	740	176		1,310	2,300	7,660	680	590	320	1,030	70	232
20	1,590	159		1,310	3,320	4,600	620	500	300	890	60	196
21	1,380	153	650	2,640	11,500	4,260	590	445	252	740	55	260
22	960	150	1,740	9,130	7,870	4,170	560	395	228	530	62	228
23	710	156	4,850	12,200	4,510	4,680	500	395	212	420	85	182
24	680	172	4,340	6,200	10,200	12,800	470	395	193	620	141	159
25	395	200	2,060	3,660	16,800	20,000	445	370	186	1,820	147	138
26	370	193	1,380	2,380	8,400	9,020	445	320	156	1,170	236	126
27	300	200	1,100	1,660	4,680	4,940	470	1,460	144	710	196	138
28	280	228	7,560	1,380	6,720	3,740	445	6,720	156	500	176	248
29	236	276	15,100	1,310	.....	3,060	770	9,660	470	445	156	1,520
30	220	300	8,180	1,590	.....	2,560	1,100	6,610	268	320	153	960
31	204	.....	4,200	2,380	.....	2,060	.....	3,580	.....	260	193	.....

NOTE.—Daily discharge estimated because of ice or missing gage readings from observer's notes, climatic data, or by comparison with flow at other stations, Oct. 1–16, Dec. 14–20, 31, Feb. 6–16. Braced figures are the means for the periods indicated.

Monthly discharge of Guyandot River at Branchland, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 1,230 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	.....	.....	306	0.249	0.29
November	300	98	171	.139	.16
December	15,100	.....	1,860	1.51	1.74
January	18,100	960	3,870	3.15	3.63
February	16,800	.....	4,290	3.49	3.63
March	29,100	2,060	9,860	8.02	9.25
April	6,720	445	1,650	1.34	1.50
May	9,660	320	1,700	1.38	1.59
June	6,610	144	1,230	1.00	1.12
July	1,820	80	438	.356	.41
August	304	55	172	.140	.16
September	6,000	126	874	.711	.79
The year	29,100	.....	2,200	1.79	24.27

MUD RIVER AT YATES, W. VA.

LOCATION.—About 200 feet above highway bridge at Yates, Cabell County, 2 miles above Howell mill dam, and 15 miles from Huntington.

DRAINAGE AREA.—318 square miles (measured on topographic maps).

RECORDS AVAILABLE.—July 19, 1915, to September 30, 1917.

GAGE.—Vertical and inclined staff on left bank, read by C. J. McDonie.

DISCHARGE MEASUREMENTS.—Made from single-span steel highway bridge below gage.

CHANNEL AND CONTROL.—One channel up to high stages, when right bank overflows around right abutment; straight for about 50 feet above and 75 feet below bridge. Primary control at ford, about 100 feet below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 16.80 feet at 5 p. m. March 14 (discharge, 5,980 second-feet); minimum is not definitely known as sandbar formed around gage during low water period.

Highest flood known reached a gage height of about 23 feet by present gage.

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—Stage-discharge relation probably permanent; affected by ice January 14–20 and February 3–11. Rating curve well defined between 14 and 5,500 second-feet; extended beyond these limits. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table, except during periods stage-discharge relation was affected by ice. Records good except for periods for which discharge was estimated on account of ice or missing gage readings, for which they are poor.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Mud River at Yates, W. Va., during the year ending Sept. 30, 1917.

[Made by F. Conklin.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Feb. 24	11.43	3,010
May 29	16.25	5,670

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	28	30	116	272	785	4,500	187	154	595	62	13	
2	27	21	83	232	648	2,640	178	130	1,280	45	14	
3	25	20	72	1,320		2,980	187	95	2,060	34	13	
4	19	19	62	1,660		4,230	170	83	813	25	7.4	3.0
5	14	19	493	1,820		2,830	283	78	371	20		
6	9.5	18	493	2,460		1,460	2,510	78	252	20	7	
7	10	17	213	1,080	200	2,060	2,280	78	569	40		49
8	8.3	16	146	543		3,740	813	72	213	28	89	232
9	8.9	14	108	371		3,330	518	116	222	20	53	443
10	9.5	20	89	283		1,080	371	170	187	26	22	170
11	14	26	89	213		648	272	123	138	24	18	146
12	14	34	89	162	38	2,600	222	130	162	22	14	102
13	11	27	78	130	23	4,230	204	162	123	20	11	52
14	8.3	31	59		146	5,860	187	123	95	19		30
15	9.5	32	46		162	3,740	162	95	78	25		25
16	10	29	55	200	283	935	130	83	67	21		25
17	10	28	59		595	1,500	116	72	61	26		24
18	12	26	45		1,660	1,500	108	62	53	26		23
19	116	24	52		813	813	95	57	51	29		20
20	272	21	58		729	518	89	51	50	27		16
21	154	22	785	1,360	1,220	1,320	83	47	67	23		16
22	108	24	2,380	5,680	595	2,460	78	44	58	49	3.5	18
23	78	26	1,220	4,450	675	1,000	72	138	47	36		17
24	59	37	468	842	2,980	3,630	67	58	41	518		16
25	49	36	327	518	3,080	3,840	67	46	35	146		13
26	41	45	242	394	842	872	62	40	32	72		11
27	38	44	294	327	970	569	58	3,130	35	45		8.6
28	34	48	2,380	349	2,880	468	58	5,320	34	34		14
29	39	51	3,030	468	.....	349	95	5,560	130	28		15
30	32	116	757	595	.....	262	222	2,060	72	21		15
31	28	.....	394	443	.....	213	.....	543	.....	16		.....

NOTE.—Discharge estimated because of ice or missing gage readings from observer's notes and climatic records as follows: Jan. 14–20; Feb. 3–11; Aug. 5–7, 14–31, and Sept. 1–6. Braced quantities represent mean discharge for the period included.

Monthly discharge of Mud River at Yates, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 318 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	272	8.3	41.8	0.131	0.15
November	116	14	30.7	.096	.11
December	3,030	45	477	1.50	1.73
January	5,680	.....	883	2.78	3.20
February	3,080	23	747	2.35	2.45
March	5,860	213	2,130	6.70	7.72
April	2,510	58	331	1.04	1.16
May	5,560	40	613	1.93	2.22
June	2,060	32	266	.836	.93
July	518	16	49.9	.157	.18
August	89	.....	10.9	.034	.04
September	443	.....	50.6	.159	.18
The year	5,860	.....	471	1.48	20.07

TWELVEPOLE CREEK BASIN.

TWELVEPOLE CREEK AT WAYNE, W. VA.

LOCATION.—At highway bridge, 500 feet above railroad bridge of East Lynne branch of Norfolk & Western Railway at Wayne, Wayne County, about three-fourths mile below junction of East and West forks.

DRAINAGE AREA.—291 square miles (measured on topographic maps).

RECORDS AVAILABLE.—July 1, 1915, to September 30, 1917.

GAGE.—Chain gage attached to upstream handrail about 90 feet from left abutment; read by Bryon Smith.

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

CHANNEL AND CONTROL.—Straight for about 80 feet above and 1,200 feet below bridge. Bed of stream composed of rock and sand. Principal control is Sampson's mill-dam; probably permanent, but at low stages the operation of the mill may affect the discharge relation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 15.25 feet at 8.30 a. m. January 22 (discharge, 5,140 second-feet); minimum, 1.18 feet August 2, 8, and 29 (discharge, about 5 second-feet).

Highest flood known reached a stage represented by gage height about 25 feet.

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

REGULATION.—None, except for backwater caused during low water periods by operation of small power plant at Sampson's mill about a mile below gage.

ACCURACY.—Stage-discharge relation probably permanent; slightly affected by ice January 14–20 and February 3–11. Operation of power plant at dam about a mile below gage may have slight effect upon stage-discharge relation at low stages, but this effect, if any, is small as the plant is only operated occasionally for a few hours at a time. Rating curve well defined beween 139 and 6,700 second-feet, fairly well defined between 29 and 139 second-feet; extended beyond these limits. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table. Open-water records good; ice records poor.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Twelvepole Creek at Wayne, W. Va., during the year ending Sept. 30, 1917.

[Made by F. Conklin.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Jan. 22	14.64	4,820
23	8.38	1,710
Mar. 25	7.78	1,660

Daily discharge, in second-feet, of Twelvepole Creek at Wayne, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	14	28	57	349	809	2,780	285	226	657	80	14	7.2
2	16	26	60	306	521	1,600	226	226	2,500	57	13	7.6
3	16	24	56	809	418	3,970	226	208	2,060	38	13	7.2
4	16	21	37	1,020	394	3,220	156	123	875	29	13	11
5	15	20	34	1,780	394	1,740	809	123	443	27	17	9
6	16	19	36	2,010	371	1,240	2,190	93	327	25	32	7.6
7	16	18	34	1,830	371	1,740	1,320	111	394	30	14	13
8	14	17	33	1,320	371	3,570	1,090	116	226	49	10	573
9	13	20	108	777	327	2,140	1,050	131	190	33	8.8	944
10	12	21	111	327	306	1,240	746	190	190	30	7.4	418
11	12	20	94	236	285	777	495	265	156	28	28	164
12	11	19	83	182	265	4,120	327	306	131	25	20	131
13	18	19	70	190	217	3,320	265	226	94	22	18	108
14	24	21	57	208	199	3,170	306	190	68	21	17	94
15	17	21	55	285	418	1,560	116	139	58	29	16	84
16	19	22	55	255	746	944	131	108	53	30	13	63
17	22	21	55	226	1,090	1,320	199	94	52	75	8.4	36
18	23	18	55	208	842	1,090	164	68	108	84	6.2	20
19	265	18	55	265	979	1,050	190	58	78	58	6.0	15
20	255	19	55	327	1,320	1,050	108	59	55	41	5.8	15
21	182	20	716	1,320	777	2,100	94	50	46	469	5.6	31
22	131	23	573	4,770	657	1,020	94	35	37	31	5.2	23
23	94	37	573	1,700	979	875	90	49	34	28	5.2	21
24	58	37	394	686	3,620	5,020	87	48	34	27	5.4	19
25	51	41	327	418	1,700	1,830	79	48	30	87	5.4	16
26	44	42	226	285	1,130	944	74	48	28	50	5.0	15
27	37	41	255	255	842	628	69	777	28	38	5.2	16
28	35	43	2,100	327	2,870	495	65	4,170	56	32	4.9	21
29	33	49	1,480	285	.....	349	67	1,880	38	24	4.8	43
30	32	56	600	349	.....	285	94	809	116	15	8.8	56
31	30	.....	394	327	.....	285	.....	443	.....	14	8.6	.....

Monthly discharge of Twelvepole Creek at Wayne, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 291 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	265	11	49.7	0.171	0.20
November	56	17	26.7	.092	.10
December	2,100	33	285	.979	1.13
January	4,770	182	762	2.62	3.02
February	3,620	199	829	2.85	2.97
March	5,020	285	1,790	6.15	7.09
April	2,190	65	374	1.29	1.44
May	4,170	35	368	1.26	1.45
June	2,500	28	305	1.05	1.17
July	469	14	52.5	.180	.21
August	32	4.8	11.1	.038	.04
September	944	7.2	99.6	.342	.38
The year	5,020	4.8	412	1.42	19.20

BIG SANDY RIVER BASIN.

LEVISA FORK AT THELMA, KY.

LOCATION.—At Chesapeake & Ohio Railway bridge at Thelma, Johnston County, 2 miles below Paintsville. Buffalo Creek enters on right about half a mile above station.

DRAINAGE AREA.—2,090 square miles (measured by United States Engineer Corps).

RECORDS AVAILABLE.—June 1, 1915, to September 30, 1917.

GAGE.—Vertical staff gage attached to right shore pier of bridge, portion of gage above 24 feet is cut in masonry steps on upper end of right abutment; read by John Stambaugh. Sea-level elevation of gage, 561.82 feet (United States Engineer Corps).

DISCHARGE MEASUREMENTS.—Made from boardwalk constructed on the lower downstream chord of bridge.

CHANNEL AND CONTROL.—Channel straight one-half mile above and 300 feet below gage. Bed of stream sandy. Remains of coffer dams around piers, and piles at measuring section. Primary control about 2,400 feet downstream composed of rock which extends three-fourths of the way across stream; remainder is firm sand, fairly permanent.

EXTREMES OF STAGE.—Maximum, mean gage height during year, 33.85 feet March 5; minimum, mean gage height, 1.50 feet October 14–16. Highest stage recorded, 42.6 feet by present gage.

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

REGULATION.—Splash dams on tributaries and in main stream about 50 miles above used by timber companies may affect low-water flow to some extent.

ACCURACY.—Discharge measurements made in 1917 apparently indicate a marked change in stage-discharge relation; additional measurements are needed for confirmation before making a new rating table. Gage read twice daily to hundredths below 10 feet and to tenths above 10 feet. Records good.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Levisa Fork at Thelma, Ky., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 29	F. C. Sammons	20.25	24,400	Mar. 3	H. E. Frye	29.10	44,400
29	do	20.40	22,100	4	do	32.25	44,000
Jan. 6	do	29.70	41,800	4	do	31.70	45,300
6	do	27.60	45,700	5	do	34.05	51,200
7	do	20.30	20,100	5	do	22.90	23,300
7	do	28.50	37,500	5	do	34.10	54,200
Feb. 25	H. E. Frye	21.00	21,500	6	do	25.70	26,500
Mar. 3	do	27.10	35,300	6	do	21.65	19,900
3	do	28.05	38,300	20	Frye and Sammons	10.6	7,310
3	do	29.20	41,300				

Daily gage height, in feet, of Levisa Fork at Thelma, Ky., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.65	2.10	2.57	6.30	9.30	13.50	6.55	4.37	3.55	3.30	2.67	4.10
2	1.69	2.10	2.60	5.45	15.25	23.60	6.30	5.02	5.50	2.80	2.55	6.15
3	1.99	2.05	2.70	5.75	11.50	28.60	6.40	5.10	6.13	2.47	2.62	4.80
4	1.97	2.00	2.77	12.65	7.75	32.20	5.90	4.65	5.25	2.65	3.17	3.30
5	1.85	1.98	3.00	27.90	6.90	33.85	5.75	4.25	3.98	3.40	2.95	2.92
6	1.72	1.95	3.10	28.05	5.77	23.25	10.55	4.10	3.55	3.42	2.75	2.57
7	1.64	1.90	2.90	18.65	5.47	15.65	13.05	4.00	3.68	2.92	2.37	2.85
8	1.57	1.85	2.82	11.70	5.45	16.60	10.95	3.78	3.33	2.27	2.42	3.85
9	1.50	1.80	2.87	8.55	5.17	13.95	9.20	3.78	3.45	2.10	3.35	4.95
10	1.65	1.87	2.67	6.85	5.40	11.25	8.00	4.15	3.35	2.65	3.62	4.75
11	1.56	1.95	2.67	5.90	7.07	9.30	6.45	4.90	3.57	2.60	3.80	4.17
12	1.51	1.95	2.70	5.10	6.80	11.50	5.65	4.95	3.75	2.25	3.15	3.50
13	1.51	1.97	2.70	4.55	5.85	18.75	5.35	4.85	3.50	2.12	2.67	3.05
14	1.50	2.25	2.50	4.60	5.80	16.25	5.23	4.58	3.38	2.05	2.50	2.75
15	1.50	2.32	2.30	5.25	6.45	13.30	5.10	4.25	3.10	2.10	2.30	2.47
16	1.50	2.27	2.50	6.80	9.07	10.97	4.83	3.90	2.85	2.37	2.25	2.32
17	1.62	2.20	2.50	6.50	7.95	14.30	4.55	3.65	2.60	2.45	2.22	2.15
18	2.55	2.20	2.77	5.72	7.40	18.70	4.33	3.45	2.50	3.05	2.12	2.06
19	5.15	2.20	2.45	5.50	7.05	13.60	4.05	3.25	2.53	3.45	1.97	2.00
20	6.30	2.20	2.40	5.90	11.75	10.45	3.93	3.05	3.65	3.52	1.90	1.87
21	6.45	2.15	3.25	6.67	22.25	9.50	3.83	2.93	2.63	3.67	1.77	1.81
22	4.70	2.10	6.30	16.00	15.50	9.90	3.68	2.80	2.38	2.65	1.75	1.82
23	3.89	2.05	9.55	14.40	11.20	10.15	3.55	2.95	2.30	3.20	2.15	1.72
24	3.35	2.12	9.05	11.77	17.90	20.30	3.43	3.03	2.30	4.47	3.05	1.65
25	3.00	2.15	6.10	9.05	20.50	23.95	3.28	2.93	2.45	5.90	3.05	1.60
26	2.75	2.15	4.92	7.25	14.80	15.45	3.25	2.83	2.43	5.85	2.85	1.60
27	2.52	2.15	4.35	6.00	10.75	11.20	3.13	3.75	2.30	5.37	2.62	1.65
28	2.37	2.17	8.95	5.52	11.75	10.50	3.23	9.45	2.45	4.57	2.27	4.62
29	2.27	2.40	19.70	5.17	.....	10.25	3.48	6.60	2.30	4.27	2.07	6.20
30	2.20	2.47	13.75	5.85	.....	9.07	3.95	4.80	3.58	3.35	2.00	5.50
31	2.17	.....	8.50	7.17	.....	7.75	.....	4.08	.....	3.05	2.30	.....

TUG FORK AT KERMIT, W. VA.

LOCATION.—About 150 feet above United Fuel Gas Co.'s ferry at Kermit, Mingo County. Marrowbone Creek enters on right about 2 miles below gage.

DRAINAGE AREA.—1,240 square miles (measured by United States Engineer Corps).

RECORDS AVAILABLE.—June 1, 1915, to September 30, 1917.

GAGE.—Vertical staff gage in three sections attached to trees on right bank of river; 0–20 feet, 160 feet above cable; 20–38 feet, 130 feet below cable; and 38 to 48 feet at cable; read by C. C. Preece. Sea-level elevation of zero of gage, 574.77 feet (United States Engineer Corps).

DISCHARGE MEASUREMENTS.—Made from car on ferry cable or by wading under cable.

CHANNEL AND CONTROL.—Channel straight above and below, bed of stream sandy; control about 150 feet below cable composed of solid rock which extends half way across from left bank and loose rock placed in river for fording, probably permanent.

ICE.—Stage-discharge relation rarely if ever affected by ice.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice. Rating curve well defined between 85 and 25,000 second-feet; beyond these limits the curve is an extension. Gage read twice daily to hundredths below 10 feet and to tenths above 10 feet. Daily discharge ascertained by applying mean daily gage heights to rating table. Record excellent.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Tug Fork at Kermit, W. Va., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec.-ft.*
Jan. 22	F. C. Sammons	13.3	9,290	Mar. 5	F. C. Sammons	30.70	35,800
Feb. 21	Frye and Sammons	16.45	12,100	5	do	27.70	27,500
25	F. C. Sammons	17.90	15,700	23	Frye and Sammons	8.10	3,350
25	do	17.35	14,200	24	do	20.95	19,900
Mar. 3	do	23.85	25,600	25	do	21.85	18,800
3	do	24.95	30,000	25	do	20.80	18,200
3	do	25,95	29,100	May 24	H. E. Frye	3.20	485
3	do	26.55	28,400	24	do	3.20	477

Daily discharge, in second-feet, of Tug Fork at Kermit, W. Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	990	195	400	1,900	5,100	8,260	2,360	1,220	1,220	290	245	780
2	572	195	400	1,470	9,820	20,000	2,120	1,100	1,540	208	220	880
3	365	185	400	2,600	5,100	26,000	1,820	1,100	2,760	185	382	490
4	275	185	400	6,000	3,320	28,000	1,540	990	1,900	275	595	335
5	208	175	435	19,800	2,360	34,300	1,750	1,100	1,540	220	595	260
6	185	155	452	17,800	1,610	12,400	6,970	1,220	880	245	335	232
7	208	155	400	8,860	1,680	7,190	6,750	1,100	730	220	290	435
8	140	140	365	5,100	1,540	11,100	4,700	990	572	195	350	830
9	132	140	350	3,480	1,470	7,420	3,640	1,220	530	220	640	1,340
10	148	165	335	2,520	1,160	5,600	2,840	2,040	730	155	290	1,040
11	140	175	320	2,040	1,220	4,340	2,280	2,200	990	185	730	640
12	132	155	365	1,470	1,100	5,800	1,900	1,820	880	232	470	435
13	148	232	335	1,280	880	12,900	1,750	1,540	640	155	350	320
14	140	260	305	1,470	990	11,300	1,540	1,280	550	155	275	260
15	125	260	305	1,470	1,540	7,900	1,400	1,100	572	220	208	208
16	132	260	335	1,680	2,840	5,700	1,280	935	382	335	195	185
17	165	275	305	1,680	3,480	8,860	1,100	830	335	595	220	175
18	595	245	275	1,540	2,840	11,300	935	685	305	780	148	232
19	1,680	245	335	1,610	2,680	6,750	1,100	595	275	780	148	148
20	1,900	232	418	1,540	5,500	4,700	830	530	290	830	148	125
21	1,470	220	382	2,200	15,000	3,980	830	550	260	685	132	132
22	880	208	1,470	9,820	7,190	3,890	780	530	220	510	118	110
23	595	208	5,900	7,660	4,520	4,070	730	530	232	550	132	95
24	452	232	3,240	5,400	13,500	19,000	685	490	220	1,040	155	102
25	382	232	1,820	3,560	15,400	18,300	640	418	208	1,100	490	110
26	320	220	1,280	2,600	8,140	7,540	685	365	185	1,040	435	118
27	275	245	990	1,970	4,340	5,100	640	830	232	880	290	140
28	245	245	4,070	1,680	4,700	4,520	595	3,000	232	530	208	1,540
29	226	320	14,700	1,470	.....	4,070	935	3,980	232	490	165	1,750
30	208	365	5,900	2,440	.....	3,480	1,220	2,200	220	382	260	1,040
31	195	.....	3,000	2,840	.....	3,160	.....	1,280	.....	320	220	.....

Monthly discharge of Tug Fork at Kermit, W. Va., for the year ending Sept. 30, 1917.

[Drainage area, 1,240 square miles]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,900	125	439	0.345	0.41
November	365	140	217	.175	.20
December	14,700	275	1,610	1.30	1.50
January	19,800	1,280	4,100	3.31	3.82
February	15,400	880	4,610	3.72	3.87
March	34,300	3,160	10,200	8.23	9.49
April	6,970	595	1,880	1.52	1.70
May	3,980	365	1,220	.984	1.13
June	2,760	185	662	.534	.60
July	1,100	155	452	.365	.42
August	730	118	304	.245	.28
September	1,750	95	483	.390	.44
The year	34,300	95	2,180	1.76	23.86

BLAINE CREEK AT YATESVILLE, KY.

LOCATION.—At covered highway bridge one-fourth mile above Yatesville, Lawrence County. Morgan Branch enters on left about 2 miles above station.

DRAINAGE AREA.—216 square miles (United States Engineer Corps).

RECORDS AVAILABLE.—June 1, 1915, to September 30, 1917.

GAGE.—Vertical staff gage in two sections attached to elm tree on right bank about 50 feet above bridge; read by Hattie M. Carter.

DISCHARGE MEASUREMENTS.—Made from board walk constructed on inside of bridge near top of siding. Wading measurements are made under bridge.

CHANNEL AND CONTROL.—Stream curved above and straight below bridge, right bank overflows at high stages, stream bed compact sand and gravel; control composed of bed rock extending half way across stream, sand and gravel rest of way, probably permanent.

ICE.—Stage-discharge relation rarely affected by ice.

ACCURACY.—Stage-discharge relation probably permanent; not affected by ice. Rating curve well defined between 20 and 4,000 second-feet; extended beyond these limits. Gage read twice daily to hundredths below and tenths above 10 feet. Daily discharge ascertained by applying mean daily gage heights to rating table. Records good.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Blaine Creek at Yatesville, Ky., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec.-ft.*
Jan. 22	H. E. Frye	15.25	5,310	Mar. 12	Frye and Sammons	10.95	3,640
22	do	15.40	5,440	19	do	3.79	614
Feb. 24	do	7.90	2,370	Apr. 26	H. E. Frye	1.81	73.7
Mar. 12	Frye and Sammons	10.91	3,620				

Daily discharge, in second-feet, of Blaine Creek at Yatesville, Ky., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	27	22	47	252	800	2,820	264	112	555	160	18	239
2	18	21	43	204	525	1,080	304	88	2,520	48	19	181
3	17	20	42	880	290	2,870	465	77	2,340	46	19	1,040
4	16	24	38	1,200	590	2,200	331	64	730	35	17	405
5	14	24	181	1,980	435	1,240	465	72	435	28	15	150
6	13	21	34	2,070	465	840	1,840	64	331	29	13	24
7	12	21	25	1,040	405	1,320	960	65	345	28	15	375
8	15	21	123	405	317	2,770	555	60	264	28	19	3,320
9	11	20	83	331	304	1,280	465	66	264	54	10	1,800
10	12	24	98	252	215	660	317	60	277	31	9	1,360
11	10	21	83	227	277	465	290	54	304	28	10	465
12	10	30	69	181	277	2,920	264	72	227	20	13	43
13	19	22	79	160	277	2,160	290	80	181	19	7	19
14	16	21	54	375	114	1,940	252	66	123	24	12	17
15	16	20	38	625	150	800	204	59	114	21	12	17
16	12	21	43	960	227	590	141	48	96	28	7	19
17	13	18	51	1,080	525	1,400	170	43	72	34	3.5	15
18	12	17	69	960	660	960	150	39	66	48	6	15
19	239	18	91	800	555	590	141	36	54	62	8	19
20	405	15	43	730	1,160	465	132	35	204	150	13	15
21	304	18	435	1,320	1,040	1,440	123	32	170	100	12	12
22	141	21	1,710	5,960	465	1,240	123	27	88	114	12	24
23	80	21	625	1,440	555	1,120	110	33	66	105	15	17
24	65	24	375	660	2,200	5,080	88	40	39	56	15	24
25	48	46	264	495	1,040	1,280	77	30	48	181	12	15
26	38	39	204	375	590	730	85	27	46	252	27	15
27	39	37	192	304	465	590	73	83	43	96	12	30
28	36	30	2,200	304	2,430	525	91	2,200	141	94	12	155
29	28	73	1,200	331	.....	435	105	1,040	405	54	10	104
30	25	54	800	360	.....	360	181	405	181	35	10	60
31	26	.....	555	331	.....	317	.....	290	.....	21	12	.....

Monthly discharge of Blaine Creek at Yatesville, Ky., for the year ending Sept. 30, 1917.

[Drainage area, 216 square miles]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	405	10	56.0	0.259	0.30
November	73	15	26.1	.121	.14
December	2,200	25	319	1.48	1.71
January	5,960	160	858	3.97	4.58
February	2,430	114	620	2.87	2.99
March	5,080	317	1,370	6.34	7.31
April	1,840	73	302	1.40	1.56
May	2,200	27	176	.815	.94
June	2,520	39	358	1.66	1.85
July	252	19	65.5	.303	.35
August	27	3.5	12.7	.059	.07
September	3,320	12	333	1.54	1.72
The year	5,960	3.5	374	1.73	23.52

SCIOTO RIVER BASIN.

SCIOTO RIVER AT WAVERLY, OHIO.

LOCATION.—At Norfolk & Western Railway bridge about 1 mile southeast of Waverly, Pike County.

DRAINAGE AREA.—5,730 square miles (United States Engineer Corps).

RECORDS AVAILABLE.—March 23, 1916 to September 30, 1917.

GAGE.—Chain gage fastened to downstream side of bridge; read by W. G. Johnston. Sea-level elevation of zero of gage, 542.00 feet (United States Engineer Corps).

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge to which gage is attached, or from highway bridge 2,000 feet below gage.

CHANNEL AND CONTROL.—For stages over 12 feet the river spreads over the bottom lands, but all water passes under the bridge.

EXTREMES OF DISCHARGE.—Maximum stage during year, 16.27 feet March 15 (discharge 39,000 second-feet); minimum mean daily discharge, estimated to be about 350 second-feet in September.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined between 400 and 140,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table, except as noted. Records good.

COOPERATION.—Base data furnished by United States Engineer Corps.

The following discharge measurement was made by Crosley and Baker of the United States Army Engineer Corps:

October 18: Gage height, 1.46, discharge, 437 second-feet.

Daily discharge, in second-feet, of Scioto River at Waverly, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	427	427	454	4,140	8,570	6,740	4,680	2,580	7,720	7,960	1,360	520
2	454	427	454	3,520	8,450	6,000	6,240	2,440	11,400	7,470	1,360	454
3	427	427	454	3,250	6,740	4,500	8,450	2,580	6,490	7,220	970	427
4	427	427	482	5,280	3,380	4,500	12,600	2,710	5,760	4,140	860	427
5	427	427	560	9,920	2,040	4,500	10,700	3,250	5,760	2,980	690	400
6	427	400	1,220	16,600	1,900	4,140	23,100	5,760	5,280	2,300	690	454
7	427	400	970	25,600	7,220	3,380	24,400	8,450	4,500	3,250	770	482
8	427	400	770	20,800	3,380	8,450	20,800	6,980	3,520	6,490	690	482
9	427	400	690	11,900	2,710	8,450	17,700	4,680	5,760	11,600	620	482
10	427	400	690	8,200	2,580	8,700	12,000	3,800	8,450	6,740	620	454
11	400	427	620	7,260	2,170	9,920	10,000	3,120	8,200	3,800	620	427
12	427	427	560	6,330	2,040	18,200	8,000	2,840	5,760	2,840	620	400
13	427	454	560	5,390	1,900	23,100	6,500	2,440	3,960	3,120	560	400
14	427	440	520	4,460	1,760	33,000	5,500	2,300	3,520	2,980	454	400
15	438	427	520	3,520	1,630	38,500	4,140	2,040	2,980	13,600	482	400
16	449	400	500	3,120	1,630	37,000	3,120	1,760	2,440	21,400	1,630	375
17	460	427	500	2,300	1,630	18,200	2,710	1,500	2,040	17,700	690	350
18	471	400	500	2,710	1,900	11,600	2,580	1,360	1,630	8,450	560	350
19	482	400	500	2,170	2,040	8,200	4,860	1,360	1,500	10,200	540	375
20	770	400	500	2,170	2,440	6,490	3,800	1,360	1,360	6,240	520	400
21	860	400	500	5,760	2,710	5,760	3,520	1,090	1,500	5,280	520	400
22	770	400	500	34,300	3,380	5,760	2,580	1,090	1,900	4,680	482	400
23	620	400	500	29,300	3,800	5,520	2,170	1,220	1,630	3,960	482	400
24	560	400	600	16,600	20,500	22,500	2,170	1,090	1,500	2,980	620	400
25	482	460	700	9,680	15,100	20,200	2,170	1,090	1,360	2,440	620	400
26	482	520	2,040	8,450	9,920	14,300	2,040	860	1,220	2,040	520	400
27	482	454	6,740	5,760	8,450	10,900	2,300	4,680	1,220	1,900	482	400
28	454	482	29,700	6,490	6,980	7,470	2,040	21,100	1,360	3,800	482	400
29	454	482	17,400	8,940	.....	6,000	2,300	21,100	5,520	2,980	454	400
30	427	454	14,800	8,810	.....	4,140	2,980	10,700	9,180	2,170	454	375
31	427	.....	8,700	8,690	.....	3,660	.....	6,740	.....	1,630	520	.....

NOTE.—Daily discharge estimated or interpolated because of missing gage readings or ice effect from observer's notes, climatic records, and from records at other gaging stations as follows: Oct. 15–18; Nov. 9, 14, 23, 25; Jan. 11–14, 30–Feb. 1; Mar. 4; Apr. 10–14; Aug. 19; Sept. 17–30.

Monthly discharge of Scioto River at Waverly, Ohio, for the year ending Sept. 30, 1917.

[Drainage area, 5,730 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	860	400	486	0.085	0.10
November	520	400	426	.074	.08
December	29,700	454	3,040	.531	.61
January	34,300	2,170	9,400	1.64	1.89
February	20,500	1,630	4,890	.853	.89
March	38,500	3,380	11,900	2.08	2.40
April	24,400	2,040	7,200	1.26	1.41
May	21,100	860	4,320	.754	.87
June	11,400	1,220	4,150	.724	.81
July	21,400	1,630	5,950	1.04	1.20
August	1,630	454	676	.118	.14
September	.....	.....	414	.072	.08
The period	38,500	.....	4,420	.771	10.48

LITTLE MIAMI RIVER BASIN.

LITTLE MIAMI RIVER AT MIAMIVILLE, OHIO.

LOCATION.—At two-span steel highway bridge about one-third mile southeast of Miamiville, Clermont County.

DRAINAGE AREA.—1,200 square miles.

RECORDS AVAILABLE.—June 21, 1915, to September 30, 1917.

GAGE.—Chain gage attached to downstream side of bridge; read by Arnold Barrere.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge, except at low stages, when they are made by wading.

CHANNEL AND CONTROL.—Channel clean of vegetation, except at high stages. Control probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 13.5 feet at 4 p. m. January 5 (discharge, 25,600 second-feet); minimum mean daily stage recorded, 1.36 feet, September 25 (discharge, 72 second-feet).

REGULATION.—Low-water flow regulated to some extent by operation of flour mill at Fosters Crossing about 11 miles upstream.

ACCURACY.—Stage-discharge relation permanent; may be affected by ice to some extent during December 13–25 and January 11–20. Rating curve well defined between 100 and 6,000 second-feet and fairly well above 6,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Low-stage record subject to error because of artificial regulation.

COOPERATION.—Base data furnished by U. S. Army Engineers.

Daily discharge, in second-feet, of Little Miami River at Miamiville, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	178	110	169	760	2,470	920	722	840	1,530	584	282	106
2	161	120	183	685	1,470	962	7,710	650	2,100	3,090	247	110
3	142	116	169	1,840	722	840	3,090	526	1,470	880	230	164
4	118	125	180	1,100	800	1,000	1,650	1,650	1,050	500	200	265
5	130	112	300	23,600	760	1,050	4,850	3,810	5,370	412	180	230
6	92	116	433	12,400	615	615	9,010	1,650	4,850	317	230	215
7	118	114	372	4,850	650	800	2,870	1,240	2,100	372	215	158
8	94	128	300	2,670	685	1,780	1,650	1,000	1,300	412	230	392
9	122	135	300	1,780	615	1,780	1,410	840	2,280	372	200	161
10	108	125	230	1,360	526	1,410	1,190	722	3,090	282	194	158
11	84	132	282	1,190	454	2,100	1,000	584	1,780	282	186	150
12	108	116	230	760	412	13,700	880	552	1,140	282	161	125
13	116	102	200	685	353	17,300	800	526	880	282	167	140
14	84	142	200	584	353	15,800	650	454	685	552	153	138
15	94	138	158	454	335	7,450	552	454	615	760	169	116
16	98	142	150	526	335	3,310	584	392	526	526	150	116
17	140	112	148	526	335	1,930	500	412	433	760	156	92
18	116	106	153	552	454	1,300	454	372	433	500	158	104
19	148	102	148	477	500	920	650	300	392	615	132	106
20	247	180	175	454	920	685	615	282	433	454	125	100
21	247	120	172	685	650	1,490	500	335	412	353	189	108
22	172	116	150	19,400	477	1,490	454	317	335	353	197	118
23	230	167	150	5,110	5,890	1,430	433	412	317	335	189	103
24	178	200	150	2,470	6,670	5,370	412	353	282	317	300	88
25	142	247	145	1,530	2,100	3,310	454	335	317	265	230	72
26	150	156	215	1,190	1,470	1,930	433	300	300	962	192	98
27	145	142	17,100	880	1,240	1,470	433	6,410	282	1,650	186	96
28	135	158	6,150	1,530	1,000	1,140	500	15,800	300	962	156	102
29	104	197	2,670	5,110	.....	962	615	4,850	880	584	148	102
30	100	161	1,240	4,070	.....	760	650	2,280	1,100	412	138	104
31	96	.....	920	2,470	.....	685	.....	1,650	.....	353	122	.....

Monthly discharge of Little Miami River at Miamiville, Ohio, for the year ending Sept. 30, 1917.

[Drainage area, 1,200 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	247	84	135	0.112	0.13
November	247	102	138	.115	.13
December	17,100	145	1,080	.900	1.04
January	23,600	454	3,250	2.71	3.12
February	6,670	335	1,190	.992	1.03
March	17,300	615	3,090	2.58	2.97
April	9,010	412	1,520	1.27	1.42
May	15,800	282	1,620	1.35	1.56
June	5,370	282	1,230	1.02	1.14
July	3,090	265	606	.505	.58
August	300	122	187	.156	.18
September	392	72	138	.115	.13
The year	23,600	72	1,190	.992	13.43

EAST FORK OF LITTLE MIAMI RIVER AT PERINTOWN, OHIO.

LOCATION.—At single-span steel highway bridge at Perintown, Clermont County, about 5 miles above junction of East Fork and Little Miami rivers.

DRAINAGE AREA.—459 square miles.

RECORDS AVAILABLE.—May 7, 1915, to September 30, 1917.

GAGE.—Chain gage attached to downstream side of bridge; read by G. W. Taylor.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge except at low stages when they are made by wading.

CHANNEL AND CONTROL.—Bed of river mostly rock; banks covered with trees and brush above a stage of about 5 feet; control rock and gravel; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 18.6 feet at noon December 27 (discharge, about 21,300 second-feet); minimum stage, −0.10 foot September 23 (discharge, about 9 second-feet).

ICE.—Stage-discharge relation affected by ice in severe winters.

ACCURACY.—Stage-discharge relation permanent; may be affected by ice to some extent during parts of December, January, and February. Rating curve well defined between 10 and 7,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table.

COOPERATION.—Base data furnished by United States Army Engineers.

Discharge measurements of East Fork of Little Miami River at Perintown, Ohio, during the year ending Sept. 30, 1917.

[Made by L. M. Crosley.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Jan. 5	14.08	12,900
5	12.15	9,400

Daily discharge, in second-feet, of East Fork of Little Miami River at Perintown, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	11	13	65	220	627	775	375	110	246	44	39	25
2	12	13	49	246	246	825	6,940	95	1,500	142	35	24
3	12	12	44	1,900	151	725	1,640	82	925	82	23	41
4	11	11	43	1,840	110	1,260	627	110	337	75	18	24
5	11	11	1,020	15,100	110	627	2,460	356	2,180	62	16	17
6	10	11	627	6,680	117	413	4,760	274	1,260	48	18	16
7	10	11	208	1,500	117	775	1,260	172	453	37	33	38
8	10	11	125	627	125	2,460	725	117	246	74	21	304
9	18	11	88	394	110	1,640	394	102	2,600	375	17	195
10	18	11	75	304	110	1,020	413	82	3,290	133	18	63
11	13	11	69	220	110	627	320	75	775	88	16	27
12	12	12	58	172	102	1,640	233	69	337	59	13	18
13	11	12	48	142	73	6,080	195	67	208	39	13	14
14	10	12	34	125	65	6,810	151	62	151	31	15	12
15	10	11	31	102	68	1,500	133	56	133	28	13	11
16	10	11	33	102	71	675	117	48	102	24	12	10
17	10	11	33	117	75	582	102	39	82	246	12	10
18	10	11	31	117	95	453	95	35	74	675	12	10
19	27	11	26	117	110	260	88	34	68	495	11	10
20	151	13	24	125	133	220	82	32	64	337	11	10
21	220	13	23	1,380	125	582	75	30	60	172	11	11
22	125	12	38	10,900	142	675	71	35	51	142	11	11
23	95	49	50	1,640	1,900	2,180	67	55	44	117	10	9
24	60	246	60	582	3,460	6,080	60	33	38	102	10	11
25	40	110	88	394	825	1,900	56	28	35	117	10	12
26	27	95	337	274	453	675	54	25	31	1,080	9.3	12
27	23	60	19,100	220	394	495	68	1,500	32	627	9.5	12
28	20	39	8,350	675	516	474	102	3,800	39	289	9.5	12
29	17	56	1,200	5,080	.....	304	125	1,500	95	151	10	12
30	15	95	495	2,600	.....	220	133	538	75	95	13	13
31	14	.....	246	925	.....	172	.....	289	.....	60	27	.....

Monthly discharge of East Fork of Little Miami River at Perintown, Ohio, for the year ending Sept. 30, 1917.

[Drainage area, 459 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	220	10	33.6	0.073	0.08
November	246	11	33.5	.073	.08
December	19,100	23	1,060	2.31	2.66
January	15,100	102	1,770	3.86	4.45
February	3,460	65	376	.819	.85
March	6,810	172	1,390	3.03	3.49
April	6,940	54	731	1.59	1.77
May	3,800	25	318	.693	.80
June	3,290	31	518	1.13	1.26
July	1,080	24	195	.425	.49
August	39	9.3	16.0	.035	.04
September	304	9	33.1	.072	.08
The year	19,100	9	543	1.18	16.05

LICKING RIVER BASIN.

LICKING RIVER AT FARMERS, KY.

LOCATION.—About 100 feet below Chesapeake & Ohio Railway bridge and about 300 feet below two-span steel highway bridge, three-fourths of a mile west of Farmers, Rowan County.

DRAINAGE AREA.—768 square miles (measured by United States Engineer Corps).

RECORDS AVAILABLE.—July 20, 1915, to September 30, 1917.

GAGE.—Combination vertical staff and slope gage on east bank of river; read by T. E. Craig.

DISCHARGE MEASUREMENTS.—Made from downstream side of two-span highway bridge 300 feet above gage.

CHANNEL AND CONTROL.—Bed of stream solid rock, straight above and below gage. Control is a rock reef about 1 mile below gage.

EXTREMES OF STAGE.—Maximum stage recorded during year 25.6 feet at 7 a. m. January 22; minimum stage 1.1 feet August 17 and 18.

ICE.—No information.

REGULATION.—The flow at low stages may be affected by storage of water for use of a sawmill at a movable dam a short distance above the gage. Dam is submerged at gage height 5 feet.

ACCURACY.—Stage-discharge relation probably permanent; not affected by ice during the year. On August 4, 1917, the sloping gage was found to be in error as follows: 5-foot mark at elevation 5.04 feet; 4-foot mark at elevation 4.17 feet; and 2-foot mark at elevation 2.23 feet. In the absence of definite information as to date of change in gage, it was assumed that the change occurred March 1, 1916, and remained constant until August 4, 1917, when discovered. Gage readings during this period below 5.0 feet were increased as indicated by the determined errors in the gage. Rating curve not yet determined. Gage read to half-tenths twice daily. Gage readings less than 5 feet are questionable on account of error in gage.

COOPERATION.—Records furnished by United States Engineer Corps.

Daily gage height, in feet, of Licking River at Farmers, Ky., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.75	2.09	2.45	4.76	5.45	19.00	4.49	3.28	5.50	2.47	1.83	1.42
2	2.12	2.02	2.41	4.34	6.50	17.60	5.28	3.90	10.80	2.25	1.77	1.18
3	2.02	1.99	2.38	5.78	6.10	16.55	6.82	2.99	13.85	2.15	1.77	1.38
4	1.92	1.96	2.35	10.82	4.70	18.82	5.92	2.84	10.52	1.96	1.75	1.20
5	1.94	1.96	5.25	15.75	3.83	18.12	5.70	2.77	6.95	1.85	1.58	1.20
6	1.80	1.89	4.03	18.45	3.72	14.55	14.60	2.70	5.05	1.77	1.48	1.32
7	1.70	1.89	3.40	17.10	3.67	10.90	14.15	2.62	5.60	1.75	1.38	1.45
8	1.73	4.15	3.28	11.05	4.01	16.20	10.28	2.60	5.08	1.77	1.38	3.92
9	1.70	1.83	3.03	5.95	4.30	17.98	6.65	2.54	4.68	1.73	1.52	5.78
10	1.67	1.92	2.89	4.95	4.28	15.10	5.60	2.60	5.60	1.70	1.38	3.90
11	1.65	1.87	2.74	4.60	3.81	10.45	4.90	2.64	4.49	1.75	1.30	2.60
12	1.87	1.92	2.67	4.12	3.51	16.82	4.49	2.72	4.15	1.89	1.28	1.98
13	1.83	2.06	2.57	3.79	3.81	17.25	4.34	2.72	3.67	1.83	1.35	1.68
14	1.77	2.09	2.47	3.77	3.30	16.95	4.47	2.62	3.35	1.85	1.32	1.55
15	1.80	2.02	2.28	3.86	3.77	12.72	4.17	2.54	3.25	1.92	1.35	1.42
16	1.77	1.99	2.50	3.93	4.93	9.00	3.67	2.47	3.12	1.87	1.18	1.32
17	1.73	1.96	2.31	4.84	7.88	9.80	3.61	2.38	2.93	2.21	1.12	1.60
18	1.75	1.89	2.54	4.24	8.10	11.38	3.38	2.52	2.72	2.12	1.12	1.52
19	2.21	1.87	2.52	4.62	6.78	9.78	3.49	2.23	2.54	2.47	1.35	1.45
20	5.05	1.89	2.28	3.96	6.70	6.78	3.18	2.21	7.95	2.80	1.25	1.42
21	5.55	1.87	2.70	7.98	9.70	11.05	2.99	2.60	4.06	2.72	1.32	1.38
22	4.27	1.87	7.82	24.90	8.98	12.05	2.93	2.04	3.01	2.80	1.45	1.40
23	3.40	1.94	9.85	22.92	6.68	9.42	2.91	2.45	2.70	2.50	1.58	1.45
24	3.01	2.60	6.62	20.18	10.00	18.98	2.80	2.64	2.54	2.43	1.48	1.65
25	2.74	2.72	4.84	12.00	12.55	18.62	2.70	2.52	2.45	3.01	1.40	1.78
26	2.54	2.62	4.26	5.98	13.00	15.25	2.67	2.21	2.21	4.78	1.20	1.80
27	2.50	2.45	4.68	5.10	7.62	8.42	2.62	10.40	2.06	4.06	1.35	1.50
28	2.38	2.38	12.52	4.72	12.30	6.78	2.54	18.38	4.44	2.38	1.42	1.88
29	2.25	2.33	14.95	4.78	.....	6.02	2.77	20.75	3.03	2.31	1.40	3.22
30	2.18	2.47	11.72	4.98	.....	5.32	3.49	16.92	2.72	1.94	1.48	.....
31	1.92	.....	7.32	4.92	.....	4.82	.....	7.55	.....	1.89	1.50	.....

NOTE.—No gage height furnished for Sept. 30.

LICKING RIVER AT CATAWBA, KY.

LOCATION.—About 200 feet below Catawba ford, about one-fourth mile north of Catawba, Pendleton County. Kinkaid Creek enters from right about 1,000 feet below gage.

DRAINAGE AREA.—3,300 square miles.

RECORDS AVAILABLE.—July 14, 1916, to September 30, 1917.

GAGE.—Combination slope and vertical staff on south bank of river about 200 feet below the ford; read by G. A. Frank. Elevation of zero of gage is 498.37 feet above sea level, which corresponds approximately to 69 feet on the United States Weather Bureau gage on Ohio River at Cincinnati, Ohio.

DISCHARGE MEASUREMENTS.—Made from cable about 500 feet upstream from gage.

CHANNEL AND CONTROL.—Bed of river at cable is mostly ledge rock. The banks are heavily wooded above an elevation of about 7 feet on the gage. The control is a rock bar just below the mouth of Kinkaid Creek; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of records, 32.8 feet at 6 a. m. January 23, 1917 (discharge, 55,200 second-feet); minimum stage recorded, 0.80 foot September 28, 1917 (discharge, 89 second-feet).

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—Stage-discharge relation probably permanent; not affected by ice during year. Rating curve fairly well defined between 110 and 860 second-feet; and well defined above 860 second-feet; below 110 second-feet the curve is an extension. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

COOPERATION.—Base data furnished by United States Army Engineers.

Discharge measurements of Licking River at Catawba, Ky., during the year ending Sept. 30, 1917.

[Made by L. M. Crosley.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 3	1.26	146	Jan. 10	9.07	8,250	Jan. 24	25.45	38,900
24	3.81	1,520	10	8.48	7,370	25	21.20	29,000
24	3.68	1,460	22	31.95	51,200	25	20.65	29,800
25	3.29	1,080	22	31.95	53,200	26	19.00	27,200
Jan. 8	13.55	15,900	23	32.45	54,800	26	18.08	25,000
9	12.25	13,400	24	27.4	42,100	27	14.55	18,200
9	11.85	12,600	24	26.3	39,300			

Daily discharge, in second-feet, of Licking River at Catawba, Ky., for the year ending Sept. 30, 1916.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1	.....	132	210	11	.....	1,360	342	21	2,370	980	125
2	.....	132	1,830	12	.....	1,270	324	22	1,830	939	125
3	.....	125	1,730	13	.....	900	139	23	1,830	939	125
4	.....	125	2,840	14	125	900	139	24	1,730	900	118
5	.....	118	1,360	15	125	1,020	132	25	939	900	118
6	.....	562	900	16	125	3,440	125	26	647	900	118
7	.....	380	2,370	17	125	5,510	125	27	360	589	112
8	.....	360	900	18	125	6,940	125	28	342	360	112
9	.....	589	1,830	19	200	5,510	132	29	342	342	118
10	.....	2,480	589	20	939	2,370	132	30	139	324	125
								31	132	324	.....

Daily discharge, in second-feet, of Licking River at Catawba, Ky., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	118	291	399	9,130	5,090	11,100	1,830	1,100	18,800	1,360	342	189
2	118	234	360	4,570	5,370	19,900	29,700	1,540	13,400	1,540	261	154
3	118	210	360	17,500	5,650	19,500	20,300	1,270	10,600	1,180	234	154
4	125	189	360	18,200	4,570	21,800	12,900	1,100	10,400	618	210	132
5	125	189	442	19,700	3,570	25,300	14,400	1,020	9,930	464	170	112
6	125	189	2,840	21,600	2,370	20,800	27,700	860	7,080	399	170	112
7	125	180	4,570	19,500	2,150	18,400	20,300	782	4,830	342	154	112
8	118	170	2,260	16,400	2,370	21,400	16,700	711	6,790	308	139	13,000
9	118	162	1,540	13,000	2,370	30,900	13,000	647	12,000	261	139	10,900
10	118	170	1,180	8,240	2,260	30,100	8,830	589	8,980	234	132	5,650
11	112	154	900	4,830	1,930	24,900	6,210	589	6,790	210	125	3,320
12	112	154	860	3,570	1,440	32,100	4,700	589	5,090	200	112	1,830
13	112	154	647	2,840	1,360	40,500	3,820	618	3,570	170	112	1,100
14	112	170	589	2,150	1,540	41,100	3,320	647	3,440	170	139	711
15	106	189	589	1,730	1,540	32,300	3,080	647	2,260	589	146	487
16	112	189	1,020	2,370	1,360	20,800	2,840	589	2,150	2,720	146	399
17	112	189	1,360	3,820	1,830	14,100	2,370	536	1,730	980	139	324
18	112	189	536	2,600	5,650	10,200	1,930	487	1,360	442	125	276
19	112	189	512	2,370	8,630	11,100	1,730	442	1,100	291	112	222
20	324	180	589	2,720	8,240	9,290	1,540	399	1,020	248	106	200
21	1,730	170	512	11,700	7,220	18,000	1,360	360	3,440	782	106	189
22	2,840	162	1,360	53,400	6,790	21,000	1,270	324	4,570	2,150	118	210
23	2,260	189	5,930	54,700	11,100	16,500	1,100	324	1,930	1,730	125	360
24	1,360	512	6,790	43,400	13,900	23,500	1,020	291	1,180	1,440	125	234
25	900	360	7,370	30,500	11,400	21,600	939	291	900	1,440	100	189
26	589	291	6,790	25,300	9,610	18,800	860	360	647	1,020	100	170
27	360	342	36,700	15,100	10,200	17,800	821	40,700	536	647	100	154
28	360	512	26,900	6,210	9,130	13,000	711	46,800	487	1,180	89	154
29	399	487	21,000	7,660	.....	8,240	782	31,700	1,540	821	100	189
30	420	464	15,800	6,360	.....	5,930	821	20,100	2,600	536	154	170
31	324	.....	12,000	5,230	.....	4,570	.....	17,500	.....	399	162	.....

Monthly discharge of Licking River at Catawba, Ky., for the years ending Sept. 30, 1916–17.

[Drainage area, 3,300 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1916.					
July 14–31	2,370	125	690	0.209	0.14
August	6,940	118	1,350	.409	.47
September	2,840	112	582	.176	.20
1916–1917.					
October	2,840	106	454	.138	.16
November	512	154	241	.073	.08
December	36,700	360	5,260	1.59	1.83
January	54,700	1,730	14,100	4.27	4.92
February	13,900	1,360	5,310	1.61	1.68
March	41,100	4,570	20,100	6.09	7.02
April	29,700	711	6,900	2.09	2.33
May	46,800	291	5,610	1.70	1.96
June	18,800	487	4,970	1.51	1.68
July	2,720	170	802	.243	.28
August	342	89	145	.044	.05
September	13,000	112	1,380	.418	.47
The year	54,700	89	5,460	1.65	22.46

SOUTH FORK OF LICKING RIVER AT HAYES, KY.

LOCATION.—At two-span steel highway bridge at Hayes, Pendleton County, about 2½ miles south of Falmouth.

DRAINAGE AREA.—922 square miles (measured by United States Engineer Corps).

RECORDS AVAILABLE.—July 7, 1916, to September 30, 1917.

GAGE.—Chain gage attached to downstream handrail of bridge; read by J. K. Frazer. Sea-level elevation of zero of gage, 540.10 feet.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge.

CHANNEL AND CONTROL.—Bed of river composed of ledge rock; banks lined with vegetation. Control about 800 feet below gage; probably permanent. Backwater begins to affect the stage-discharge relation at this station when the main Licking River reaches a stage of about 28 feet on the gage at Falmouth.

EXTREMES OF STAGE.—Maximum stage recorded during year, 15.5 feet at 7 a. m. January 22; minimum stage recorded, 0.20 foot at 6 a. m. September 6.

ICE.—Stage-discharge relation not affected by ice except during severe winters.

ACCURACY.—Stage-discharge relation probably permanent, except as affected by backwater from the Licking. Not affected by ice during the year. Rating curve not yet determined. Gage read twice daily to hundredths.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of South Fork of Licking River at Hayes, Ky., during the year ending Sept. 30, 1917.

[Made by L. M. Crosley.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 3	.63	17.4	Jan. 22	14.0	23,400	Jan. 24	9.55	13,000
Jan. 9	3.66	1,730	23	14.20	22,900	25	4.67	3,300
10	3.17	1,240						

Daily gage height, in feet, of South Fork of Licking River at Hayes, Ky., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.65	0.79	0.72	3.05	2.89	3.46	2.89	1.70	4.81	1.07	0.85	0.67
2	.59	.68	.69	2.73	3.20	5.68	11.17	1.57	4.41	2.35	.74	56
3	.62	.61	.66	7.95	3.28	4.96	7.99	1.48	4.06	1.81	.69	.46
4	.56	.53	.69	6.48	2.42	6.36	5.29	1.35	3.78	1.28	.66	.39
5	.52	.52	1.15	7.18	3.26	6.66	5.77	1.41	3.13	1.08	.60	.33
6	.60	.51	1.08	6.92	3.70	5.13	8.42	1.35	2.61	1.00	.57	.24
7	.53	.53	2.34	5.72	3.83	4.63	6.49	1.35	2.33	.94	.54	.25
8	.57	.56	1.99	4.32	3.33	6.39	4.79	1.31	3.96	.88	.53	2.72
9	.60	.59	1.72	3.51	2.94	9.09	4.27	1.22	6.24	.83	.52	4.72
10	.60	.57	1.48	3.11	2.67	8.02	3.77	1.17	4.48	.79	.53	3.34
11	.64	.56	1.37	2.81	2.57	6.39	3.31	1.17	3.94	.75	.52	2.08
12	.53	.57	1.28	2.53	2.43	10.82	3.02	1.17	3.12	.70	.52	1.51
13	.45	.57	1.13	2.29	2.17	11.19	2.74	1.25	2.62	.66	.51	1.26
14	.43	.58	1.07	2.12	2.20	8.47	2.60	1.32	3.17	.66	.45	1.07
15	.40	.57	1.14	1.84	2.05	6.87	2.38	1.20	2.36	.76	.52	.99
16	.38	.55	1.06	1.88	1.89	5.02	2.30	1.17	2.51	1.61	.65	.93
17	.35	.55	1.15	2.33	1.93	4.25	2.15	1.05	2.17	1.10	.53	.89
18	.31	.52	1.10	2.35	2.72	3.82	2.04	1.07	1.93	.88	.43	.74
19	.71	.54	1.06	2.31	4.06	3.77	1.93	1.03	1.67	.78	.42	.61
20	.87	.52	1.07	2.16	3.66	3.22	1.81	.97	1.60	.72	.37	.50
21	1.31	.53	1.18	5.85	3.46	6.87	1.72	.89	1.51	.67	.31	.86
22	1.26	.56	1.82	14.68	3.12	7.39	1.65	.92	1.51	.75	.41	.48
23	1.06	.71	1.60	14.08	4.83	5.22	1.56	.88	1.98	1.45	.53	.58
24	1.08	1.45	2.49	8.73	4.16	6.97	1.50	.86	1.63	1.28	.49	.70
25	1.19	1.23	3.72	4.43	3.96	6.65	1.44	.91	1.46	1.72	.41	.65
26	1.10	.94	3.52	3.68	3.46	4.62	1.46	1.00	1.19	1.74	.33	.54
27	1.00	.85	11.82	3.24	3.42	4.77	1.37	13.36	1.11	1.31	.28	.47
28	.95	.76	8.40	3.26	3.00	3.67	1.27	13.66	1.04	1.29	.30	.42
29	.88	.77	7.08	4.76	.....	3.41	1.42	7.58	1.08	1.17	.36	.39
30	.91	.73	4.92	3.41	.....	2.96	1.54	4.76	1.09	1.05	.39	.44
31	.89	.....	3.65	3.11	.....	2.67	.....	3.46	.....	.96	1.00	.....

MIAMI RIVER BASIN.

MIAMI RIVER AT SIDNEY, OHIO.

LOCATION.—At North Street Bridge, Sidney, Shelby County, Ohio.

DRAINAGE AREA.—555 square miles.

RECORDS AVAILABLE.—February 1, 1914, to September 30, 1917.

GAGE.—Vertical staff attached to downstream side of west abutment; read by H. B. Blake. Elevation of zero of gage, 926.46 feet above mean sea level.

DISCHARGE MEASUREMENTS.—Made from downstream side of the bridge at the gage, from the upstream side of highway bridge about 1,000 feet below the gage, or by wading.

CHANNEL AND CONTROL.—Shift during floods. Foliage along the banks may cause some backwater at high stages.

EXTREMES OF STAGE.—The flood of March–April, 1913—the highest known to have occurred at this station—reached a stage March 25 represented by 17.9 feet on gage.

ICE.—Stage-discharge relation may be affected by ice during short periods.

REGULATION.—A small power plant a short distance above the gage draws water from the Miami & Erie Canal feeder (see "Diversions"), and discharges it into the river above the gage. Another power plant takes water from Tawawa Creek and discharges it into the river above the point of control, which is just below the gage; this power plant is not in operation during the greater part of the summer for lack of water. The flow is practically unregulated by these power plants.

DIVERSIONS.—Water to feed the Miami & Erie Canal is diverted from the river at Port Jefferson, but a part of it is returned to the river above the gage. The amount diverted past the gage may be a large proportion of the low-water flow at the gage. Water diverted is not included in the table of daily discharge.

ACCURACY.—Stage-discharge relation practically permanent; not seriously affected by ice during the year. Measurements in 1917 indicate a shift in stage-discharge relation and do not cover sufficient range in stage to define a rating curve. Gage read once daily to tenths.

COOPERATION.—Gage-height record furnished by the United States Weather Bureau and results of discharge measurements by the Miami Conservancy District.

Discharge measurements of Miami River at Sidney, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 26	H. R. Daubenspeck..	−0.90	42.0	June 4	H. R. Daubenspeck..	−0.02	151
Mar. 8	G. N. Burrell.....	1.25	536	4	.....do.....	− .02	147
May 15	H. R. Daubenspeck..	− .15	141	Aug. 16	G. N. Burrell.....	− .95	43.8

Discharge measurements of Miami & Erie Canal feeder at Sidney, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 26	H. R. Daubenspeck..	.....	[a] 19.0	May 15	H. R. Daubenspeck..	.....	28.9
Mar. 8	G. N. Burrell.....	.....	17.2	Aug. 16	G. N. Burrell.....	.....	22.5

[a] Downstream side of Court Street bridge.

Daily gage height, in feet, of Miami River at Sidney, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.2	−1.0	−0.9	−0.3	1.9	0.8	0.3	0.8	1.4	1.3	0.3	−0.9
2	.0	−1.1	− .9	− .4	1.5	.5	1.4	1.5	.8	.9	.0	−1.2
3	.0	−1.1	−1.0	− .4	1.2	.3	2.5	.9	− .1	1.0	− .2	−1.1
4	.0	−1.1	− .8	− .5	1.2	.1	2.5	.6	.0	.5	− .8	−1.2
5	.0	−1.1	− .7	1.8	2.1	.0	2.6	1.9	.0	.2	−1.0	−1.0
6	.1	−1.0	− .1	3.8	1.4	− .2	2.6	2.1	.8	− .3	−1.0	− .0
7	.0	−1.0	.5	3.2	1.2	− .2	2.5	1.5	1.6	− .6	− .9	− .8
8	.1	−1.1	.6	2.2	1.0	1.0	1.6	1.2	1.2	− .4	−1.0	− .8
9	.1	−1.1	.6	1.6	1.0	1.3	1.1	1.1	.8	.1	− .9	.9
10	.1	−1.0	.4	1.7	.8	1.2	.8	.8	.8	.1	− .9	−1.0
11	.0	−1.0	.4	1.3	.8	1.8	.7	.3	1.0	.1	−1.0	−1.2
12	.0	−1.1	.4	1.0	.8	3.2	.6	.2	.9	− .4	− .9	−1.1
13	− .6	−1.1	.2	.8	.7	3.0	.4	.0	.9	.0	−1.0	−1.0
14	− .7	−1.0	.2	.7	.7	6.1	.2	− .1	.9	6.5	−1.0	−1.0
15	− .7	−1.1	.0	.6	.7	4.7	.2	− .2	.6	4.8	− .9	−1.2
16	− .7	−1.1	− .2	.4	.5	3.2	.1	− .3	.0	3.6	− .9	−1.3
17	−1.0	−1.1	− .4	.3	.0	2.2	− .1	− .4	.1	3.7	−1.0	−1.4
18	−1.1	−1.0	− .6	.3	− .3	1.8	.0	− .5	.1	2.2	−1.0	−1.5
19	−1.1	−1.1	− .8	.3	− .3	1.2	.1	− .5	.0	2.0	−1.1	−1.5
20	−1.0	−1.1	− .7	.3	2.0	1.0	.1	− .6	.3	.9	−1.0	−1.4
21	− .7	−1.1	− .7	.3	1.7	1.5	− .1	− .4	− .2	.6	− .9	−1.3
22	− .8	−1.0	− .7	1.5	1.4	1.7	− .2	− .4	− .2	.3	− .8	−1.2
23	− .9	− .9	− .8	2.8	1.5	1.3	− .3	.9	− .3	.0	− .9	−1.2
24	−1.0	− .6	− .9	2.0	2.8	2.7	− .3	.5	1.6	− .2	− .9	−1.2
25	−1.0	− .7	− .9	1.6	1.9	2.5	− .1	− .1	1.0	− .4	− .9	−1.1
26	− .9	− .9	− .8	1.3	1.2	1.6	− .1	− .2	.5	1.4	− .9	−1.0
27	−1.0	− .9	− .6	1.1	1.4	1.2	.1	1.2	.9	1.0	−1.0	−1.0
28	− .9	− .9	1.4	.8	1.2	1.0	− .1	1.1	.8	.9	−1.0	−1.0
29	−1.0	− .8	1.0	.6	.....	.7	− .2	1.6	3.9	.6	−1.0	−1.0
30	−1.1	− .9	.7	1.7	.....	.4	− .2	.6	2.6	.7	−1.0	−1.0
31	−1.1	.....	.1	1.4	.....	.2	.....	.8	.....	.6	− .9	.....

MIAMI RIVER AT PIQUA, OHIO.

LOCATION.—At North Main Street Bridge at Piqua, Miami County.

DRAINAGE AREA.—842 square miles (determined by Morgan Engineering Co.).

RECORDS AVAILABLE.—October 1, 1913, to June 30, 1914; October 1, 1914, to September 30, 1917. The United States Weather Bureau has obtained daily gage readings since January 1, 1911, and flood stages January 1, 1907, to December 31, 1910.

GAGE.—Mott gage; read by V. D. Crist. Sea-level elevation of zero of gage, 849 feet.

DISCHARGE MEASUREMENTS.—Made from upstream side of highway bridge about 3,000 feet below gage, or by wading.

CHANNEL AND CONTROL.—Control shifts somewhat during floods.

EXTREMES OF STAGE.—Flood of March-April, 1913, highest known at station, reached stage of 23.3 feet March 25, referred to gage datum.

ICE.—Stage-discharge relation affected by ice during winters.

DIVERSIONS.—Water from Miami & Erie Canal feeder is taken from the feeder in hydraulic canal and carried through a siphon under Loramie Creek, thence along the edge of the hills to Piqua, where it is used for power. It is discharged into the canal about a mile below the gage. In addition, water is diverted from the river into the lower canal level about 3 miles above the gage. The total diversion is therefore the flow in the "hydraulic" plus the flow in the canal opposite the gage. There has been practically no flow in the canal since the banks were washed out February 1, 1916.

REGULATION.—Water is discharged from power plants into the river above the gage, but the effect of the regulation is not appreciable.

ACCURACY.—Stage-discharge relation considered permanent during 1916 and 1917; probably affected by ice during parts of December, January, and February of these two years, although none was reported. Rating curve fairly well defined between 20 and 20,000 second-feet, beyond these limits the curve is an extension. Gage read daily to tenths. Gage-height record previous to October 1, 1914, unreliable. Records October 1, 1915, to September 30, 1917, considered good, except for parts of the winter months when affected by ice.

COOPERATION.—Gage-height record furnished by the United States Weather Bureau. Results of discharge measurements furnished by the Miami Conservancy District.

Discharge measurements of Miami River at Piqua, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 27	H. R. Daubenspeck..	0.90	71.4	June 30	H. R. Daubenspeck..	3.68	3,080
Mar. 9	G. N. Burrell.....	2.12	916	July 26	B. E. Jones.....	2.08	788
May 16	H. R. Daubenspeck..	1.21	185	July 27	G. N. Burrell.....	1.76	554

Discharge measurements of hydraulic canal at Piqua Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec.-ft.*
Oct. 26	H. R. Daubenspeck..	.....	[a] 26.9	May 16	H. R. Daubenspeck..	.....	[a] 26.8
Mar. 9	G. N. Burrell.....	.....	[a] 38.6	Aug. 16	G. N. Burrell.....	.....	[b] 2.9

[a] At Pioneer Pole & Shaft Co., South Main Street. [b] Upstream side of Wood Street Bridge.

Daily discharge, in second-feet, of Miami River at Piqua, Ohio, for the years ending Sept. 30, 1916–17.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915–16.												
1	866	153	196	3,800	13,300	300	2,230	866	460	118	68	153
2	1,090	118	153	20,000	6,440	244	1,580	556	370	118	68	118
3	760	118	153	13,000	3,800	196	976	556	370	118	68	118
4	658	90	153	7,620	2,390	196	1,090	1,450	300	90	68	90
5	658	90	153	4,900	1,830	556	976	976	300	90	51	90
6	556	90	153	3,800	1,580	460	760	760	556	90	51	2,390
7	556	90	244	2,940	1,330	3,140	658	22,100	976	90	68	244
8	460	90	196	2,230	1,090	3,800	556	9,060	1,700	90	90	153
9	460	90	153	1,830	1,200	2,940	658	4,460	1,450	90	90	118
10	370	90	118	1,450	866	2,090	976	2,570	1,090	90	90	118
11	370	90	90	1,580	556	1,580	1,330	1,960	866	90	90	118
12	300	90	90	3,140	460	1,200	1,090	1,330	760	90	68	90
13	244	90	90	9,300	866	866	976	866	658	90	68	90
14	300	68	90	6,220	658	760	866	760	460	68	51	90
15	1,090	68	90	2,750	460	658	760	556	370	68	51	118
16	866	68	90	1,960	658	556	658	556	370	68	51	118
17	658	68	153	1,450	866	556	556	370	460	68	51	153
18	1,830	68	2,570	1,090	976	556	370	370	760	68	51	153
19	2,570	1,580	1,960	760	976	460	300	300	976	68	51	153
20	1,830	2,230	1,580	760	976	460	244	244	658	68	51	153
21	1,330	1,830	1,200	976	866	460	2,230	244	658	68	51	153
22	976	1,450	760	3,800	658	6,660	1,700	300	2,230	90	51	153
23	760	1,200	658	2,750	866	8,100	1,330	460	1,700	90	51	153
24	658	976	460	2,090	1,090	5,340	976	370	1,090	90	51	196
25	556	866	1,700	1,700	1,330	3,360	658	300	760	90	39	196
26	556	760	2,230	1,330	1,090	2,750	658	244	460	90	39	153
27	460	658	1,960	1,330	866	12,200	2,090	244	300	90	39	153
28	370	460	1,580	2,090	658	10,300	2,090	300	244	68	153	244
29	300	300	1,960	2,570	460	5,780	1,830	976	196	68	153	370
30	244	244	2,230	7,140	.....	3,800	1,330	760	153	68	153	244
31	196	.....	2,230	17,000	.....	2,940	.....	556	.....	68	153	.....

Daily discharge in second-feet, of Miama River at Piqua, Ohio, for the years ending Sept. 30, 1916–17—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916–17.												
1	196	51	68	300	2,090	760	244	1,450	658	1,700	153	68
2	196	51	68	244	1,700	556	1,200	1,330	460	1,090	118	51
3	153	51	68	196	1,330	370	2,390	866	300	658	90	51
4	153	51	68	196	976	244	1,960	556	196	244	90	51
5	153	51	90	1,450	760	196	1,580	2,390	153	153	90	51
6	153	51	153	5,120	658	196	2,570	2,570	244	118	68	51
7	118	51	300	3,360	556	244	1,960	1,700	1,090	118	68	68
8	118	51	300	2,230	460	658	1,450	1,200	760	658	68	68
9	118	51	300	1,580	460	866	976	760	370	370	68	68
10	118	68	300	1,330	370	760	658	460	658	244	68	68
11	90	68	300	1,090	370	976	460	300	658	153	68	68
12	90	68	300	866	370	3,580	370	244	460	118	68	68
13	90	68	300	556	370	2,750	300	196	300	118	68	68
14	90	90	244	370	370	9,060	244	153	300	11,400	68	51
15	68	90	244	300	370	5,560	244	153	244	7,380	68	51
16	68	90	196	244	370	3,140	196	118	244	5,340	68	51
17	68	90	153	244	370	1,960	196	118	244	3,580	68	51
18	68	68	152	244	370	1,330	300	118	196	1,960	68	51
19	68	68	153	244	370	866	300	118	196	1,450	68	51
20	90	68	153	244	658	556	244	90	196	1,090	68	51
21	153	68	153	244	760	976	244	196	153	760	68	51
22	118	68	153	556	556	1,090	196	556	153	460	68	68
23	90	68	153	1,700	658	760	153	1,090	244	300	90	51
24	68	90	153	1,450	3,140	2,570	196	658	1,700	244	118	51
25	68	90	153	976	1,830	2,230	244	370	976	244	90	51
26	68	68	153	556	1,580	1,830	556	196	556	556	68	51
27	51	68	153	370	1,330	1,330	370	300	244	460	68	51
28	51	68	1,330	300	976	866	300	658	658	370	68	68
29	39	68	866	300	.....	556	244	1,200	5,560	300	68	51
30	39	68	556	1,580	.....	370	196	760	3,140	244	68	51
31	39	.....	460	1,700	.....	244	.....	460	.....	244	68	.....

Monthly discharge of Miami River at Piqua, Ohio, for years ending Sept. 30, 1916–17.

Month.	Discharge in second-feet.			Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.
1915–16.				1916–17.			
October	2,570	196	739	October	196	39	98.4
November	2,230	68	473	November	90	51	67.3
December	2,570	90	821	December	1,330	68	264
January	20,000	760	4,300	January	5,120	196	972
February	13,300	460	1,700	February	3,140	370	864
March	12,200	196	2,690	March	9,060	196	1,530
April	2,230	244	1,080	April	2,570	153	685
May	22,100	244	1,790	May	2,570	90	688
June	2,230	153	723	June	5,560	153	710
July	118	68	84.2	July	11,400	118	1,360
August	153	39	71.9	August	153	68	77.5
September	2,390	90	228	September	68	51	56.7
The year.	22,100	39	1,230	The year.	11,400	39	615

MIAMI RIVER AT TADMOR, OHIO.

LOCATION.—At National Road bridge at Tadmor, Montgomery County, about 4¾ miles below mouth of Honey Creek, which enters from left.

DRAINAGE AREA.—1,130 square miles (determined by Morgan Engineering Co.).

RECORDS AVAILABLE.—January 1, 1914, to September 30, 1917.

GAGE.—Vertical staff in two sections; read by E. J. Shepard. Sea-level elevation of zero of gage, 763.68 feet.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge at gage or by wading.

CHANNEL AND CONTROL.—May shift slightly during floods.

EXTREMES OF STAGE.—Highest stage known, 25.4 feet, occurred March 25, 1913.

ICE.—Stage-discharge relation may be affected by ice for short periods during severe winters.

DIVERSIONS.—None. All the water diverted into Miami & Erie Canal is wasted into the river several miles above Tadmor.

ACCURACY.—Stage-discharge relation practically permanent; probably affected by ice to some extent during December 14–27, January 14–27, and February 2–19. Rating curve well defined between 99 and 11,000 second-feet and extended beyond these limits. Gage read daily to tenths. Low-water readings are liable to be in error as they do not check closely with hydrographer's readings. Daily discharge ascertained by applying daily gage height to rating table.

The daily discharge as computed by the Miami Conservancy District is published. During rises additional gage readings are made and are used in determining the daily discharge instead of using the regular gage reading alone. In the table of monthly discharge, the maximum daily discharge for many months is the discharge corresponding to a special gage reading and not to the gage reading taken at the regular time. Records good except for periods of very low water or as affected by ice.

COOPERATION.—Gage-height record furnished by the United States Weather Bureau. Results of discharge measurements and daily discharge furnished by the Miami Conservancy District.

Discharge measurements of Miami River at Tadmor, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 1	H. R. Daubenspeck..	1.75	124	May 17	H. R. Daubenspeck..	2.5	400
Mar. 10	G. N. Burrell.....	3.72	1,200	Aug. 10	G. N. Burrell.....	1.95	153

Daily discharge, in second-feet, of Miami River, at Tadmor, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	268	232	169	530	1,680	971	649	1,260	876	2,830	431	143
2	268	232	199	477	2,780	710	1,220	2,040	1,050	1,700	387	143
3	268	232	199	431	2,780	710	3,220	1,500	822	530	344	169
4	305	232	199	350	2,780	649	2,570	1,360	526	431	305	199
5	305	199	199	1,590	2,780	649	2,120	2,680	632	387	199	169
6	268	199	199	7,560	2,780	477	3,860	3,100	956	431	169	143
7	268	199	268	4,880	2,780	431	1,990	2,570	1,490	649	143	143
8	268	199	344	3,170	2,780	530	1,440	1,600	1,050	477	117	143
9	268	199	344	2,310	2,780	530	1,040	1,170	573	431	143	143
10	268	199	344	1,910	2,780	530	1,040	763	646	387	169	143
11	268	199	344	1,930	2,780	996	649	986	477	344	169	117
12	268	169	344	1,840	2,780	5,030	530	530	387	477	169	117
13	232	169	344	1,840	2,780	4,590	477	387	431	665	143	117
14	232	169	305	2,020	2,780	12,000	431	305	649	5,660	143	117
15	232	169	305	2,020	2,780	8,190	387	268	772	8,170	143	117
16	232	143	305	2,020	2,780	4,570	344	232	477	5,980	143	117
17	232	143	305	2,020	2,780	3,110	344	169	431	4,420	117	117
18	268	143	305	2,020	2,780	1,910	344	199	431	3,280	117	117
19	268	143	305	2,020	2,780	1,200	305	199	387	2,680	117	143
20	268	117	305	2,020	1,360	971	268	199	305	1,930	95	143
21	268	117	305	2,020	1,680	1,040	232	203	199	1,040	95	143
22	232	117	305	2,380	913	1,510	232	441	199	772	143	117
23	232	143	305	2,380	1,850	1,460	232	936	344	649	199	177
24	232	143	205	2,380	3,850	3,930	232	990	530	477	232	117
25	232	143	305	2,380	2,040	3,190	268	454	477	477	199	117
26	232	143	305	2,380	1,600	2,040	305	387	477	530	143	143
27	232	143	647	2,380	1,360	1,040	305	390	477	649	117	143
28	232	143	1,430	1,360	1,200	710	305	834	670	589	143	143
29	232	169	1,310	971	.....	649	268	1,340	5,570	530	199	117
30	232	169	1,040	710	.....	530	268	757	4,780	477	268	117
31	232	.....	1,040	710	.....	431	.....	487	.....	431	199	.....

Monthly discharge of Miami River at Tadmor, Ohio, for the year ending Sept. 30, 1917.

[Drainage area, 1,130 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	305	232	253	0.224	0.26
November	232	117	170	.150	.17
December	[a] 2,980	169	417	.369	.43
January	[a] 9,280	[b] 344	2,030	1.80	2.08
February	[a] 4,530	[b] 904	2,410	2.13	2.22
March	[a] 14,700	431	2,100	1.86	2.14
April	[a] 3,980	232	862	.763	.85
May	[a] 3,380	169	927	.820	.95
June	[a] 6,900	199	903	.799	.89
July	[a] 9,460	344	1,560	1.38	1.59
August	431	95	184	.163	.19
September	199	117	134	.119	.13
The year	[a] 14,700	95	991	.877	11.90

[a] Maximum discharge determined from special reading.
[b] Minimum discharge determined from special reading.

MIAMI RIVER AT DAYTON, OHIO.

LOCATION.—At Main Street Bridge, Dayton, Montgomery County, about half a mile below mouth of Mad River and 1 mile above mouth of Wolf Creek.

DRAINAGE AREA.—2,520 square miles (determined by Miami conservancy district).

RECORDS AVAILABLE.—March 18, 1905, to December 31, 1909; April 1, 1913, to September 30, 1917.

GAGE.—Vertical staff attached to downstream end of first pier from left bank; read by C. E. Wilson. Sea-level elevation of zero of gage, 723.73 feet.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Control apparently shifts considerably at high stages and not so much at low stages. Weeds in the channel sometimes affect stage-discharge relation.

EXTREMES OF STAGE.—The flood of March–April, 1913, reached a stage of 29.0 feet on March 26, as determined by the Miami Conservancy District.

ICE.—Ice may affect the stage-discharge relation during severe winters.

DIVERSIONS.—A power plant about a mile above the station may divert water around the section, and a dam on Mad River about 2 miles above the station diverts water into the Miami & Erie Canal.

ACCURACY.—Stage-discharge relation not permanent; probably affected by ice during the latter part of December and the first part of February. Additional measurements needed in order to define curve for 1917. Gage read daily to tenths.

COOPERATION.—Gage-height record furnished by the United States Weather Bureau. Results of discharge measurements furnished by the Miami Conservancy District.

Discharge measurements of Miami River at Dayton, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 30	G. N. Burrell	2.68	2,170
May 31	H. R. Daubenspeck	2.55	2,030
June 30	G. N. Burrell	5.75	8,160

Discharge measurements of Miami and Erie Canal at Dayton, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 2	G. N. Burrell		[a] 126
24	H. R. Daubenspeck		[a] 96

[a] Warren Street bridge.

Daily gage height, in feet, of Miami River at Dayton, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.2	0.6	0.9	1.6	3.9	2.7	2.2	3.0	2.8	4.3	1.7	1.0
2	.9	.6	.9	1.6	3.8	2.3	3.0	4.7	2.7	3.5	1.6	.9
3	.9	.6	.9	1.5	4.0	3.0	5.4	3.5	2.6	2.7	1.5	.9
4	.9	.6	.9	1.5	4.0	2.5	4.4	2.9	2.1	2.2	1.3	.8
5	.9	.6	1.0	5.0	4.0	2.0	3.9	5.0	2.5	1.9	1.2	.8
6	.9	.6	1.0	8.9	4.0	1.8	5.1	5.2	2.7	1.7	1.1	.8
7	.9	.6	1.0	6.4	4.0	1.7	4.6	4.3	3.1	1.8	1.1	.8
8	.9	.6	1.2	4.9	4.0	2.0	4.2	3.4	3.2	3.0	1.1	.8
9	1.0	.6	1.3	4.0	4.0	2.9	3.4	3.2	2.6	2.8	1.1	1.0
10	1.0	.7	1.3	3.8	3.8	2.8	3.0	2.9	2.7	2.3	1.0	.8
11	.9	.7	1.3	3.6	3.4	2.9	2.8	2.7	2.5	2.1	1.0	.8
12	.9	.7	1.4	2.9	2.7	6.4	2.6	2.5	2.4	2.0	1.0	.8
13	.9	.7	1.4	2.5	2.6	5.1	2.4	2.3	2.1	2.0	1.0	.7
14	.9	.7	1.3	3.1	2.4	10.5	2.3	2.2	2.0	2.7	1.1	.7
15	.8	.7	1.3	2.8	1.8	8.7	2.2	2.0	1.9	9.0	1.0	.7
16	.8	.7	1.3	3.5	1.7	6.0	2.1	1.9	1.8	6.4	.9	.7
17	.8	.7	1.3	3.6	1.7	4.9	1.9	1.8	1.8	5.0	.7	.7
18	.8	.7	1.3	3.6	1.6	4.3	2.1	1.8	1.6	4.9	.7	.7
19	.8	.7	1.3	3.4	1.5	3.5	3.2	1.7	1.6	3.6	.7	.7
20	1.0	.7	1.3	3.0	2.1	3.0	2.7	1.7	1.5	3.0	.7	.7
21	1.0	.6	1.3	2.1	2.7	3.0	2.8	1.6	1.5	2.7	.7	.7
22	.9	.6	1.3	3.9	2.5	3.8	2.8	2.3	1.5	2.4	1.3	.7
23	.9	.7	1.3	4.1	2.4	3.5	2.1	2.5	1.4	2.1	1.7	.7
24	.9	1.1	1.3	3.8	5.5	5.4	2.0	2.7	3.5	2.1	1.4	.7
25	.8	1.0	1.3	3.1	4.1	5.0	2.4	2.2	3.3	2.0	1.2	.7
26	.8	1.0	1.3	2.7	3.1	4.1	2.7	1.8	2.4	2.9	1.2	.6
27	.7	.9	1.8	2.1	2.9	3.6	2.9	2.0	2.0	2.9	1.1	.6
28	.7	.9	3.0	2.2	3.0	3.1	2.5	2.8	3.3	2.4	1.0	.6
29	.7	1.0	2.9	2.1	.....	2.7	2.3	3.3	7.4	2.2	.9	.6
30	.7	1.2	2.2	3.5	.....	2.5	2.2	3.0	6.1	1.7	1.0	.6
31	.7	.....	1.9	4.0	.....	2.3	.....	2.6	.....	1.7	1.0	.....

MIAMI RIVER AT FRANKLIN, OHIO.

LOCATION.—In NW. ¼ sec. 3, T. 1 N., R. 5 E., at suspension bridge on Second Street at Franklin, Warren County. Twin Creek enters about 2¾ miles downstream.

DRAINAGE AREA.—2,780 square miles (Miami Conservancy District).

RECORDS AVAILABLE.—March 15, 1916 to September 30, 1917.

GAGE.—Vertical staff in two sections. Lower section reading 0—12.45 feet bolted to downstream side of old stone abutment on east side of river. Upper section nailed to south side of telephone pole 25 feet below east end of bridge. Read by Mrs. John Coleman. Sea-level elevation of zero of gage 658.41 feet.

DISCHARGE MEASUREMENTS.—Made from downstream side of suspension bridge. Current very sluggish at low stages and low-water measurements are subject to error on that account.

CHANNEL AND CONTROL.—The principal control consists of a boulder and gravel bar one-half mile below the gage, free from vegetation and apparently permanent.

EXTREMES OF DISCHARGE.—Maximum discharge during year, 30,500 second-feet in March; minimum discharge, 460 second-feet in September.

Highest stage known 23.0 feet on March 26, 1913.

ICE.—Stage-discharge relation affected by ice during severe winters.

REGULATION.—See "Diversions."

DIVERSIONS.—Some water is diverted from the river 2 miles above the gage but it is returned to the river about 800 feet above the station. There is little or no flow in the Miami & Erie Canal at this place.

ACCURACY.—Stage-discharge relation practically permanent; probably not affected by ice during the year. Rating curve well defined. Gage read to tenths once daily. Daily discharge ascertained by applying daily-gage height to rating table. Daily discharge as computed by the Miami Conservancy District is published. During rises special gage readings are made which are used in obtaining the mean daily discharge. The maximum monthly discharge in the table of monthly discharge for many months is the discharge corresponding to one of these special readings and does not therefore correspond to the maximum mean daily discharge as given in the table of daily discharge. Records excellent.

COOPERATION.—Base data and computed daily discharge furnished by Miami Conservancy District.

Discharge measurements of Miami River at Franklin, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 6	H. R. Daubenspeck..	1.10	516	June 1	H. R. Daubenspeck..	2.85	2,570
Mar. 3	G. N. Burrell.....	2.20	1,590	Aug. 1	G. N. Burrell.....	1.80	1,170

Daily discharge, in second-feet, of Miami River at Franklin, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,000	630	460	1,400	5,210	2,630	1,880	2,970	2,470	5,880	1,200	540
2	900	630	460	1,100	4,220	2,470	2,800	6,310	2,800	4,610	1,200	540
3	900	630	460	1,200	3,680	2,470	7,800	4,610	2,320	2,800	1,200	540
4	900	630	460	1,200	2,470	1,400	6,570	3,140	1,880	2,800	1,200	540
5	900	630	720	7,730	2,170	1,400	4,830	6,790	4,610	2,470	900	540
6	900	630	720	18,820	2,170	1,400	7,120	8,360	4,610	1,400	900	460
7	900	630	720	13,410	2,170	1,200	8,490	6,080	3,500	1,400	900	460
8	900	540	900	7,630	2,170	1,500	5,420	4,610	3,680	900	810	460
9	900	540	900	5,640	2,170	2,800	4,040	3,320	2,800	2,800	810	460
10	900	540	900	5,010	2,170	2,800	3,320	3,140	2,630	2,020	810	460
11	900	540	900	4,040	2,020	3,140	2,630	2,630	2,020	2,020	720	460
12	810	540	900	3,860	2,020	10,160	2,470	2,020	1,880	1,400	720	460
13	810	540	900	3,680	1,880	13,210	2,320	1,880	1,750	1,400	630	460
14	810	540	900	3,140	1,880	26,600	2,020	1,750	1,500	4,910	630	460
15	720	540	900	2,800	1,880	24,200	1,880	1,750	1,400	17,650	630	460
16	720	540	720	2,800	1,880	12,560	1,750	1,620	1,400	11,700	630	460
17	720	540	720	2,630	1,880	9,940	1,400	1,400	1,400	8,020	630	460
18	630	540	720	2,320	1,000	5,890	1,400	1,300	1,300	7,070	630	460
19	630	540	720	2,020	1,100	4,220	1,500	1,300	1,300	4,610	630	460
20	630	540	720	1,880	1,750	4,220	2,630	1,200	1,300	3,680	630	630
21	630	540	720	1,750	2,320	4,220	2,470	1,200	1,200	2,800	540	540
22	630	540	720	6,480	2,170	4,220	2,020	1,300	1,200	2,170	900	540
23	630	460	720	5,350	3,270	4,340	1,750	1,620	1,100	1,880	1,400	540
24	720	460	630	4,410	7,900	7,560	1,620	2,630	4,220	1,880	1,400	540
25	720	460	630	2,800	6,210	8,720	1,880	2,020	3,680	1,400	900	540
26	720	460	720	2,470	3,500	5,420	2,320	1,880	2,020	1,400	900	540
27	630	460	3,000	2,020	2,800	4,410	2,320	2,630	1,500	2,800	900	540
28	630	460	3,500	2,020	2,800	3,500	2,470	2,800	2,630	2,020	720	540
29	630	460	3,140	2,470	.....	2,800	2,020	4,220	12,700	2,020	720	540
30	630	460	2,970	2,800	.....	2,320	1,880	2,800	10,870	2,020	630	460
31	630	.....	2,320	5,210	.....	2,020	.....	2,470	.....	2,020	540	.....

Monthly discharge of Miami River at Franklin, Ohio, for the year ending Sept. 30, 1917.

[Drainage area, 2,780 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,000	630	764	0.275	0.32
November	630	460	540	.194	.22
December	3,500	460	1,090	.392	.45
January	a20,900	1,100	4,200	1.51	1.74
February	a8,810	1,000	2,740	.986	1.03
March	a30,500	1,200	5,930	2.13	2.45
April	a9,400	1,400	3,090	1.11	1.24
May	a8,520	1,200	2,960	1.06	1.22
June	a14,300	1,100	2,920	1.05	1.17
July	a19,300	900	3,610	1.30	1.50
August	1,400	540	837	.301	.35
September	630	460	503	.181	.20
The year	a30,500	460	2,440	.878	11.89

a From special gage readings.

MIAMI RIVER AT HAMILTON, OHIO.

LOCATION.—At single-span highway bridge on High Street at Hamilton, Butler County.

DRAINAGE AREA.—3,580 square miles.

RECORDS AVAILABLE.—February 28, 1910, to September 30, 1917. Flood stages only, November 16, 1904, to February 27, 1910, reported by United States Weather Bureau.

GAGE.—Vertical staff attached to a single pile about 75 feet above High-Main Street bridge reading from 0 to 10 feet. A staff fastened to an oak sleeper in the left concrete river wall just above the new bridge reads from 10 feet to 27 feet. Sea-level elevation of zero of gage, 564.63 feet. For description of old gage, see Water-Supply Paper 353.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge.

CHANNEL AND CONTROL.—Apparently permanent under ordinary conditions. The section at the bridge shifts somewhat during floods on account of the high velocity.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11.8 feet at 5 p. m. March 13 (discharge, 37,000 second-feet); minimum stage, 1.9 feet September 17–18, 19, 30 (discharge, 370 second-feet).

The maximum stage on record at this station occurred at 3 a. m. March 26, 1913, at gage height 34.6 feet.

According to records of United States Weather Bureau, the highest stage prior to 1913 was 21.2 feet March 24, 1898.

ICE.—Stage-discharge relation affected by ice for short periods during severe weather only, as factory wastes probably keep the temperature of the water above the freezing point.

DIVERSIONS.—The Miami & Erie Canal is fed by water taken from Miami River at Middletown, Ohio. The quantity diverted is about 120 second-feet as shown by discharge measurements made during the summer of 1916.

REGULATION.—There are several power plants in Hamilton above the station, but all the water is returned to the river above the gage.

ACCURACY.—Stage-discharge relation practically permanent; effect of ice is considered negligible. Rating curve fairly well defined between 900 second-feet and 62,000 second-feet. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table except as noted. Records excellent.

COOPERATION.—Results of discharge measurements furnished by Miami Conservancy District.

Discharge measurements of Miami River at Hamilton, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 30	G. N. Burrell[a]	2.05	433	July 24	B. E. Jones	3.00	2,050
Mar. 28	do	4.00	4,140	Aug. 6	G. N. Burrell[a]	2.44	1,050
June 7	H. R. Daubenspeck[a]	4.40	5,610				

[a] Engineers of Miami Conservancy District.

Discharge measurements of Miami & Erie Canal at Hamilton, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 30	G. N. Burrell		105	June 8	H. R. Daubenspeck		105
Mar. 28	do		116	Aug 6	G. N. Burrell		122

NOTE.—At High Street bridge.

Daily discharge, in second-feet, of Miami River at Hamilton, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	830	700	700	1,720	6,910	3,340	3,100	3,840	3,340	7,650	970	700
2	830	700	700	1,450	4,910	3,100	7,650	6,910	4,350	6,200	970	580
3	830	580	700	1,540	3,340	3,100	9,150	4,910	4,090	4,090	830	970
4	830	580	700	1,450	3,100	2,870	7,650	5,850	3,340	3,340	830	700
5	830	580	700	23,900	2,870	2,650	8,020	9,900	20,800	3,100	830	580
6	700	580	700	23,900	3,100	2,440	10,300	10,300	8,780	2,870	830	470
7	700	580	700	14,600	3,340	2,220	9,900	7,280	5,520	2,870	830	580
8	700	580	830	9,900	3,340	2,440	6,910	5,520	4,910	2,870	700	1,040
9	700	580	970	6,910	3,100	4,090	4,910	4,350	5,520	3,840	700	640
10	700	580	830	5,520	2,870	3,840	4,350	3,840	6,200	3,840	700	470
11	700	580	830	4,620	2,760	6,550	3,840	3,340	4,090	3,100	700	470
12	700	580	830	3,590	2,650	16,200	3,340	2,760	3,340	3,100	700	470
13	700	580	830	2,760	2,500	26,200	2,870	2,650	2,870	3,100	580	470
14	700	580	700	2,650	2,350	32,200	2,540	2,440	3,340	4,910	580	470
15	700	700	580	2,650	2,200	25,700	2,220	2,120	2,760	18,200	580	470
16	700	700	470	2,500	2,020	13,800	2,020	2,020	2,440	12,200	580	450
17	700	700	470	2,350	2,020	9,900	2,020	1,820	2,220	13,800	525	370
18	700	700	470	2,200	2,020	7,650	2,760	1,820	2,020	7,650	525	370
19	700	700	470	2,020	2,330	5,520	3,590	1,630	2,020	5,210	525	420
20	700	700	470	2,020	2,650	4,350	3,340	1,450	1,820	4,350	525	470
21	700	700	470	2,020	2,650	4,350	3,100	1,280	1,820	3,840	604	470
22	700	700	470	14,600	2,650	5,210	2,870	1,450	1,630	3,340	1,450	470
23	700	700	470	7,650	7,650	7,280	2,870	3,100	1,450	3,100	2,020	470
24	700	700	470	5,520	10,600	11,000	2,650	2,870	4,350	2,220	1,200	470
25	700	700	470	4,910	6,200	9,520	2,650	2,870	4,350	1,720	970	470
26	700	700	470	3,590	4,350	6,910	2,650	2,870	3,100	2,760	900	470
27	700	700	7,650	3,100	3,840	5,210	3,590	4,090	3,100	3,340	700	470
28	700	700	4,910	3,100	3,340	4,350	3,100	8,400	4,350	2,330	700	470
29	700	700	3,340	4,910	.....	3,590	2,870	6,200	9,900	1,820	700	470
30	700	700	2,760	6,200	.....	2,870	2,650	4,350	12,200	1,360	700	420
31	700	.....	2,120	6,910	.....	2,760	.....	3,840	.....	1,040	700	.....

NOTE.—Daily discharge interpolated because of missing gage readings as follows: Jan. 16–18, 20, Feb. 4, 6, 11, 13–15.

Monthly discharge of Miami River at Hamilton, Ohio, for the year ending Sept. 30, 1917.

Month.	Discharge in second-feet.			Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.
October	830	700	721	May	10,300	1,280	4,070
November	700	580	652	June	20,800	1,450	4,670
December	7,650	470	1,200	July	18,200	1,040	4,620
January	23,900	1,450	5,830	August	2,020	525	795
February	10,600	2,020	3,630	September	1,040	370	527
March	32,200	2,220	7,780				
April	10,300	2,020	4,320	The year	32,200	370	3,240

MIAMI RIVER AT VENICE, OHIO.

LOCATION.—About 400 feet downstream from boundary line between Hamilton and Butler counties, at single span highway bridge three-fourths mile southeast of Venice, Butler County. Indian Creek enters from right about 1.4 miles above station.

DRAINAGE AREA.—3,790 square miles (measured by U. S. Army Engineers).

RECORDS AVAILABLE.—June 14, 1915, to September 30, 1917.

GAGE.—Chain gage fastened to downstream side of bridge; read by H. B. Matson.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—The control for medium stages is the remains of an old mill dam about 1¼ miles below the gage. For stages below about 3 feet a riffle is formed by an unstable gravel bar under the bridge. This bar scours out during high water and reforms at low stages. All water flows under the bridge for stages less than 25 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 17.7 feet at 7 a. m. March 14 (discharge, 35,600 second-feet); minimum stage, 1.13 feet at 4.30 p. m. November 14 (discharge, about 465 second-feet).

The highest stage known corresponds to about 38 feet on the gage during the 1913 flood.

DIVERSIONS.—The Miami & Erie Canal is fed by water taken from Miami River at Middletown and Miamisburg, Ohio. The canal at Lindenwald near the point where it leaves the drainage basin has a flow of about 100 second-feet which is a considerable part of the low-water flow of Miami River.

REGULATION.—The flow during low stages is probably regulated to a large extent by power plants in Hamilton.

ACCURACY.—Stage-discharge relation practically permanent except for possible slight changes at low stage because of shifts in the gravel bar at the bridge; probably not affected by ice during the year. Rating curve well defined between 460 and 35,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

COOPERATION.—Base data furnished by the United States Engineer Corps.

The following discharge measurement was made by L. M. Crosley:

November 8, 1917: Gage height, 1.33 feet; discharge, 516 second-feet.

Daily discharge, in second-feet, of Miami River at Venice, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	900	595	678	1,800	7,260	3,490	3,080	4,080	3,640	6,900	1,340	798
2	798	568	650	1,610	5,860	2,820	7,620	6,720	4,710	7,800	1,260	765
3	830	568	622	1,610	2,820	2,450	9,070	5,520	4,390	3,930	1,180	1,110
4	765	568	595	1,520	2,450	2,450	8,160	6,030	3,080	2,690	1,110	865
5	765	540	705	20,400	1,700	2,000	7,800	9,620	11,800	2,110	970	798
6	765	515	765	23,700	2,330	1,700	10,000	9,810	9,810	1,800	970	735
7	735	542	798	14,700	2,450	2,000	10,000	7,800	6,550	2,000	1,080	735
8	705	568	970	9,620	2,570	3,210	7,440	6,200	5,520	2,820	970	1,520
9	735	595	1,040	7,260	2,220	3,780	6,030	4,710	6,380	3,080	870	830
10	705	595	970	6,200	1,700	4,240	5,030	3,490	5,520	2,450	870	765
11	678	622	900	5,360	1,610	5,690	4,240	3,640	4,390	2,220	870	765
12	678	568	970	3,780	1,520	18,600	3,490	3,080	3,490	2,000	870	735
13	678	568	935	2,950	1,520	25,400	3,350	2,570	3,080	2,000	780	735
14	678	490	900	2,450	1,340	34,000	2,950	2,570	2,950	5,690	798	735
15	650	540	830	2,330	1,520	26,900	2,330	2,330	2,450	15,200	798	735
16	622	595	798	2,220	1,430	14,700	2,330	2,110	2,220	11,600	798	705
17	650	595	735	2,220	1,430	10,800	2,330	2,000	2,110	13,500	798	705
18	622	595	705	2,110	1,520	8,340	2,220	1,800	1,800	8,160	765	735
19	705	540	735	1,900	2,000	6,200	3,640	1,800	1,700	5,860	765	705
20	765	515	678	1,800	2,690	5,190	3,640	1,700	1,610	4,080	735	705
21	798	595	705	2,110	2,570	4,710	3,080	1,520	1,520	3,210	765	705
22	678	595	678	16,500	3,080	5,860	2,820	1,700	1,430	2,690	1,340	705
23	705	650	650	8,160	7,800	7,260	2,450	2,450	1,430	2,220	2,450	678
24	765	650	622	6,380	9,440	11,600	2,920	2,950	2,450	2,000	1,260	705
25	735	735	568	5,360	7,440	10,000	2,330	2,570	3,780	1,900	970	705
26	678	735	622	3,930	4,390	7,620	2,690	2,000	2,570	2,950	970	705
27	650	622	6,550	3,210	4,080	6,200	3,350	3,930	2,110	3,930	830	705
28	650	650	5,360	3,640	4,080	5,030	3,210	8,880	3,490	2,570	798	705
29	650	650	3,490	5,030	.....	4,080	2,950	7,800	8,700	1,900	765	705
30	595	678	2,330	6,900	.....	3,490	2,570	5,190	9,620	1,610	798	735
31	678	.....	2,220	7,260	.....	3,080	.....	3,930	.....	1,430	798	.....

Monthly discharge of Miami River at Venice, Ohio, for the year ending Sept. 30, 1917.

Month.	Discharge in second-feet.			Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.
October	900	595	710	May	9,810	1,520	4,210
November	735	490	595	June	11,800	1,430	4,140
December	6,550	568	1,280	July	15,200	1,430	4,270
January	23,700	1,520	5,940	August	2,450	735	979
February	9,440	1,340	3,240	September	1,520	678	774
March	34,000	1,700	8,160				
April	10,000	2,220	4,410	The year	34,000	490	3,230

LORAMIE CREEK AT LOCKINGTON, OHIO.

LOCATION.—In NE. ¼ sec. 30, T. 7 N., R. 6 E., at steel highway bridge, half a mile northwest of Lockington, Shelby County, and 1½ miles below mouth of Turtle Creek.

DRAINAGE AREA.—255 square miles (measured by Miami Conservancy District).

RECORDS AVAILABLE.—September 13, 1915, to September 30, 1917.

GAGE.—Vertical staff in two sections; lower section reading 0–10.45 feet, bolted to downstream face of pier; upper section fastened to a tree 100 feet southwest of west end of bridge. Read by Vernon Jones. Sea-level elevation of zero of gage, 875.99 feet.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge or by wading.

CHANNEL AND CONTROL.—The principal control is a sand and gravel bar about 100 feet below the gage and is liable to shift. During summer months flow is affected somewhat by a growth of vegetation along the edge of the stream.

EXTREMES OF STAGE.—Highest stage known, 15.6 feet March 25, 1913.

ICE.—The creek is frozen over during severe winters.

DIVERSIONS.—The summit level of the Miami & Erie Canal is supplied by water from the Loramie reservoir. Consequently, water is diverted from Loramie Creek to Lake Erie drainage. There is no flow in the Miami & Erie Canal at Lockington, as the 1913 flood destroyed the canal embankment at a number of places, and no repairs have been made.

REGULATION.—There is a small amount of regulation, due to the storage of water in Loramie reservoir, which controls about 30 per cent of the total drainage area of Loramie Creek.

ACCURACY.—Stage-discharge relation not permanent; not seriously affected by ice during the year. Rating curve not developed. Measurements indicate considerable change in the control. Gage read to tenths once daily. Records good.

COOPERATION.—Base data furnished by Miami Conservancy District.

Discharge measurements of Loramie Creek at Lockington, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 26	H. R. Daubenspeck..	1.35	14.2	July 14	B. H. Petty.....	5.8	3,310
Mar. 8	G. N. Burrell.....	2.20	297	17	H. R. Daubenspeck..	3.9	1,410
May 15	H. R. Daubenspeck..	1.5	61.4	17	.....do.....	3.85	1,410
June 4	.....do.....	1.5	75.8	19	.....do.....	1.98	173
30	.....do.....	3.88	1,330				

Daily gage height, in feet, of Loramie Creek at Lockington, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.4	1.3	1.3	1.7	3.0	2.0	1.9	3.1	1.9	3.0	1.5	1.0
2	1.4	1.3	1.3	1.7	3.0	2.0	2.8	2.8	1.8	2.4	1.5	1.0
3	1.4	1.3	1.3	1.6	3.0	1.9	2.5	2.5	1.8	2.0	1.5	1.0
4	1.3	1.3	1.3	1.5	3.0	1.7	2.1	2.1	1.5	1.7	1.5	1.0
5	1.3	1.3	1.8	5.0	3.0	1.7	2.0	4.0	1.5	1.5	1.5	1.0
6	1.3	1.3	1.8	4.8	3.0	1.7	1.9	3.6	2.0	1.5	1.4	1.0
7	1.3	1.3	1.7	4.0	3.0	1.8	1.9	2.9	2.8	2.8	1.4	1.0
8	1.3	1.3	1.7	3.4	3.0	2.0	1.8	2.6	2.2	2.4	1.4	1.0
9	1.3	1.3	1.6	3.1	2.5	2.3	1.8	2.4	1.7	1.8	1.3	1.0
10	1.3	1.3	1.6	2.9	2.5	2.0	1.6	2.2	1.7	1.5	1.3	1.0
11	1.3	1.3	1.6	2.6	2.0	2.5	1.5	1.8	1.7	1.5	1.2	1.0
12	1.3	1.3	1.5	2.3	1.8	3.9	1.5	1.8	1.6	1.5	1.1	1.0
13	1.3	1.3	1.5	2.0	1.5	4.0	1.5	1.8	1.6	1.5	1.0	1.0
14	1.3	1.3	1.5	2.0	1.3	6.0	1.5	1.7	1.6	6.6	1.0	1.0
15	1.3	1.3	1.4	2.0	1.3	4.4	1.5	1.7	1.5	5.7	1.0	1.0
16	1.3	1.3	1.4	2.1	1.3	3.6	1.5	1.6	1.5	4.7	1.0	1.0
17	1.3	1.3	1.4	2.3	1.3	2.8	1.5	1.6	1.5	4.0	1.0	1.0
18	1.3	1.3	1.4	2.4	1.6	2.0	2.1	1.5	1.5	3.0	1.0	1.0
19	1.3	1.3	1.4	2.4	1.9	1.7	1.8	1.5	1.5	2.1	1.0	1.0
20	1.5	1.3	1.4	2.4	2.2	1.7	1.9	1.5	1.5	2.0	1.0	1.0
21	1.9	1.3	1.4	2.4	2.4	1.9	1.9	2.6	1.5	2.0	1.0	1.0
22	1.6	1.3	1.4	2.8	2.4	1.9	1.8	2.6	1.5	1.8	1.0	1.0
23	1.5	1.3	1.4	3.1	2.8	2.3	1.8	2.8	1.5	1.7	1.0	1.0
24	1.4	1.3	1.4	2.8	3.5	3.7	1.7	2.6	3.2	1.5	1.0	1.0
25	1.4	1.3	1.4	2.8	2.7	3.0	2.0	2.3	2.0	1.5	1.0	1.0
26	1.3	1.3	1.4	2.6	2.3	2.8	2.2	2.0	1.8	1.5	1.0	1.0
27	1.3	1.3	1.6	2.3	2.1	2.6	2.5	2.4	1.8	1.5	1.0	1.0
28	1.3	1.3	3.3	2.0	2.1	2.2	2.3	2.5	2.0	1.5	1.0	1.0
29	1.3	1.3	2.3	2.1	.....	1.9	1.9	2.3	4.9	1.5	1.0	1.0
30	1.3	1.3	2.0	2.5	.....	1.7	1.8	2.0	4.0	1.5	1.0	1.0
31	1.3	.....	1.9	2.8	.....	1.7	.....	2.0	.....	1.5	1.0	.....

STILLWATER RIVER AT PLEASANT HILL, OHIO.

LOCATION.—At steel highway bridge, about three-fourth mile northwest of Pleasant Hill, Miami County, in SE. ¼ sec. 18, T. 7 N., R. 5 E., 4 miles below mouth of Greenville Creek.

DRAINAGE AREA.—453 square miles (Miami Conservancy District).

RECORDS AVAILABLE.—April 7, 1916, to September 30, 1917.

GAGE.—Vertical staff gage in two sections—0 to 10.27 feet bolted to downstream face of pier, 10.27 feet to 20.25 feet bolted to face of downstream wing wall of left abutment. Read by Elmer Herbst.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge or by wading below the bridge.

CHANNEL AND CONTROL.—The control is formed of compact rock and gravel about 1,000 feet below the gage; apparently permanent. Channel is straight above and below the bridge. During high floods the water overflows the levee on the left bank and spreads over a wide strip of bottom land.

EXTREMES OF DISCHARGE.—Maximum discharge during year, 7,190 second-feet in March; minimum discharge, 10 second-feet in November, December, and January. The highest stage on record, 17.5 feet by present gage, occurred March 25, 1915.

ICE.—Stage-discharge relation occasionally affected by ice.

ACCURACY.—Stage-discharge relation probably permanent; may be affected by ice to some extent during portions of December and January. Rating curve well defined from 28 second-feet to 8,800 second-feet; extended beyond these limits. Gage read to tenths daily. Daily discharge ascertained by applying daily gage height to rating table. The daily discharge as computed by Miami Conservancy District is published. During rises special gage readings are made which are used in obtaining the mean daily discharge. The maximum monthly discharge in the table of monthly discharge for many months is the discharge corresponding to one of these special readings and does not, therefore, correspond to the maximum mean daily discharge as listed in the table of mean daily discharge. Records are considered excellent except for periods possibly affected by ice.

COOPERATION.—Base data and mean daily discharge are furnished by the Miami Conservancy District.

Discharge measurements of Stillwater River at Pleasant Hill, Ohio, during the years ending Sept. 30, 1916 and 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1916.		*Feet.*	*Sec-ft.*	1917.		*Feet.*	*Sec-ft.*
May 9	H. R. Daubenspeck..	5.32	1,680	Mar. 1	G. N. Burrell.....	2.80	227
June 3	G. N. Burrell.....	3.25	420	14	E. W. Lane.....	10.44	6,860
July 5	H. R. Daubenspeck..	2.05	130	15	H. R. Daubenspeck..	7.08	3,300
31	G. N. Burrell.....	1.80	53.0	16	G. N. Burrell.....	5.30	1,710
Aug. 30	.....do.....	1.60	34.8	June 29	B. H. Petty.....	7.32	3,470
Oct. 25	.....do.....	1.82	60.6	July 14	H. R. Daubenspeck..	9.2	5,480

Daily discharge, in second-feet, of Stillwater River at Pleasant Hill, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	34	24	10	10	357	283	318	2,590	200	1,440	157	19
2	45	24	10	13	357	252	400	1,960	200	1,160	119	34
3	34	34	13	34	357	252	1,440	1,300	200	785	119	45
4	24	24	24	87	318	252	1,230	580	200	318	87	45
5	24	24	45	3,190	318	224	1,020	2,260	252	318	87	45
6	34	24	45	4,220	357	224	2,120	2,300	318	283	87	34
7	24	34	45	2,120	318	200	2,030	1,680	785	224	57	45
8	24	34	34	785	283	630	1,770	785	580	252	57	45
9	34	45	34	580	252	680	1,440	630	580	318	34	34
10	24	45	45	680	252	680	1,230	488	318	630	34	34
11	24	34	45	488	224	1,290	1,090	400	283	488	34	34
12	24	34	34	488	200	2,180	785	318	252	680	34	24
13	34	24	34	488	200	3,630	488	252	252	910	34	24
14	34	34	34	445	224	6,860	318	252	224	4,490	19	24
15	34	34	24	400	200	4,570	252	200	200	3,920	19	34
16	34	45	24	400	200	1,980	224	200	200	1,370	19	24
17	45	34	24	400	200	1,340	252	200	200	962	19	24
18	34	34	24	318	178	785	488	157	200	785	19	24
19	57	24	24	318	178	630	785	178	178	630	13	24
20	72	24	34	318	157	488	785	157	178	531	13	34
21	57	19	24	580	137	630	680	157	200	400	13	102
22	45	19	24	1,300	137	580	580	318	200	318	19	72
23	45	24	24	1,230	318	630	488	580	1,060	252	200	34
24	34	24	24	1,090	1,940	2,300	680	488	1,530	224	157	34
25	24	24	19	962	1,230	1,770	1,300	318	680	224	119	45
26	34	19	19	785	400	1,300	1,680	318	580	200	87	45
27	24	19	13	680	400	580	900	252	785	200	87	45
28	24	13	13	400	318	400	733	252	1,390	200	57	34
29	34	13	13	252	.....	318	580	224	4,120	157	57	34
30	34	10	13	252	.....	318	1,160	224	2,350	157	34	34
31	24	.....	10	283	.....	318	.....	252	.....	157	19	.....

Monthly discharge of Stillwater River at Pleasant Hill, Ohio, for the year ending Sept. 30, 1917.

[Drainage area, 453 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	72	24	34.6	0.076	0.09
November	45	10	27.2	.060	.07
December	45	10	25.9	.057	.07
January	4,220	10	761	1.68	1.94
February	1,940	137	358	.790	.82
March	7,190	200	1,180	2.60	3.00
April	2,120	224	908	2.00	2.23
May	3,340	157	654	1.44	1.66
June	5,500	178	623	1.38	1.54
July	6,050	157	742	1.64	1.89
August	200	13	61.6	.136	.16
September	102	19	37.6	.083	.09
The year	7,190	10	452	0.998	13.56

STILLWATER RIVER NEAR WEST MILTON, OHIO.

LOCATION.—In SE. ¼ sec. 4, T. 4 N., R. 5 E., 1 mile below mouth of Ludlow Creek, entering from right, at bridge of Cleveland, Cincinnati, Chicago & St. Louis Railway (Peoria & Eastern division), about 2 miles north of West Milton, Miami County.

DRAINAGE AREA.—600 square miles.

RECORDS AVAILABLE.—January 1, 1914, to September 30, 1917.

GAGE.—Vertical staff in two sections; read by M. J. Shellhaas. Sea-level elevation of zero of gage, 812.97 feet.

DISCHARGE MEASUREMENTS.—Made from downstream side of railroad bridge at gage, from upstream side of highway bridge about 300 feet below the gage, or by wading.

CHANNEL AND CONTROL.—Regular section shifts slightly during high water; weeds during the summer may affect the stage-discharge relation.

EXTREMES OF STAGE.—Maximum daily stage recorded during year, 8.3 feet in March; mimimum daily stage, 0.5 foot in October.

The flood of March–April, 1913, reached a stage of 28 feet on March 25.

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—Stage-discharge relation changes during floods; affected by ice to some extent December 15–26 and January 13–21. Rating curve for 1917 not definitely defined. Gage read daily to tenths. Records good.

COOPERATION.—Gage-height record furnished by United States Weather Bureau. Results of discharge measurements furnished by the Miami Conservancy District.

Discharge measurements of Stillwater River near West Milton, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec.-ft.*
Mar. 22	G. N. Burrell	3.00	1,220	July 26	B. E. Jones	2.36	686
May 21	H. R. Daubenspeck	1.3	186	27	G. N. Burrell	1.88	382

Daily gage height, in feet, of Stillwater River near West Milton, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.9	1.2	1.0	1.7	2.5	1.8	1.9	3.6	2.0	2.5	1.6	0.7
2	.8	1.0	1.0	1.7	2.6	1.5	3.4	5.1	1.9	2.4	1.4	.7
3	.8	1.0	1.0	1.6	2.6	1.4	4.3	2.6	1.9	2.0	1.2	.7
4	.8	1.2	1.0	1.7	2.6	1.4	2.9	2.6	1.9	1.9	1.0	.7
5	.7	1.2	1.5	4.9	2.6	1.4	2.7	4.7	2.0	1.9	.9	.7
6	.7	1.3	1.4	6.0	2.6	1.4	4.0	4.2	2.5	1.7	.7	.7
7	.7	1.2	1.4	4.5	2.6	1.5	3.8	2.9	2.7	2.0	.7	.7
8	.6	1.2	1.5	3.1	2.6	1.9	3.0	2.6	2.4	2.9	.7	.7
9	.6	1.4	1.4	2.6	2.6	2.2	2.5	2.5	2.0	2.2	.7	.7
10	.6	1.4	1.4	2.6	2.6	2.3	2.2	2.2	2.0	2.1	.7	.7
11	.6	1.3	1.4	2.3	2.6	2.5	2.0	2.0	2.0	2.0	.7	.7
12	.6	1.1	1.3	2.3	2.6	4.7	2.0	2.0	2.0	2.2	.7	.7
13	.5	1.0	1.3	2.3	2.6	3.9	1.9	2.0	1.9	2.2	.7	.7
14	.5	.9	1.3	2.3	2.6	8.3	1.9	1.9	2.0	6.9	.7	.7
15	.6	.9	1.4	2.3	2.6	6.0	1.9	1.9	2.0	6.0	.7	.7
16	1.0	.9	1.4	2.3	2.6	3.9	1.9	1.7	2.0	3.2	.7	.7
17	1.1	.8	1.4	2.3	2.6	3.3	1.7	1.7	2.0	2.6	.7	.6
18	1.3	.8	1.4	2.3	2.2	2.7	2.4	1.6	1.9	2.7	.7	.6
19	1.5	.8	1.4	2.3	1.9	2.5	2.5	1.6	1.9	2.2	.7	.6
20	1.6	.8	1.4	2.3	2.0	2.4	2.4	1.6	1.7	2.0	.6	.6
21	1.7	.7	1.4	2.3	2.0	2.6	2.1	1.5	1.7	1.9	.7	2.3
22	1.6	.7	1.4	2.3	2.0	3.0	1.9	1.6	1.7	1.8	1.1	2.0
23	1.6	.9	1.4	2.7	2.3	2.6	1.9	2.0	3.1	2.0	1.2	2.0
24	1.6	1.0	1.4	2.5	4.8	4.4	2.0	1.9	3.9	1.9	1.3	2.0
25	1.5	1.0	1.4	2.3	2.6	3.4	2.5	1.7	2.7	1.7	1.2	1.9
26	1.5	1.0	1.4	2.0	2.0	2.8	3.4	1.7	2.5	2.9	1.1	1.9
27	1.5	1.1	2.0	1.9	2.1	2.4	2.5	1.7	2.6	2.0	.9	1.9
28	1.4	1.1	2.9	1.9	2.1	2.0	2.5	1.7	2.6	1.9	.7	2.0
29	1.4	1.0	2.7	2.0	.....	1.9	2.0	1.9	5.7	1.8	.7	2.0
30	1.4	1.0	2.3	3.0	.....	1.9	2.0	1.9	4.0	1.7	.7	2.0
31	1.3	.....	1.9	2.9	.....	1.8	.....	1.9	.....	1.6	.7	.....

MAD RIVER NEAR SPRINGFIELD, OHIO.

LOCATION.—At old mill about 800 feet south of Cleveland, Cincinnati, Chicago & St. Louis Railway bridge No. 121 and one-third mile below mouth of Buck Creek, near Springfield, Clark County.

DRAINAGE AREA.—488 square miles.

RECORDS AVAILABLE.—December 31, 1903, to March 31, 1906; February 1, 1914, to September 30, 1917.

GAGE.—Vertical staff in two sections; lower section attached to north wall of rock-lined overflow channel from millrace; upper section attached to south side of old mill building; read by O. W. Bruney. Sea-level elevation of zero of gage, 887.81 feet. The station operated 1903 to 1906 was located about one mile down stream.

DISCHARGE MEASUREMENTS.—Made from highway bridge about 1,000 feet below gage or by wading about 1,500 feet below gage.

CHANNEL AND CONTROL.—Channel shifts slightly during floods.

EXTREMES OF STAGE.—Maximum daily stage recorded during year, 6.8 feet in July; minimum daily stage recorded, 1.1 feet September 26–30.

The flood of March–April, 1913, reached a stage on March 25 represented by 19.2 feet, referred to gage datum.

ICE.—Stage-discharge relation is affected by ice during severe winters.

ACCURACY.—Stage-discharge relation probably permanent, probably not seriously affected by ice during the year. Rating curve for 1917 not definitely defined. Gage read daily to tenths. Records good.

COOPERATION.—Gage-height record furnished by the United States Weather Bureau. Results of discharge measurements furnished by the Miami Conservancy District

Discharge measurements of Mad River near Springfield, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec-ft.*
Oct. 26	G. N. Burrell.....	1.35	197	Mar. 12	G. N. Burrell.....	3.45	898
Nov. 18	H. R. Daubenspeck..	1.30	201	May 22	H. R. Daubenspeck...	1.95	382
18	.....do.....	1.30	223	Aug. 8	G. N. Burrell.....	1.52	259

Daily gage height, in feet, of Mad River near Springfield, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	1.3	1.3	1.8	2.0	2.0	2.2	3.6	2.3	3.5	1.7	1.4
2	.....	1.3	1.3	1.8	2.0	1.9	3.3	3.2	2.3	3.2	1.6	1.4
3	.....	1.3	1.3	1.8	2.0	1.8	3.2	3.0	2.5	3.2	1.6	1.4
4	.....	1.3	1.3	1.8	2.0	1.8	3.2	2.8	3.2	3.1	1.5	1.3
5	.....	1.3	1.4	6.3	2.0	1.7	3.1	2.6	3.6	2.8	1.5	1.3
6	.....	1.3	1.5	4.9	2.0	1.6	3.0	2.3	2.8	1.8	1.5	1.3
7	.....	1.3	1.5	3.7	2.0	1.6	2.8	2.3	2.1	2.0	1.5	1.3
8	.....	1.3	1.5	3.5	2.0	2.6	2.7	2.3	2.1	1.9	1.4	1.3
9	.....	1.3	1.5	3.3	2.0	2.4	2.4	2.3	1.9	1.8	1.4	1.3
10	.....	1.3	1.4	3.0	2.0	2.2	2.2	2.3	1.9	2.0	1.5	1.3
11	.....	1.3	1.4	2.7	2.0	2.5	2.2	2.3	1.8	1.8	1.5	1.3
12	.....	1.3	1.4	2.5	2.0	3.6	2.1	2.3	1.8	2.4	1.5	1.3
13	.....	1.3	1.4	2.5	2.0	3.4	2.1	2.2	1.8	1.9	1.5	1.3
14	.....	1.3	1.4	2.5	2.0	6.5	2.0	2.0	1.8	6.8	1.5	1.3
15	.....	1.3	1.4	2.5	2.0	4.2	2.0	1.9	1.8	4.6	1.4	1.3
16	.....	1.3	1.4	2.5	2.0	4.0	2.0	1.8	1.8	3.0	1.5	1.2
17	.....	1.3	1.4	2.3	2.0	3.8	2.0	1.8	1.8	2.9	1.4	1.2
18	.....	1.3	1.4	2.3	2.0	3.5	4.0	1.8	1.8	3.0	1.4	1.2
19	.....	1.3	1.4	2.3	3.9	3.4	2.4	1.8	1.9	2.6	1.3	1.2
20	.....	1.3	1.4	2.3	2.9	3.2	2.3	1.9	1.9	2.5	1.3	1.2
21	.....	1.3	1.4	2.3	2.7	3.5	2.2	2.0	2.0	2.4	1.3	1.2
22	.....	1.3	1.4	2.3	2.3	3.2	2.2	2.3	2.3	2.3	1.5	1.2
23	.....	1.4	1.5	2.1	1.9	2.9	2.2	2.2	2.5	2.1	1.5	1.2
24	.....	1.4	1.6	2.0	3.6	2.7	2.2	2.1	2.3	1.9	1.5	1.2
25	.....	1.4	1.9	2.0	2.3	2.6	2.3	2.0	2.4	1.7	1.4	1.2
26	.....	1.3	3.2	2.0	2.1	2.6	2.3	2.0	2.4	2.5	1.3	1.1
27	.....	1.3	1.8	2.0	2.0	2.4	2.3	2.0	2.5	2.3	1.3	1.1
28	.....	1.3	1.8	2.0	2.0	2.4	2.2	2.7	2.8	2.0	1.3	1.1
29	.....	1.4	1.8	2.6	.....	2.2	2.2	2.6	5.7	1.9	1.3	1.1
30	.....	1.3	1.8	2.4	.....	2.2	2.2	2.3	3.5	1.7	1.4	1.1
31	.....	.....	1.8	2.0	.....	2.2	.....	2.6	.....	1.7	1.4	.....

MAD RIVER NEAR DAYTON, OHIO.

LOCATION.—In SE. ¼ sec. 8, T. 2 E., R. 8 N. Great Miami base line, at covered highway bridge about a mile northwest of Wright, Greene County, and 5 miles above Dayton.

DRAINAGE AREA.—652 square miles.

RECORDS AVAILABLE.—November 19, 1914, to September 30, 1917.

GAGE.—Vertical staff, attached to the downstream side of west abutment of bridge; read by John Morris. Sea-level elevation of zero of gage, 783.91 feet.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge at gage or by wading about 150 feet above gage.

CHANNEL AND CONTROL.—Stream bed is made up of boulders and gravel; probably permanent.

EXTREMES OF DISCHARGE.—Maximum daily stage recorded during year, 7.4 feet; March 14 (discharge, 5,250 second-feet); minimum daily stage, 0.8 foot September 28–30 (discharge, 209 second-feet).

The flood of March–April, 1913, the highest known to have occurred at this station, reached a stage on March 25, represented by 14.0 feet, referred to gage datum.

ICE.—Stage-discharge relation seldom affected by ice, as velocities are high.

ACCURACY.—Stage-discharge relation changed about March 15, 1917; not seriously affected by ice during the years 1915 and 1917. Rating curve used November 19, 1914, to March 14, 1917, fairly well defined between 230 and 5,500 second-feet; that used from March 15 to September 30, 1917, well defined between 210 and 6,000 second-feet. Gage read daily to tenths. Daily discharge ascertained by applying daily gage height to rating table. Data for 1915 are republished on account of a revision of the rating curve, and supersede those published in Water-Supply Paper 403. Data as published for 1916 in Water-Supply Paper 433 are correct. Records good.

COOPERATION.—Gage-height record and results of discharge measurements furnished by Miami Conservancy District.

Discharge measurements of Mad River near Dayton, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec.-ft.*
Oct. 27	G. N. Burrell.....	1.20	256	May 18	H. R. Daubenspeck..	1.55	471
Mar. 26	.....do.....	2.40	942	Aug. 10	G. N. Burrell.....	1.15	296

Daily discharge, in second-feet, of Mad River near Dayton, Ohio, for the years ending Sept. 30, 1915 and 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1914-15.												
1	.....	.....	225	410	1,500	520	265	265	410	465	410	310
2	.....	.....	195	310	4,810	520	265	225	575	1,300	410	310
3	.....	.....	225	310	3,650	520	265	225	575	575	410	310
4	.....	.....	195	265	1,910	465	265	225	465	465	410	265
5	.....	.....	740	265	1,500	520	265	225	410	740	360	410
6	.....	.....	685	265	4,590	1,170	265	225	360	575	360	1,980
7	.....	.....	575	3,260	2,220	980	265	310	410	410	360	920
8	.....	.....	520	1,100	1,300	980	265	265	410	4,700	360	740
9	.....	.....	520	740	1,100	740	265	265	410	3,750	630	630
10	.....	.....	465	520	980	685	265	265	310	1,300	465	2,220
11	.....	.....	465	520	920	630	465	265	310	980	410	920
12	.....	.....	410	520	2,380	630	410	265	265	860	740	630
13	.....	.....	360	465	2,900	575	410	265	265	685	630	520
14	.....	.....	360	410	1,770	520	360	225	265	630	465	520
15	.....	.....	360	410	1,430	520	360	225	310	1,430	410	410
16	.....	.....	360	410	1,100	520	360	265	740	2,720	360	360
17	.....	.....	225	980	1,100	410	310	265	465	1,770	360	360
18	.....	.....	225	740	860	360	310	265	360	980	360	310
19	.....	225	310	630	800	410	310	265	920	2,380	360	630
20	.....	225	225	575	740	410	265	310	685	1,240	360	520
21	.....	225	225	410	740	410	265	360	520	2,900	575	410
22	.....	195	225	410	685	360	265	410	465	1,360	1,170	360
23	.....	195	225	410	685	360	310	310	360	920	685	360
24	.....	195	225	410	685	360	265	265	310	740	630	360
25	.....	195	195	410	685	360	265	265	310	630	575	360
26	.....	195	195	410	685	360	265	265	260	575	465	310
27	.....	195	195	410	740	360	265	310	260	575	410	465
28	.....	195	195	360	575	360	265	310	260	520	360	980
29	.....	195	225	360	.....	310	265	265	225	410	360	630
30	.....	195	920	360	.....	310	265	685	1,170	520	360	465
31	.....	.....	465	360	.....	310	.....	465	.....	410	310	.....
1916-17.												
1	405	320	360	405	980	700	700	1,630	1,040	920	405	285
2	405	320	360	405	810	545	980	920	755	810	360	285
3	360	320	360	405	700	545	1,300	865	700	700	360	320
4	360	320	360	405	1,300	450	865	755	645	595	320	285
5	360	320	405	1,980	1,300	450	865	1,980	980	495	320	285
6	360	320	405	4,370	1,770	405	2,060	1,170	1,300	450	320	285
7	360	320	405	1,500	1,980	405	1,240	920	865	645	360	285
8	320	320	405	1,040	810	700	980	810	700	595	360	285
9	320	320	405	920	700	700	865	810	645	495	320	285
10	320	360	405	810	700	645	810	700	865	645	320	285
11	320	360	405	755	700	810	755	645	755	595	320	285
12	320	320	360	595	595	1,840	755	595	645	755	320	250
13	320	320	360	495	595	1,300	755	595	495	595	285	250
14	320	320	360	495	495	5,250	700	595	495	1,630	285	250
15	320	320	360	495	450	2,220	700	595	495	3,080	285	250
16	320	320	360	495	450	1,360	700	545	450	1,170	285	250
17	320	320	360	495	450	1,170	700	545	450	1,040	285	250
18	320	320	360	450	545	865	980	495	405	1,360	285	250
19	405	320	360	450	450	865	865	495	405	865	285	250
20	450	320	360	450	920	865	755	495	405	755	285	250
21	405	320	360	450	700	865	700	495	405	645	320	250
22	405	320	360	2,540	595	980	700	545	405	595	405	250
23	360	360	360	1,770	700	920	645	595	405	545	405	250
24	360	405	360	980	1,980	2,460	545	545	645	495	320	250
25	360	405	360	810	980	1,240	700	495	495	450	285	250
26	360	360	360	700	755	980	700	450	450	865	285	250
27	320	360	700	595	1,100	865	645	645	450	810	250	250
28	320	405	1,360	700	700	865	645	700	865	700	250	209
29	320	405	755	980	.....	810	645	1,360	3,170	545	285	209
30	320	360	450	1,430	.....	755	595	810	1,360	495	360	209
31	320	.....	405	1,170	.....	700	.....	700	.....	450	320	.....

Monthly discharge of Mad River near Dayton, Ohio, for the years ending Sept. 30, 1915, and 1917.

[Drainage area, 652 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1914–15.					
November 19–30	225	195	202	0.310	0.12
December	920	195	353	.541	.62
January	3,260	265	562	.862	.99
February	4,810	575	1,540	2.36	2.46
March	1,170	310	514	.788	.91
April	465	265	297	.456	.51
May	685	225	291	.446	.51
June	1,170	225	435	.666	.74
July	4,700	410	1,210	1.86	2.14
August	1,170	310	469	.719	.83
September	2,220	265	599	.919	1.03
The period Nov. 19 to Sept. 30	4,810	195	604	.926	10.86
1916–17.					
October	450	320	350	0.537	0.62
November	405	320	339	.520	.58
December	1,360	360	430	.660	.76
January	4,370	405	953	1.46	1.68
February	1,980	450	865	1.33	1.38
March	5,250	405	1,080	1.66	1.91
April	2,060	545	828	1.27	1.42
May	1,980	450	758	1.16	1.34
June	3,170	405	738	1.13	1.26
July	3,080	450	800	1.23	1.42
August	405	250	318	.488	.56
September	320	209	260	.399	.45
The year	5,250	209	643	.986	13.38

BUCK CREEK AT SPRINGFIELD, OHIO.

LOCATION.—At Plum Street Bridge in Springfield, Clark County.

DRAINAGE AREA.—163 square miles.

RECORDS AVAILABLE.—July 15, 1914, to September 30, 1917.

GAGE.—Vertical staff in two sections; read by S. Van Bird, jr. Elevation of zero of gage above sea level, 908.2 feet.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge or by wading.

CHANNEL AND CONTROL.—Channel may shift slightly during floods.

EXTREMES OF STAGE.—Maximum daily stage recorded during year, 5.9 feet, January 5; minimum daily stage, 0.5 foot, September 27.

The flood of March–April, 1913, the highest known to have occurred at this station, reached a stage on March 25, represented by 12.3 feet, referred to gage datum.

ICE.—Stage-discharge relation affected by ice for short periods only, as the use of water for condensing purposes at points above the gage tends to keep the temperature above freezing.

ACCURACY.—Stage-discharge relation not permanent; probably not affected by ice. Rating curve for 1917 not definitely defined. Gage read daily to tenths. Records good.

COOPERATION.—Base data furnished by the Miami Conservancy District.

Discharge measurements of Buck Creek at Springfield, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 12	G. N. Burrell	1.78	190
May 22	H. R. Daubenspeck	1.35	107
Aug. 8	G. N. Burrell	1.00	65.7

Daily gage height, in feet, of Buck Creek at Springfield, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.0	0.8	0.9	1.1	1.5	1.3	1.4	1.8	1.6	1.8	0.9	0.7
2	1.0	.8	.9	1.3	1.3	1.4	2.0	1.5	1.6	1.7	1.0	.7
3	1.0	.8	.9	1.6	1.2	1.5	1.8	1.4	1.5	1.6	.9	.7
4	1.0	.8	.9	1.9	1.0	1.4	1.6	2.5	1.7	1.6	.8	.6
5	1.0	.8	1.0	5.9	.9	1.4	2.2	2.0	2.1	1.4	.8	.7
6	1.0	.8	.9	2.5	.9	1.3	2.5	1.9	2.0	1.3	.7	.7
7	1.0	.8	.9	2.1	.8	1.3	1.9	1.5	2.0	1.2	.9	.6
8	.9	.8	.8	1.9	.8	1.5	1.8	1.5	2.2	1.4	1.0	.7
9	.9	.8	.8	1.6	.8	1.4	1.8	1.4	1.9	1.3	1.0	.7
10	.9	.9	.8	1.5	.8	1.3	1.7	1.3	1.3	1.3	1.1	.7
11	.9	.9	.8	1.3	.8	2.5	1.5	1.3	1.3	1.3	.9	.8
12	.9	.8	.8	1.0	1.0	1.9	1.2	1.3	1.4	1.4	.9	.6
13	.9	.8	.8	1.0	1.0	2.4	1.2	1.3	1.2	1.5	.8	.7
14	.9	.8	.8	.9	1.0	3.5	1.2	1.3	1.5	1.3	.8	.6
15	.9	.8	.8	.9	1.1	2.0	1.2	1.2	1.3	4.2	.7	.6
16	.9	.8	.8	.9	1.2	1.8	1.2	1.2	1.3	1.5	.9	.6
17	.9	.8	.7	.9	1.1	1.9	1.2	1.2	1.3	1.9	.8	.7
18	.9	.8	.7	1.0	1.1	1.7	2.4	1.3	1.3	2.0	.8	.6
19	1.1	.8	.8	1.0	1.3	1.6	1.6	1.2	1.3	1.5	.7	.6
20	1.2	.8	.8	1.0	1.7	1.5	1.4	1.2	1.3	1.4	.7	.7
21	1.1	.8	.8	1.5	1.2	1.8	1.4	1.3	1.3	1.2	.6	.7
22	1.0	.8	.8	3.8	1.5	1.8	1.3	1.4	1.4	1.1	.7	.6
23	.9	1.4	.8	2.0	3.5	1.9	1.2	1.4	3.0	1.0	.8	.6
24	.9	1.2	.8	1.7	1.8	2.5	2.0	1.6	1.5	.9	.7	.6
25	.8	1.0	.8	1.5	1.5	1.9	1.5	1.4	1.3	1.2	.6	.7
26	.8	.9	1.0	1.2	1.5	1.7	1.4	1.7	1.4	1.4	.9	.6
27	.8	.8	2.2	1.2	1.4	1.9	1.5	1.9	2.5	1.2	.8	.5
28	.8	1.0	2.0	1.8	1.3	1.4	1.6	3.0	2.2	1.1	.8	.6
29	.8	1.2	1.6	2.2	.....	1.2	1.4	2.0	2.1	1.1	.8	.6
30	.8	1.0	1.3	2.0	.....	1.2	1.4	1.8	2.0	1.0	.8	.6
31	.8	.....	1.1	1.8	.....	1.1	.....	1.6	.....	.9	.8	.....

TWIN CREEK NEAR GERMANTOWN, OHIO.

LOCATION.—At covered highway bridge in NE. ¼ sec. 14, T. 3 N., R. 4 E., about 1 mile west of Germantown, Montgomery County, and about 2 miles above mouth of Little Twin Creek, which enters from left.

DRAINAGE AREA.—272 square miles.

RECORDS AVAILABLE.—April 12, 1914, to September 30, 1917.

GAGE.—Vertical staff in two sections; read by Thomas Stettler. Sea-level elevation of zero of gage, 712.73 feet.

DISCHARGE MEASUREMENTS.—Made from downstream side of the bridge or by wading about 200 feet above gage. The bridge makes an angle of about 45° with the direction of the current. Flood measurements can be made at the highway bridge about half a mile below the gage.

CHANNEL AND CONTROL.—Channel shifts slightly during floods.

EXTREMES OF STAGE.—Maximum daily stage recorded during year, 7.1 feet, March 14; minimum daily stage, 0.8 foot, September 18-30. The flood of March–April, 1913, the highest known to have occurred at this station, reached a stage on March 25 of 18.3 feet, referred to gage datum.

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—Stage-discharge relation not permanent; probably not affected by ice. Rating curve not developed. Measurements indicate considerable change in control. Gage read daily to tenths. Records good.

COOPERATION.—Station maintained and records furnished by the Miami Conservancy District.

Discharge measurements of Twin Creek near Germantown, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 31	H. R. Daubenspeck..	1.25	23.2	May 23	H. R. Daubenspeck..	2.62	459
Mar. 27	G. N. Burrell.....	2.30	306	July 26	G. N. Burrell.....	2.08	231
Apr. 10	H. R. Daubenspeck..	2.20	308				

Daily gage height, in feet, of Twin Creek near Germantown, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.4	1.2	1.4	2.4	3.5	2.0	2.0	2.1	2.8	1.9	1.3	1.2
2	1.3	1.2	1.3	2.3	2.5	1.9	4.3	2.5	2.3	1.9	1.2	1.3
3	1.3	1.2	1.3	2.3	2.4	1.9	3.4	2.1	2.6	1.9	1.1	1.7
4	1.3	1.2	1.3	2.3	2.0	1.8	2.7	2.1	2.2	1.7	1.1	1.4
5	1.2	1.2	1.5	5.5	1.9	1.8	2.5	4.3	2.6	1.6	1.1	1.2
6	1.2	1.2	1.5	6.3	1.9	1.7	4.0	2.8	4.5	1.6	1.1	1.1
7	1.2	1.2	1.5	3.8	1.9	1.8	3.0	2.7	3.2	1.6	1.1	1.0
8	1.2	1.2	1.5	3.1	1.9	2.0	2.5	2.4	2.6	1.9	1.1	1.1
9	1.2	1.2	1.6	2.8	1.9	2.6	2.3	2.2	2.3	1.7	1.1	1.1
10	1.2	1.3	1.6	2.8	1.9	2.7	2.2	2.2	3.2	1.6	1.0	1.1
11	1.2	1.3	1.6	2.5	1.6	2.6	2.1	2.1	2.5	1.6	1.0	1.1
12	1.2	1.3	1.6	2.2	1.6	6.4	2.1	2.1	2.2	1.6	1.0	1.0
13	1.2	1.3	1.5	2.1	1.7	3.7	2.1	2.0	2.1	1.5	1.0	1.0
14	1.2	1.3	1.3	1.9	1.6	7.1	2.0	1.9	2.0	3.7	1.0	1.0
15	1.2	1.3	1.4	1.9	1.6	4.0	1.9	1.9	2.0	2.0	1.0	.9
16	1.2	1.3	1.4	1.9	1.7	3.2	1.9	1.8	1.9	1.8	1.0	.9
17	1.2	1.3	1.4	1.8	1.7	3.0	1.9	1.8	1.8	1.9	.9	.9
18	1.2	1.3	1.3	1.8	1.7	2.6	1.8	1.8	1.8	2.0	.9	.8
19	1.3	1.3	1.3	1.8	1.7	2.3	2.1	1.7	1.8	1.8	.9	.8
20	1.3	1.3	1.3	1.7	2.2	2.2	2.0	1.7	1.7	1.7	.9	.8
21	1.5	1.2	1.4	1.8	1.9	2.2	2.0	1.7	1.7	1.6	.9	.8
22	1.6	1.2	1.3	6.7	1.8	2.8	1.9	1.7	1.7	1.5	2.3	.8
23	1.5	1.3	1.3	3.8	1.7	2.4	1.8	1.8	1.6	1.4	2.1	.8
24	1.4	1.5	1.3	2.9	3.8	4.4	1.8	2.1	1.6	1.4	1.7	.8
25	1.4	1.5	1.3	2.4	2.3	3.1	1.9	1.9	1.6	1.4	1.7	.8
26	1.4	1.4	1.3	2.1	2.1	2.6	1.9	1.8	1.6	2.9	1.4	.8
27	1.3	1.4	3.1	2.1	2.1	2.4	1.9	3.7	1.6	2.1	1.2	.8
28	1.3	1.3	3.7	2.1	2.1	2.2	1.9	2.7	2.3	1.7	1.1	.8
29	1.3	1.4	2.5	2.2	.....	2.1	2.0	3.9	2.7	1.5	1.1	.8
30	1.3	1.4	2.3	3.7	.....	2.0	1.9	2.8	2.7	1.4	1.2	.8
31	1.2	.....	2.3	3.2	.....	2.0	.....	2.8	.....	1.3	1.3	.....

FOURMILE CREEK NEAR SEVENMILE, OHIO.

LOCATION.—In NW. ¼ sec. 7, T. 2 N., R. 3 E. first principal meridian, at steel-truss highway bridge about 2 miles southwest of Sevenmile, Butler County, and about 5 miles above junction with Miami River, near Hamilton.

DRAINAGE AREA.—178 square miles.

RECORDS AVAILABLE.—November 17, 1914, to September 30, 1917.

GAGE.—Vertical staff in two sections; read by W. B. Eaton. The lower section is on downstream side of bridge pier; upper section is on tree on right bank just below bridge. Sea-level elevation of zero of gage, 618.69 feet.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge at gage or by wading 700 feet above gage.

CHANNEL AND CONTROL.—Stream bed is composed of gravel; shifts considerably during floods.

EXTREMES OF STAGE.—Maximum daily stage recorded during year, 6.5 feet June 5; minimum daily stage, 0.5 foot October 11–15, 17. Maximum stage recorded, 18 feet, March 25, 1913.

ICE.—Stage-discharge relation may be affected by ice jams at times.

ACCURACY.—Stage-discharge relation not permanent; probably not seriously affected by ice during the year. Rating curve not developed. Recent measurements indicate some change in control. Gage read to tenths daily. Records good.

COOPERATION.—Gage-height recorded and results of discharge measurements furnished by the Miami Conservancy District.

Discharge measurements of Fourmile Creek near Sevenmile, Ohio., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec-ft.*
Oct. 31	G. N. Burrell.....	0.7	2.1	June 5	H. R. Daubenspeck..	4.75	2,380
Mar. 13	H. R. Daubenspeck..	7.4	5,350	Aug. 15	G. N. Burrell.....	1.2	6.5
14	.....do.....	4.25	1,540				

Daily gage height, in feet, of Fourmile Creek near Sevenmile, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.9	0.7	1.0	1.4	2.6	2.7	3.5	2.6	2.4	1.8	1.8	1.1
2	.8	.7	1.0	1.4	2.4	2.7	3.3	2.0	2.0	1.7	1.8	1.1
3	.6	.7	1.0	1.7	2.4	2.7	3.0	1.9	2.0	1.7	1.8	1.1
4	.6	.7	.9	1.6	1.7	1.9	2.8	1 9	3.3	1.7	1.8	1.1
5	.6	.7	.9	5.0	1.7	1.5	2.8	1.7	6.5	1.7	1.7	1.1
6	.6	.7	1.1	3.4	1.7	1.5	2.6	1.4	4.8	1.7	1.7	1.1
7	.6	.7	1.1	2.8	1.7	1 5	2.5	1.3	2.9	1.7	1.7	1.1
8	.6	.7	1.1	2.4	1 7	1.5	2.0	1 8	2.6	1.8	1.4	1.2
9	.6	.7	1.4	1.6	1.5	1 6	1.8	1.8	2.5	1.8	1.3	1.1
10	.6	.7	1.1	1.6	1.5	1.5	1.8	1.8	2.0	2.0	1.1	1.0
11	.5	.7	1.1	1.4	1.5	1.5	1.6	1.8	2.0	2.0	1.1	1.0
12	.5	.7	1.1	1.4	1.5	4 0	1.7	1.8	1.8	2.1	1.1	1.0
13	.5	.7	1.1	1.3	1.5	5.0	1.8	1.8	1.8	2.2	1.1	.9
14	.5	.7	1.1	1.4	1 9	5 4	1.8	1.7	1.8	2.2	1.1	.9
15	.5	.7	1.1	1.6	2.1	3.2	1.8	1.7	1.8	2.2	1.1	.9
16	.9	.7	1.1	1.6	2.5	2.9	1.8	1.6	1.8	2.3	1.2	.9
17	.5	.7	1.0	1.6	2.5	2.8	1.8	1.6	1.8	2.3	1.2	.9
18	1.0	.7	1.0	1.6	2.5	2.8	1.8	1.8	1.8	2.3	1.2	.9
19	1.1	.7	.9	1.6	2.6	2.8	1.8	1.8	1.8	2.3	1.2	.9
20	1.1	.7	.9	1.6	2.6	2.8	1.8	1.8	1.8	2.4	1.8	.9
21	1.1	.7	1.1	1.6	2.6	2.8	1.9	1.8	1.8	2.4	1.7	.9
22	1.1	.7	1.1	5.0	2.6	2.8	1.9	1.8	1.8	2.2	1.4	.9
23	.9	1.4	1.1	2.4	3.0	2.8	1.9	1.8	1.8	1.8	1.1	.9
24	.9	1.1	1.1	2.0	3.0	3.0	2.0	1.8	1.8	1.8	1.1	.9
25	.9	1.1	1.1	2.0	2.9	2.8	1.6	1.8	1.8	1.6	1.1	.9
26	.7	1.1	1.4	2.1	2.9	2.8	1.7	2.0	2.0	1.6	1.2	.9
27	.7	1.1	3.2	2.4	2.8	2.7	2.0	1.9	2.0	1.7	1.2	.9
28	.7	1.1	2.9	2.4	2.9	2.4	2.2	2.3	1.8	1.8	1.4	.9
29	.7	1.1	2.4	3.6	.....	2.1	1.9	2.3	1.8	1.8	1.4	.9
30	.7	1.1	1.8	3.0	.....	2.0	3.0	2.4	1.8	1.8	1.4	.9
31	.7	.....	1.6	2.6	.....	3.5	.....	3.0	.....	1.8	1.3	.....

SEVENMILE CREEK AT SEVENMILE, OHIO.

LOCATION.—On line between sec. 5, T. 2 N., R. 3 E., and sec. 32, T. 3 N., R. 3 E. first principal meridian, at covered highway bridge about half a mile west of Sevenmile, Butler County, and about 1 mile above junction with Fourmile Creek.

DRAINAGE AREA.—128 square miles.

RECORDS AVAILABLE.—November 17, 1914, to September 30, 1917.

GAGE.—Vertical staff on downstream side of west abutment; read by H. L. Kumler. Sea-level elevation of zero of gage, 623.1 feet.

DISCHARGE MEASUREMENTS.—Made from bridge at gage or by wading just above bridge.

CHANNEL AND CONTROL.—Stream bed at the gage is for the most part limestone bedrock in horizontal layers; although some gravel occurs along the east side, the section is practically permanent.

EXTREMES OF STAGE.—Maximum daily stage recorded during year, 7.8 feet January 5; minimum daily stage, 1.4 feet August 19–20. Maximum stage recorded, 17 feet, March 25, 1913.

ICE.—Stream is seldom covered with ice on account of the high velocities, but stage-discharge relation is sometimes affected by ice jams.

ACCURACY.—Stage-discharge relation practically permanent; not seriously affected by ice during the year. Rating curve not developed. Gage read daily to tenths. Records good.

COOPERATION.—Gage-height record and results of discharge measurements furnished by the Miami Conservancy District.

Discharge measurements of Sevenmile Creek at Sevenmile, Ohio, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 31	G. N. Burrell	1.80	4.4	June 5	H. R. Daubenspeck	5.9	2,290
Mar. 14	H. R. Daubenspeck	4.8	1,300	Aug. 15	G. N. Burrell	1.80	11.2

Daily gage height, in feet, of Sevenmile Creek at Sevenmile, Ohio, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.8	1.8	1.9	2.2	3.2	2.2	2.7	2.5	2.6	2.4	2.0	2.0
2	1.8	1.8	1.9	2.2	2.6	2.2	3.9	2.4	2.7	2.6	2.0	2.0
3	1.8	1.8	1.8	2.2	2.4	2.1	3.2	2.3	2.6	2.8	2.0	2.0
4	1.8	1.8	1.8	2.2	2.7	.....	2.9	2.3	2.8	2.4	1.9	1.9
5	1.8	1.7	1.9	7.8	4.4	.....	4.2	3.5	7.2	2.3	1.9	1.8
6	1.7	1.7	1.9	3.9	4.5	.....	3.7	2.6	3.8	2.5	1.9	1.8
7	1.7	1.7	1.9	3.3	4.4	.....	3.0	2.6	3.3	2.3	1.8	1.8
8	1.8	1.7	1.9	3.0	3.5	.....	2.9	2.6	2.9	2.3	1.8	2.0
9	1.8	1.8	1.9	2.8	2.5	.....	2.8	2.6	2.5	2.2	1.7	1.9
10	1.8	1.8	1.9	2.7	2.2	.....	2.7	2.5	3.3	2.2	1.7	1.8
11	1.8	1.7	1.9	2.6	2.3	.....	2.7	2.5	3.0	2.2	1.7	1.7
12	1.8	1.7	1.9	2.5	2.3	.....	2.6	2.4	2.5	2.0	1.7	1.7
13	1.8	1.8	1.9	2.5	2.8	.....	2.5	2.3	2.5	2.0	1.7	1.6
14	1.8	1.8	2.0	3.2	2.4	.....	2.5	2.3	2.7	3.8	1.6	1.6
15	1.8	1.8	2.0	3.4	2.2	.....	2.5	2.2	2.6	3.0	1.6	1.6
16	1.8	1.8	2.0	3.2	2.2	.....	2.4	2.2	2.4	2.4	1.6	1.9
17	1.8	1.8	2.0	3.3	2.2	.....	2.4	2.2	2.4	4.8	1.5	1.8
18	1.7	1.8	2.0	3.1	2.3	3.1	2.3	2.2	2.3	2.7	1.5	1.8
19	1.7	1.8	2.0	3.2	2.3	3.1	2.4	2.2	2.3	2.5	1.4	1.8
20	1.9	1.8	2.0	2.9	2.6	3.0	2.4	2.2	2.3	2.2	1.4	1.8
21	2.0	1.8	2.0	2.3	2.3	2.8	2.4	2.2	2.2	2.2	1.5	1.8
22	1.9	1.8	2.0	4.9	2.2	2.7	2.4	2.2	2.2	2.2	1.5	1.8
23	1.9	1.9	2.0	3.2	2.4	2.8	2.4	2.3	2.2	2.2	2.2	1.8
24	1.9	1.9	1.9	3.9	3.1	3.5	2.4	2.3	2.2	2.2	2.1	1.8
25	1.8	1.9	1.9	3.7	2.2	3.1	2.3	2.5	2.2	2.1	2.1	1.7
26	1.8	1.8	1.9	2.5	2.2	3.1	2.3	2.5	2.0	2.1	2.1	1.7
27	1.8	1.8	4.2	2.4	2.2	2.8	2.3	2.6	2.0	2.0	2.0	1.7
28	1.8	1.9	2.9	2.7	2.2	2.7	2.6	3.1	2.8	2.0	2.0	1.7
29	1.8	1.9	2.4	3.2	.....	2.7	2.5	3.4	2.6	2.0	2.2	1.7
30	1.8	1.9	2.2	3.1	.....	2.7	2.3	2.6	2.3	2.0	2.1	1.7
31	1.8	.....	2.2	3.1	.....	2.6	.....	2.4	.....	2.0	2.1	.....

NOTE.—No readings Mar. 4–17.

WHITEWATER RIVER AT BROOKVILLE, IND.

LOCATION.—At two-span steel highway bridge about three-fourths mile south of Brookville, Franklin County, and about 2,000 feet below junction of east and west forks of Whitewater River.

DRAINAGE AREA.—1,180 square miles.

RECORDS AVAILABLE.—June 8, 1915, to September 30, 1917.

GAGE.—Chain gage fastened to downstream side of bridge; read by H. Koerner.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Control about 500 feet below gage is probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 13.7 feet March 13 (discharge, about 39,000 second-feet); minimum stage, 1.05 feet morning February 14 (discharge, 164 second-feet).

REGULATION.—Flow regulated to some extent by the Thompson-Norris strawboard mill at Brookville. Water is diverted from the west fork about 10 miles above station and flows down the old Whitewater Canal to the mill and is returned to the river a few hundred feet above junction of the east and west forks.

ACCURACY.—Stage-discharge relation practically permanent; probably not affected by ice during year. Rating curve well-defined between 200 and 12,500 second-feet; beyond these limits curve is an extension. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Records good.

COOPERATION.—Base data furnished by United States Army Engineers.

Daily discharge, in second-feet, of Whitewater River at Brookville, Ind., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	228	199	242	570	1,340	835	788	2,500	1,540	650	242	208
2	228	199	242	570	740	740	5,430	1,840	2,680	695	242	199
3	228	199	255	650	462	650	3,620	1,280	1,540	495	228	1,400
4	218	190	255	610	352	695	2,320	1,100	935	375	228	272
5	208	199	255	19,900	228	740	4,960	3,620	15,300	352	218	228
6	208	199	255	13,400	532	430	7,550	2,320	4,050	352	228	208
7	199	199	288	3,420	695	1,100	3,620	1,690	3,040	402	255	242
8	199	199	308	2,500	740	1,840	2,320	1,400	1,840	1,160	218	4,730
9	199	199	462	2,000	532	1,280	2,000	1,280	4,730	695	218	570
10	218	208	288	1,690	430	1,160	1,690	1,840	3,420	495	228	328
11	242	218	272	1,280	375	2,680	1,480	308	2,320	462	218	255
12	228	208	308	835	190	11,100	1,280	835	1,480	462	218	218
13	242	218	288	935	190	27,900	1,160	835	1,160	402	218	218
14	218	228	255	788	164	19,900	990	695	1,040	2,500	208	218
15	218	228	255	610	172	4,960	935	650	885	990	199	208
16	208	228	255	695	375	3,420	885	610	788	740	199	204
17	208	228	255	650	352	2,860	788	532	650	1,340	199	199
18	208	218	242	462	532	3,040	788	495	610	935	208	194
19	218	228	255	570	695	1,760	835	495	570	610	199	190
20	255	228	242	570	695	1,540	835	462	462	462	272	199
21	308	218	272	695	695	1,620	835	462	430	430	228	218
22	242	228	242	9,420	610	2,320	740	532	430	352	328	218
23	228	242	228	2,860	3,230	3,830	650	1,040	430	328	352	218
24	228	255	228	1,690	2,860	4,050	650	570	430	375	375	199
25	228	242	242	1,340	1,340	2,320	740	495	402	352	255	199
26	228	255	228	1,220	1,040	1,690	788	462	375	402	242	190
27	218	255	6,180	935	1,040	1,540	788	1,100	495	430	228	190
28	208	255	3,830	1,160	935	1,230	990	4,270	1,840	352	218	208
29	208	242	352	2,160	.....	1,160	1,040	2,500	1,480	288	208	199
30	199	255	650	2,000	.....	1,040	1,100	1,280	990	272	218	208
31	199	.....	570	2,500	.....	990	.....	1,220	.....	255	218	.....

Monthly discharge of Whitewater River at Brookville, Ind., for the year ending Sept. 30, 1917.

[Drainage area, 1,180 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	308	199	222	0.188	0.22
November	255	190	222	.188	.21
December	6,180	228	597	.506	.58
January	19,900	462	2,540	2.15	2.48
February	3,230	164	769	.652	.68
March	27,900	430	3,560	3.02	3.48
April	7,550	650	1,750	1.48	1.65
May	4,270	308	1,250	1.06	1.22
June	15,300	375	1,880	1.59	1.77
July	2,500	255	594	.503	.58
August	375	199	236	.200	.22
September	4,730	190	418	.354	.40
The year	27,900	164	1,170	.992	13.49

KENTUCKY RIVER BASIN.

DIX RIVER NEAR BURGIN, KY.

LOCATION.—At covered wooden highway bridge on Burgin and Buena Vista pike, 3¾ miles due east of Burgin, Mercer County. Kennedy's mill is one-fourth mile above station.

DRAINAGE AREA.—395 square miles (86 per cent measured on topographic maps and 14 per cent on map of Kentucky, compiled by United States Geological Survey, scale 1:500,000).

RECORDS AVAILABLE.—July 2, 1910, to July 16, 1911; October 1, 1911, to September 30, 1917.

GAGE.—Staff gage attached to right upstream wing wall of bridge near face of abutment; read twice daily by Frank Martin. Soundings taken at the measuring section indicate that the zero of the gage as replaced by the observer on February 15, 1913, is approximately 0.2 foot below zero of gage installed when station was established. Gage readings subsequent to February 15, 1913, refer to a datum which is about 0.2 foot below datum of original gage.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge, from a boat, or by wading.

CHANNEL AND CONTROL.—Probably permanent except during extreme floods. At stages above low water the growth of foliage on trees and brush at the control may affect the stage-discharge relation to a small extent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 29.0 feet about 3 a. m. January 22 (discharge, 27,500 second-feet); minimum stage, 2.80 feet July 11–14 (discharge, 2.5 second-feet).

Maximum stage about 30 feet; date unknown.

ICE.—Ice forms only during severe winters.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice during the year. Rating curve well defined up to 455 second-feet and fairly well defined between 455 and 12,000 second-feet; extended above 12,000 second-feet. Gage read twice daily to quarter tenths. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

COOPERATION.—Station maintained in cooperation with Kentucky State Geological Survey, J. B. Hoeing, State geologist.

Discharge measurements of Dix River near Burgin, Ky., during the year ending Sept. 30, 1917.

[Made by Jones and Sellier.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Jan. 23	11.68	4,950
July 19	2.86	3.4

Daily discharge, in second-feet, of Dix River near Burgin, Ky., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	16	22	35	455	925	6,510	345	222	60	16	44	35
2	34	21	32	455	1,270	3,040	4,830	190	82	14	38	34
3	12	20	31	2,090	875	6,990	2,860	142	1,150	12	36	50
4	11	18	31	11,200	649	4,400	1,270	116	389	9.6	35	108
5	10	18	34	12,400	438	2,770	925	97	244	9.2	32	92
6	9.2	16	32	6,270	318	1,940	1,870	88	160	8.0	29	75
7	8.0	15	32	2,420	345	2,090	1,340	94	133	8.0	25	58
8	6.4	15	36	1,400	292	6,510	875	88	256	8.0	24	48
9	10	15	42	925	268	3,310	825	77	180	6.8	21	41
10	9.2	12	42	735	233	1,800	691	72	691	4.6	19	34
11	8.0	12	39	529	233	1,210	529	72	491	2.5	16	32
12	7.6	11	34	389	211	1,270	405	71	331	2.5	13	27
13	6.8	11	36	331	142	2,170	421	66	222	2.5	11	20
14	6.0	10	39	280	142	1,660	438	61	160	2.5	10	18
15	6.0	9.2	38	280	190	1,530	405	56	124	3.2	9.2	16
16	7.6	9.2	35	359	1,340	925	318	51	100	3.4	10	13
17	10	9.2	32	374	975	3,220	268	49	86	3.6	11	12
18	15	9.2	35	359	735	3,700	233	45	70	3.9	10	10
19	46	10	32	345	825	1,400	211	41	58	4.2	14	7.6
20	256	10	34	405	3,900	925	190	38	50	16	15	6.0
21	568	12	36	1,400	2,770	780	160	35	44	29	16	7.6
22	200	13	100	22,300	1,270	925	133	34	38	88	21	6.0
23	73	12	649	7,870	975	1,030	133	34	35	82	133	5.3
24	85	17	491	1,870	4,300	10,300	116	31	29	62	649	5.3
25	62	29	438	1,400	2,250	2,950	116	29	29	48	875	5.3
26	48	31	491	1,030	1,270	1,400	97	25	24	48	222	3.2
27	41	34	691	735	825	925	85	24	20	280	108	4.2
28	36	54	4,720	649	7,230	1,030	78	32	18	438	85	11
29	32	48	3,130	925	.....	735	100	82	19	222	66	22
30	29	41	1,340	825	.....	529	280	66	16	70	44	108
31	25	.....	649	649	.....	405	.....	55	.....	50	41	.....

Monthly discharge of Dix River near Burgin, Ky., for the year ending Sept. 30, 1917.

[Drainage area, 395 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	568	6	54.6	0.138	0.16
November	54	9.2	18.8	.048	.05
December	4,720	31	433	1.10	1.27
January	22,300	280	2,630	6.66	7.68
February	7,230	142	1,260	3.19	3.32
March	10,300	405	2,530	6.41	7.39
April	4,830	78	685	1.73	1.93
May	222	24	70.4	.178	.20
June	1,150	16	177	.448	.50
July	438	2.5	50.2	.127	.15
August	875	9.2	86.5	.219	.25
September	108	3.2	30.5	.077	.09
The year	22,300	2.5	669	1.69	22.99

ELKHORN CREEK AT FORKS OF ELKHORN, KY.

LOCATION.—At footbridge at Forks of Elkhorn, Franklin County, three-fourths mile below forks of stream and 5 miles northeast of Frankfort.

DRAINAGE AREA.—415 square miles (measured by United States Engineer Corps).

RECORDS AVAILABLE.—April 26, 1915, to September 30, 1917.

GAGE.—Vertical staff in two sections on left bank; section reading 0 to 5 feet attached to elm tree 40 feet below bridge, other section attached to sycamore tree about 20 feet below bridge; read by R. S. Estes.

DISCHARGE MEASUREMENTS.—Made from footbridge.

CHANNEL AND CONTROL.—Bed of stream loose and bed rock; probably permanent. Control short distance below gage, composed of solid rock and boulders; permanent.

ICE.—Stage-discharge relation probably not affected by ice except during severe winters.

ACCURACY.—Stage-discharge relation probably permanent; not affected by ice during year. Rating curve well defined, 65 to 18,000 second-feet and fairly well defined at other stages. Gage read twice daily to tenths. Daily discharge ascertained by applying mean gage readings to rating table. Results good.

COOPERATION.—Base data furnished by United States Engineer Corps.

Discharge measurements of Elkhorn Creek at Forks of Elkhorn, Ky., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec.-ft.*
Jan. 3	C. J. Thiebaud	6.6	4,260	May 19	C. J. Thiebaud	0.55	78.2
22	do	11.75	13,500	July 20	B. E. Jones	.96	140
22	do	11.8	12,700	31	L. Scofield	.6	78.9
Apr. 3	do	5.92	3,630				

Daily discharge, in second-feet, of Elkhorn Creek at Forks of Elkhorn, Ky., for the years ending Sept. 30, 1915–1917.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1915.						1915.					
1	135	482	180	180	335	16	204	305	390	320	254
2	135	1,710	196	180	320	17	196	278	335	1,140	455
3	180	1,540	222	222	305	18	196	278	305	1,880	835
4	180	1,060	320	910	292	19	180	243	278	910	730
5	164	1,540	410	800	1,540	20	180	222	243	910	482
6	164	662	352	662	2,420	21	180	213	204	910	320
7	222	1,380	320	455	1,620	22	455	213	180	1,380	266
8	730	1,300	1,380	320	1,140	23	1,220	196	180	948	254
9	432	1,140	2,600	243	730	24	1,060	188	180	835	254
10	292	835	2,330	213	482	25	835	180	180	765	254
11	292	510	1,710	213	390	26	630	180	180	510	254
12	266	390	1,060	213	335	27	630	180	180	370	254
13	232	335	695	213	335	28	750	180	180	335	254
14	213	335	540	213	305	29	872	180	180	335	254
15	213	335	455	910	278	30	695	172	180	455	254
						31	540	.....	180	390	.....

Daily discharge in second-feet, of Elkhorn Creek at Forks of Elkhorn, Ky., for the years ending Sept. 30, 1915–1917—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915–16.												
1	2,420	213	335	2,150	4,620	662	730	196	135	172	135	109
2	2,700	213	335	2,060	3,390	570	600	196	135	149	135	109
3	1,970	213	335	1,800	2,240	570	482	204	135	142	135	109
4	1,140	213	335	1,460	1,540	482	390	278	135	128	135	109
5	765	213	335	1,380	1,220	410	320	243	135	122	135	109
6	540	213	335	1,620	1,060	370	266	213	278	122	135	109
7	432	213	335	1,380	872	1,710	232	213	600	122	122	109
8	352	213	335	910	730	1,620	232	213	305	122	122	109
9	335	213	335	910	600	1,220	266	204	204	122	109	109
10	335	213	335	910	482	835	305	180	204	122	109	109
11	305	213	335	2,420	455	600	254	180	232	122	135	109
12	278	213	352	6,280	510	482	213	180	335	122	135	109
13	254	213	390	8,730	3,820	432	213	172	254	122	122	109
14	232	335	410	4,260	3,180	370	213	142	204	188	335	109
15	213	1,460	410	2,600	2,060	1,540	213	116	254	180	1,380	109
16	213	1,710	1,380	2,060	1,710	910	213	109	266	142	540	109
17	213	1,140	12,700	1,380	1,710	910	213	109	305	135	232	109
18	213	948	13,200	910	1,620	835	213	109	243	135	135	109
19	222	3,080	6,000	662	1,220	730	213	109	5,240	2,420	122	109
20	232	2,980	3,600	540	1,060	630	213	109	4,040	765	122	109
21	213	1,880	2,420	432	765	570	213	109	1,880	695	109	109
22	213	1,300	1,620	1,540	600	510	213	109	1,140	482	188	109
23	213	985	1,300	1,380	540	455	213	109	695	390	135	109
24	213	800	948	1,060	948	390	213	109	540	204	135	109
25	213	662	2,600	1,060	1,800	335	213	109	410	164	122	109
26	213	540	1,880	872	1,620	410	213	109	305	213	122	109
27	213	432	1,540	730	1,220	1,620	213	109	278	164	109	109
28	213	410	1,710	600	872	1,620	196	109	266	164	109	116
29	213	370	4,500	1,710	800	1,380	196	109	222	142	109	149
30	213	335	4,500	6,420	.....	1,060	196	135	188	135	109	116
31	213	.....	2,790	5,480	.....	872	.....	135	.....	135	109	.....
1916–17.												
1	109	109	109	695	630	630	570	164	410	66	86	57
2	109	109	109	630	630	1,140	7,020	164	695	66	76	49
3	109	109	109	5,240	570	1,460	3,920	164	455	66	76	49
4	109	109	109	2,790	410	2,150	2,240	164	305	66	76	49
5	109	109	1,380	3,820	335	2,150	2,600	164	278	66	66	49
6	109	109	305	3,390	335	1,620	4,740	135	232	66	62	49
7	109	109	232	2,600	335	1,460	2,980	135	455	66	57	49
8	109	109	196	1,460	254	2,880	570	135	1,460	66	57	92
9	109	109	196	835	180	4,860	1,540	135	8,550	66	57	116
10	109	109	164	765	164	4,040	1,220	135	2,600	66	57	86
11	109	109	164	570	164	4,150	765	135	1,380	66	57	62
12	109	109	135	510	164	5,870	570	135	630	66	57	57
13	109	109	135	510	164	4,620	370	135	410	66	53	57
14	109	109	135	510	164	5,240	335	135	455	66	49	57
15	109	109	135	510	164	3,080	278	135	305	66	49	57
16	109	109	135	510	164	2,240	278	135	254	66	49	49
17	109	109	135	510	164	1,710	278	135	180	66	49	49
18	109	109	135	455	232	1,300	278	135	135	66	49	49
19	164	109	135	278	370	835	232	103	135	66	49	49
20	128	109	135	196	335	630	213	76	135	86	49	49
21	122	109	135	2,330	335	3,600	180	76	135	109	49	49
22	109	109	135	13,400	335	2,330	135	81	135	86	49	49
23	109	109	135	6,720	570	2,150	135	109	135	76	49	49
24	109	109	232	2,980	910	3,390	135	86	109	66	49	49
25	109	109	410	2,060	570	2,420	135	86	109	254	49	49
26	109	109	765	1,380	370	1,460	135	86	97	305	49	49
27	109	109	6,570	910	335	1,620	135	5,360	86	180	49	49
28	109	109	4,500	835	370	1,060	135	5,360	86	122	49	49
29	109	109	2,980	765	.....	695	135	2,150	76	86	49	49
30	109	109	1,710	765	.....	455	164	765	66	66	66	49
31	109	.....	1,060	630	.....	305	.....	455	.....	76	62	.....

Monthly discharge of Elkhorn Creek at Forks of Elkhorn, Ky., for the years ending Sept. 30, 1915–1917.

[Drainage area, 415 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1915.					
May	1,220	135	409	0.986	1.14
June	1,710	172	559	1.35	1.51
July	2,600	180	527	1.27	1.46
August	1,880	180	592	1.43	1.65
September	2,420	254	540	1.30	1.45
1915–16.					
October	2,700	213	507	1.22	1.41
November	3,080	213	738	1.78	1.99
December	13,200	335	2,190	5.28	6.09
January	8,730	432	2,120	5.11	5.89
February	4,620	455	1,490	3.59	3.87
March	1,710	335	810	1.95	2.25
April	730	196	269	.648	.72
May	278	109	152	.366	.42
June	5,240	135	652	1.57	1.75
July	2,420	122	276	.665	.77
August	1,380	109	190	.458	.53
September	149	109	111	.267	.30
The year	13,200	109	792	1.91	25.99
1916–17.					
October	164	109	112	0.270	0.31
November	109	109	109	.263	.29
December	6,570	109	739	1.78	2.05
January	13,400	196	1,920	4.63	5.34
February	910	164	347	.836	.87
March	5,870	305	2,310	5.57	6.42
April	7,020	135	1,080	2.60	2.90
May	5,360	76	560	1.35	1.56
June	8,550	66	683	1.65	1.84
July	305	66	89.2	.215	.25
August	86	49	56.4	.136	.16
September	116	49	55.7	.134	.15
The year	13,400	49	677	1.63	22.14

EAGLE CREEK AT GLENCOE, KY.

LOCATION.—At county highway bridge half a mile south of Glencoe, Gallatin County,

DRAINAGE AREA.—445 square miles (United States Engineer Corps).

RECORDS AVAILABLE.—April 29, 1915, to September 30, 1917.

GAGE.—Vertical staff attached to upstream side of first pier from left abutment of bridge; read by Anna Connelly.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Bed of stream sand and loose stone; probably permanent. Small island covered with trees about 250 feet below bridge. Point of control not determined.

ICE.—Stage-discharge relation probably not affected by ice except in very cold winters.

ACCURACY.—Stage-discharge relation probably permanent; not affected by ice during year. Rating curve well defined between 50 and 15,000 second-feet, extended beyond these limits. Gage read twice daily to tenths. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

COOPERATION.—Base data furnished by United States Engineer Corps.

The following discharge measurement was made by C. J. Thiebaud, of the United States Army Engineer office at Frankfort, Ky.:

May 12, 1917: Gage height, 1.40 feet; discharge, 83.1 second-feet.

Daily discharge, in second-feet, of Eagle Creek at Glencoe, Ky., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept
1	9	26	51	146	260	380	273	193	5,540	30	58	48
2	9	26	51	122	193	870	12,600	115	4,390	30	45	32
3	9	22	45	9,570	138	722	3,830	85	1,350	465	45	26
4	9	22	40	3,500	138	1,500	488	122	345	146	30	22
5	9	22	225	6,380	138	870	2,880	96	810	90	22	18
6	9	22	183	2,580	138	488	6,510	90	442	62	22	14
7	9	22	193	810	138	810	810	75	273	45	18	14
8	9	22	115	286	138	3,400	510	75	248	40	18	345
9	9	22	96	193	138	3,190	930	75	3,400	32	14	193
10	9	26	85	173	138	1,500	695	75	2,780	30	14	85
11	9	22	66	155	138	930	442	96	488	28	14	66
12	9	22	51	108	138	4,740	286	578	260	26	11	58
13	9	22	45	164	138	7,280	260	260	173	22	11	58
14	9	22	40	122	138	5,900	214	115	930	22	11	45
15	9	22	40	85	138	1,660	193	130	330	26	11	40
16	9	22	40	85	138	510	193	75	183	40	11	30
17	9	22	40	85	138	330	146	66	155	138	11	26
18	9	22	40	85	85	314	122	58	122	70	11	24
19	9	22	40	85	108	260	115	51	96	183	11	18
20	35	22	40	85	300	214	108	45	80	80	11	18
21	35	22	40	3,830	248	5,080	108	40	70	70	11	18
22	35	22	40	13,500	173	2,010	96	40	66	85	11	45
23	58	28	115	1,200	1,420	532	85	35	58	108	11	28
24	85	122	214	300	2,780	4,960	85	35	51	40	11	22
25	75	193	193	214	236	810	85	35	45	138	11	22
26	58	138	362	164	183	362	80	32	45	173	9	18
27	48	90	14,700	155	314	2,380	75	13,200	40	130	9	14
28	42	90	5,420	465	420	810	75	22,300	35	80	9	14
29	38	75	1,060	695	.....	362	75	2,380	35	58	9	11
30	35	75	345	1,060	.....	260	314	465	32	58	9	11
31	26	.....	273	380	.....	225	.....	622	.....	58	54	.....

Monthly discharge of Eagle Creek at Glencoe, Ky., for the year ending Sept. 30, 1917.

[Drainage area, 445 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	85	9	23.9	0.054	0.06
November	193	22	43.6	.098	.11
December	14,700	40	783	1.76	2.03
January	13,500	85	1,510	3.39	3.91
February	2,780	85	314	.706	.74
March	7,280	214	1,730	3.89	4.48
April	12,600	75	1,090	2.45	2.73
May	22,300	32	1,340	3.01	3.47
June	5,540	32	762	1.71	1.91
July	465	22	84	.189	.22
August	58	9	17.8	.040	.05
September	345	11	46.1	.104	.12
The year	22,300	9	650	1.46	19.83

GREEN RIVER BASIN.

GREEN RIVER AT MUNFORDVILLE, KY.

LOCATION.—At toll highway bridge at Munfordville, Hart County. Louisville & Nashville Railroad bridge is about a mile below highway bridge.

DRAINAGE AREA.—1,790 square miles (measure on map of Kentucky compiled by United States Geological Survey, scale 1: 500,000.)

RECORDS AVAILABLE.—February 27, 1915, to September 30, 1917.

GAGE.—Chain gage attached to upstream handrail of bridge; read by Chester Williams.

DISCHARGE MEASURMENTS.—Made from upstream side of bridge or by wading 100 feet below the bridge.

CHANNEL AND CONTROL.—The control for low stages is at a riffle used as a ford immediately below the bridge and is believed to be permanent; control at high stages is also believed to be permanent. Discharge relation may be affected to some extent at high stages by differences in the foliage on the brush and trees in the flood plain.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 35.5 feet at 5.30 a. m. January 7 (discharge, 31,400 second-feet); minimum stage, 2.85 feet at 5.30 a. m. July 7 (discharge, 128 seond-feet). Minimum discharge for 1916 was 118 second feet and not 144, as given in this paragraph in Water-Supply Paper 433.

Highest known stage, about 54 feet; date unknown.

ICE.—Ice seldom forms at this station.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice during the year. Rating curve well defined below and fairly well defined above 1,700 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Record good.

COOPERATION.—Station maintained in cooperation with the Kentucky Geological Survey, J. B. Hoeing, State geologist.

Discharge measurements of Green River at Munfordville, Ky., during the year ending Sept. 30, 1917.

[Made by B. E. Jones.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Jan. 24	34.65	29,500	Jan. 26	17.49	10,200	Jan. 27	8.82	4,560
25	32.14	26,600	26	16.07	9,000	July 10	2.97	179
25	29.51	21,800	26	12.77	7,050	11	2.99	179

Daily discharge, in second-feet, of Green River at Munfordville, Ky., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	862	413	365	15,500	5,180	14,300	3,220	2,020	788	475	421	750
2	675	397	320	4,650	5,180	15,700	10,600	1,880	938	405	350	938
3	520	381	320	3,000	4,800	16,900	15,100	1,500	1,350	373	298	975
4	397	358	358	2,480	4,050	18,300	10,000	1,280	1,050	358	215	750
5	350	475	373	6,360	2,780	17,200	7,890	1,500	1,420	290	238	600
6	305	305	520	16,100	2,480	12,000	13,900	1,350	1,050	312	208	560
7	282	290	520	31,300	2,020	8,140	13,200	1,120	1,280	146	208	1,350
8	245	520	520	26,700	1,950	10,300	10,600	975	1,120	222	505	900
9	245	290	560	11,000	1,880	12,500	8,060	862	1,650	268	1,720	638
10	260	268	490	4,580	1,580	10,900	7,460	862	4,800	182	825	505
11	252	290	498	3,750	1,350	8,230	5,640	825	3,820	202	750	429
12	222	282	505	2,920	1,200	7,290	4,280	750	2,780	189	429	342
13	365	290	490	9,540	1,050	21,600	3,980	750	1,950	176	312	320
14	202	290	445	1,950	1,050	23,700	3,820	750	1,420	196	445	365
15	189	290	413	1,650	1,280	15,900	3,600	675	1,120	189	900	298
16	176	350	350	1,420	2,850	8,910	3,220	638	862	245	2,480	290
17	230	245	397	1,580	3,600	11,000	2,480	600	788	305	6,620	260
18	452	252	373	1,720	3,300	15,000	2,180	560	638	389	3,380	429
19	520	245	490	1,580	3,000	16,100	1,880	560	675	342	1,500	230
20	2,400	245	381	2,180	9,080	8,660	2,020	520	560	560	975	230
21	4,280	245	429	2,320	12,200	5,480	1,950	505	560	712	750	238
22	3,080	238	1,120	20,900	10,800	6,120	1,420	520	505	900	1,120	320
23	1,800	238	1,950	28,600	6,700	6,530	1,200	638	505	788	4,480	342
24	1,200	335	2,100	30,300	6,780	12,000	1,280	600	475	520	5,560	312
25	938	505	2,020	26,400	8,060	15,700	1,200	600	490	712	5,020	238
26	788	498	3,000	9,920	6,960	12,600	1,120	560	437	505	2,550	230
27	675	381	9,160	4,500	5,180	7,890	975	520	437	712	1,500	230
28	638	429	12,200	3,600	7,550	6,440	1,050	712	437	381	975	245
29	560	413	12,800	3,520	.....	5,180	1,420	975	490	560	788	230
30	482	373	11,800	4,500	.....	4,120	1,720	1,050	560	505	675	381
31	437	.....	6,440	4,280	.....	3,380	.....	975	.....	365	600	.....

Monthly discharge of Green River at Munfordville, Ky., for the year ending Sept. 30, 1917.

[Drainage area, 1,790 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	4,280	176	775	0.433	0.50
November	520	238	338	.189	.21
December	12,800	320	2,310	1.29	1.49
January	31,300	1,420	9,320	5.21	6.01
February	12,200	1,050	4,420	2.47	2.57
March	23,700	3,380	11,600	6.49	7.48
April	15,100	975	4,880	2.73	3.05
May	2,020	505	891	.498	.57
June	4,800	437	1,160	.649	.72
July	900	146	403	.225	.26
August	6,620	208	1,510	.844	.97
September	1,350	230	464	.259	.29
The year	31,300	146	3,180	1.78	24.12

115805°—20—WSP 453——8

WABASH RIVER BASIN.

VERMILION RIVER NEAR DANVILLE, ILL.

LOCATION.—In sec. 22, T. 19 N., R. 11 W., at Chicago & Eastern Illinois Railroad bridge, about 3 miles south of Danville, Vermilion County, 1¾ miles above Stony Creek, and 3 miles below mouth of North Fork.

DRAINAGE AREA.—1,280 square miles.

RECORDS AVAILABLE.—November 12, 1914, to September 30, 1917.

GAGE.—Chain gage attached to downstream side of bridge; read by Ralph Bradbury till July 14 and by William Taylor afterward.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge or by wading.

CHANNEL AND CONTROL.—Soft mud and sand; likely to shift.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 13.4 feet at 4.30 a. m. June 6 (discharge, 7,840 second-feet); minimum stage, 2.20 feet at 6.30 a. m. October 3 (discharge, 16 second-feet).

1915–1917: Maximum stage recorded, 18.9 feet January 31, 1916 (discharge, 12,800 second-feet); minimum stage, 2.00 feet November 20 and 23 to 25, 1915 (discharge, 15 second-feet).

ACCURACY.—Stage-discharge relation not permanent; affected by ice and changed during high water in June. Rating curve used till June 5 fairly well defined between 35 and 10,000 second-feet; curve used after that date fairly well defined between 52 and 10,000 second-feet. Gage read to hundredths twice daily. Gage heights probably 1.0 foot in error for a period just before or after July 8. Daily discharge ascertained by applying mean daily gage height to rating tables. Records fair except for very low stages in October and November, for period affected by ice, and for period about July 8, for which they are poor.

Discharge measurements of Vermilion River near Danville, Ill., during the year ending Sept. 30, 1917.

[Made by H. C. Beckman.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
Dec. 12	2.74	93	Aug. 13	2.74	113
June 22	4.00	621	13	2.74	118

Daily discharge, in second-feet, of Vermilion River near Danville, Ill., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	21	33	42			150	1,120	482	4,160	940	308	329
2	19	28	38			155	1,120	409	3,760	830	250	185
3	19	22	39			160	1,120	364	3,040	740	216	174
4	34	19	38			153	1,120	482	2,160	640	185	157
5	32	20	38			122	1,390	1,390	4,880	560	154	140
				395	50							
6	31	22	42			105	2,080	1,390	7,600	470	132	114
7	28	24	50			103	2,080	1,460	6,960	390	200	101
8	26	28	54			101	1,680	1,460	6,160	330	351	269
9	24	40	160			96	1,320	1,390	6,640	288	308	308
10	23	43	140			94	852	1,320	7,360	250	233	308
11	21	43				101	796	1,180	5,600	233	137	216
12	21	43				103	715	940	4,320	216	127	150
13	21	42				321	662	715	3,600	200	116	118
14	22	38				3,040	636	532	3,280	185	101	101
15	24	38				3,520	636	409	2,960	329	86	86
			95	135	40							
16	25	36				3,440	610	364	2,720	351	80	82
17	26	35				3,360	610	321	1,680	488	75	75
18	33	34				3,360	584	300	1,390	418	67	66
19	43	33				3,040	610	300	1,000	373	62	60
20	72	33				2,720	636	300	715	329	60	59
21	103	32				2,400	610	364	610	250	59	55
22	92	35				2,080	532	715	560	216	64	54
23	77	70				1,760	482	1,760	511	200	120	64
24	64	85				1,680	507	2,160	488	185	64	74
25	51	79			85	1,530	532	2,080	464	185	250	84
26	45	79	240	70		1,320	532	1,920	715	662	185	77
27	38	68				1,120	532	1,840	1,460	1,120	114	71
28	35	58				940	558	1,840	2,960	1,320	179	67
29	36	48				769	584	1,920	2,400	1,060	351	62
30	38	45				636	558	2,560	1,390	585	418	59
31	36					532		4,400		418	373	

NOTE.—No gage height record for Mar. 2 and Sept. 23-24; discharge interpolated. Discharge estimated July 2-8 because of erroneous gage heights. Discharge Dec. 11 to Feb. 28 estimated because of ice, from gage heights, observer's notes, and weather records. Braced figures show mean discharge for periods included.

Monthly discharge of Vermilion River near Danville, Ill., for the year ending Sept. 30, 1917.

[Drainage area, 1,280 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	103	19	38.1	0.030	0.03
November	85	19	41.8	.033	.04
December			136	.106	.12
January			196	.153	.18
February			56.4	.044	.05
March	3,520	94	1,260	.984	1.13
April	2,080	482	860	.672	.75
May	4,400	300	1,200	.938	1.08
June	7,600	464	3,050	2.38	2.66
July	1,320	185	476	.372	.43
August	418	59	175	.137	.16
September	329	54	126	.098	.11
The year	7,600		635	.496	6.74

EMBARRASS RIVER AT STE. MARIE, ILL.

LOCATION.—In sec. 30, T. 6 N., R. 14 W., at highway bridge at north end of Main Street, Ste. Marie, Jasper County, about 450 feet downstream from Cincinnati, Indianapolis & Western Railway bridge, and 2½ miles upstream from mouth of Hickory (or North Fork) Creek.

DRAINAGE AREA.—1,540 square miles.

RECORDS AVAILABLE.—October 20, 1909, to December 31, 1912; August 24, 1914, to September 30, 1917.

GAGE.—Standard chain gage attached to bridge; read by V. C. Wuerth.

DISCHARGE MEASUREMENTS.—Made from downstream side of highway bridge at ordinary stages; during high water made also from downstream side of five wooden trestles on Cincinnati, Indianapolis & Western Railway bridge, northwest of highway bridge.

CHANNEL AND CONTROL.—Measuring section is at a pool; control is about 1,800 feet below gage; may shift.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 21.2 feet at 8 a. m. June 6 (discharge, 14,000 second-feet); minimum stage recorded, 1.51 feet at 3 p. m. November 8 (discharge, 22 second-feet).

Flood of spring of 1908 reached a height of 22.5 feet on the present gage (discharge not determined). Minimum stage during periods of records, 1.1 feet September 5 to 9, 1914, and October 19, 1914 (discharge, 1.0 second-foot).

ACCURACY.—Stage-discharge relation probably permanent throughout the year; seriously affected by ice during the winter. Rating curve fairly-well defined between 35 and 5,030 second-feet; above 5,030 second-feet it is based on an extension of curve for main river channel and estimated overflow. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage heights to rating table. Records fair, except for extremely low stages, for highest stages in June and for periods of ice effect.

Discharge measurements of Embarrass River at Ste. Marie, Ill., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 18	G. J. Trinkaus	12.97	3,090	May 25	H. C. Beckman	15.68	4,420
18	do	12.89	3,040	June 23	do	6.67	847
21	do	9.08	1,720	Aug. 14	do	3.97	344
21	do	8.85	1,630				

Daily discharge, in second-feet, of Embarrass River at Ste. Marie, Ill., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	41	27	34			272	1,030	4,210	4,850	855	1,560	212
2	40	27	30			257	3,160	3,390	5,230	731	1,140	335
3	38	26	30	650		184	2,100	2,340	5,860	639	780	257
4	36	25	34			170	2,180	1,560	4,970	596	731	212
5	34	25	28			143	1,380	1,980	5,690	514	684	184
					115							
6	34	25	30	3,570		130	1,170	1,590	13,600	422	1,060	170
7	34	23	30	3,080		130	830	1,260	8,240	386	1,060	170
8	33	22	34	2,380		130	980	1,260	7,190	369	1,030	156
9	32	31	42	1,940		124	1,080	1,140	6,650	352	905	335
10	30	30	79	1,260		124	1,230	1,030	6,220	335	639	1,080
11	27	34		639		124	830	955	5,690	303	514	1,450
12	26	30		534		227	661	855	5,230	272	554	1,520
13	26	30		476		980	596	780	4,670	257	386	980
14	28	32				3,910	534	684	3,660	257	335	554
15	34	35				5,160	476	514	3,340	257	272	458
			45		80							
16	33	34				4,370	458	514	2,980	272	242	369
17	31	33				3,340	422	514	2,620	287	227	319
18	30	30				3,160	404	495	1,940	476	227	257
19	34	28				2,220	404	458	1,590	404	212	242
20	33	27				1,900	386	386	1,350	335	198	212
21	31	27			476	1,520	369	386	1,140	272	184	198
22	35	27		270	707	1,060	335	1,350	980	242	177	184
23	37	35			980	1,200	335	4,370	880	227	335	170
24	34	35			880	1,260	335	5,230	830	212	198	156
25	34	34			596	1,800	335	4,160	707	198	184	143
26	39	33	235		422	1,620	335	3,440	639	198	163	130
27	34	32			335	1,590	404	2,020	617	3,210	156	124
28	33	34			272	1,450	3,810	4,260	1,030	4,260	156	117
29	33	43			.....	980	3,860	5,160	955	2,340	156	117
30	30	38			.....	856	3,080	4,730	880	2,140	272	104
31	29	.....			.....	731	.....	3,960	.....	1,620	272	.....

NOTE.—Discharge interpolated for Oct. 3 and 4 and Mar. 30; estimated, because of ice, for Dec. 11 to Jan. 5 and Jan. 14 to Feb. 20, from gage heights, observer's notes and weather records. Braced figures show mean discharge for periods included.

Monthly discharge of Embarrass River at Ste. Marie, Ill., for the year ending Sept. 30, 1917.

[Drainage area, 1,540 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	41	26	33.0	0.021	0.02
November	43	22	30.4	.020	.02
December	.....	.....	102	.066	.08
January	3,570	.....	709	.460	.53
February	980	.....	236	.153	.16
March	5,160	124	1,330	.864	1.00
April	3,860	335	1,120	.727	.81
May	5,230	386	2,100	1.36	1.57
June	13,600	617	3,670	2.38	2.66
July	4,260	198	750	.487	.56
August	1,560	156	484	.314	.36
September	1,520	104	364	.236	.26
The year	13,600	.....	912	.592	8.03

WEST BRANCH OF WHITE RIVER NEAR NOBLESVILLE, IND.

LOCATION.—In sec. 16, T. 19 N., R. 5 E. At steel highway bridge known as Conners Bridge, about 4½ miles north of Noblesville, Hamilton County.

DRAINAGE AREA.—900 square miles (measured on 1,500,000 scale map).

RECORDS AVAILABLE.—May 13, 1915, to September 30, 1917.

GAGE.—Chain gage attached to upstream side of bridge; read by Marvin Scearce.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge or by wading.

CHANNEL AND CONTROL.—Coarse sand and gravel, strewn with boulders; probably permanent.

EXTREMES OF STAGE.—Maximum stage recorded during year, 10.1 feet at 4.35 p. m. March 14; minimum stage, 1.26 feet 4.10 p. m. October 12.

ICE.—Stage-discharge relation affected by ice during severe winters.

ACCURACY.—Stage-discharge relation probably permanent; probably affected by ice last part of December, middle of January and first half of February. Rating curve not determined. Gage read twice daily to hundredths. Station last visited on October 21, 1916.

COOPERATION.—Gage-height record furnished by Noblesville Heat, Light & Power Co., Noblesville, Ind.

No measurements made at this station by engineers of Survey during the year.

Daily gage height, in feet, of West Branch of White River near Noblesville, Ind., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.46	1.36	1.47	2.69	3.35	2.73	4.79	4.46	5.39	3.33	.....	1.55
2	1.45	1.36	1.48	2.51	3.56	2.55	5.47	5.38	4.36	3.70	.....	1.55
3	1.44	1.36	1.48	2.38	4.45	2.49	4.42	5.42	3.71	3.22	.....	1.57
4	1.42	1.36	1.47	2.35	.....	2.56	5.01	5.56	3.46	2.60	.....	1.55
5	1.39	1.36	1.50	2.75	4.17	2.57	5.22	5.78	4.11	2.22	1.63	1.54
6	1.35	1.36	1.51	7.12	.....	2.44	6.52	6.41	5.01	2.26	1.64	1.49
7	1.34	1.35	1.52	6.87	.....	2.28	7.17	4.71	5.61	2.30	1.63	1.50
8	1.34	1.30	1.51	5.27	.....	2.20	6.22	4.31	4.36	2.31	1.60	1.97
9	1.29	1.38	1.43	3.97	3.27	2.66	4.67	4.11	4.06	2.34	1.59	1.55
10	1.28	1.33	1.44	3.65	.....	3.25	3.62	3.72	5.58	2.46	1.49	1.57
11	1.28	1.29	1.48	3.35	.....	3.27	3.52	3.62	5.48	2.44	1.59	1.56
12	1.27	1.40	2.04	3.17	2.83	5.22	3.32	3.49	4.48	2.34	1.56	1.55
13	1.31	1.44	3.43	2.84	.....	6.77	3.07	3.31	3.74	2.41	1.56	1.57
14	1.35	1.42	2.63	2.56	.....	9.71	2.87	3.16	3.56	2.56	1.57	1.54
15	1.36	1.38	2.38	4.01	.....	8.87	2.79	2.80	3.24	4.61	1.59	1.54
16	1.34	1.38	2.39	6.03	2.81	6.22	2.74	2.72	3.01	4.36	1.58	1.54
17	1.34	1.35	2.52	.....	.....	4.47	2.61	2.65	2.90	4.01	1.54	1.43
18	1.36	1.38	2.39	.....	.....	4.37	2.76	2.58	2.70	3.96	1.51	1.37
19	1.41	2.70	2.34	5.19	2.83	4.07	3.37	2.50	2.60	3.16	1.49	1.37
20	1.50	2.70	2.10	.....	4.92	3.27	4.16	2.44	2.52	2.76	1.47	1.37
21	1.50	2.68	.....	5.99	5.47	3.72	3.92	2.48	2.54	2.62	1.47	1.36
22	1.52	3.06	2.98	5.48	5.17	3.72	3.72	2.76	2.45	2.33	1.50	1.39
23	1.44	5.56	3.33	5.97	3.31	3.77	3.42	3.51	2.42	2.20	1.47	1.41
24	1.45	4.43	.....	5.39	2.82	4.97	3.86	3.26	2.42	2.11	1.49	1.44
25	1.44	3.58	.....	4.83	2.71	5.22	4.46	3.01	2.36	2.07	1.47	1.39
26	1.40	1.37	2.92	4.29	2.61	4.52	5.06	2.84	2.37	2.71	1.47	1.38
27	1.36	1.38	.....	4.17	3.05	4.77	5.46	4.06	3.17	2.51	1.44	1.38
28	1.38	1.38	.....	3.55	2.98	4.87	4.76	4.56	4.61	2.34	1.41	1.38
29	1.36	1.37	2.76	3.47	.....	3.52	4.36	5.24	3.96	.....	1.44	1.37
30	1.36	1.48	.....	3.27	.....	3.57	3.86	5.65	3.60	.....	1.49	1.33
31	1.36	.....	2.92	3.29	.....	3.28	.....	5.84	.....	.....	1.53	.....

LITTLE WABASH RIVER AT WILCOX, ILL.

LOCATION.—In SW. ¼ sec. 3, T. 2 N., R. 8 E., at highway bridge at Wilcox, Clay County, about 6 miles southeast of Clay City and a quarter of a mile below mouth of Big Muddy Creek.

DRAINAGE AREA.—1,130 square miles.

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

GAGE.—Standard chain gage attached to bridge; read by Hugh Holman.

DISCHARGE MEASUREMENTS.—At ordinary stages made from downstream side of bridge, which is at a pool; during high water made also from bridge across drainage ditch and overflow section about half a mile east of the highway bridge.

CHANNEL AND CONTROL.—Heavy clay, probably permanent; control section is about 100 feet below the bridge. A determination by soundings August 22, 1914, indicates that there would be no flow past the gage if the stage were to fall to about 1.2 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year 22.2 feet at 5 a. m. June 8 (discharge, 6,290 second-feet); minimum stage, 1.88 feet October 12 and 13 (discharge, 6.6 second-feet).

1914–1917: Maximum stage prevailed August 22, 1915 (gage inaccessible, discharge estimated as 10,000 second-feet); minimum stage recorded, 1.70 feet August 23, 1914 (discharge, 4 second-feet).

ACCURACY.—Stage-discharge relation practically permanent; affected by ice during most of winter. Rating curve well defined between 63 and 420 second-feet, fairly well defined below 63 second-feet and between 420 and 3,360 second-feet, and poorly defined above 3,360 second-feet. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good except for very high stages and for periods affected by ice, for which they are poor.

Discharge measurements of Little Wabash River at Wilcox, Ill., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 11[a]	H. C. Beckman	11.88	1,060	Sept. 13	H. C. Beckman	2.98	58.5
12[a]	do	7.01	476	13	do	2.97	57.6
Mar. 19[a]	G. J. Trinkaus	8.24	641				

[a] Measurement made during rapidly falling stage.

Daily discharge, in second-feet, of Little Wabash River at Wilcox, Ill., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	8.0	13	22	280		172	1,260	4,350	3,580	103	128	22
2	8.0	13	22	232		161	3,060	4,420	4,000	103	94	19
3	8.0	12	21	172		134	3,880	4,490	4,070	84	103	18
4	7.6	12	21	156		103	3,940	4,210	4,000	113	60	24
5	7.4	10	22	2,000		89	3,110	4,070	3,880	60	49	24
6	7.4	10	20	3,820	230	71	1,840	3,700	4,070	52	46	22
7	7.0	10	20	4,350		71	1,220	2,290	5,490	41	38	49
8	8.0	9	26	4,350		60	1,080	1,180	6,290	46	35	49
9	7.6	12	49	4,000		60	1,380	597	5,260	41	84	19
10	7.0	16	60	3,580		56	1,770	452	5,050	35	683	43
11	7.0	14				56	2,100	405	4,840	35	532	26
12	6.6	13				98	1,480	405	4,490	35	184	19
13	6.6	14				791	614	452	4,070	32	108	134
14	8.6	16				2,200	390	452	3,760	32	71	46
15	9.0	15				3,580	308	319	2,470	30	56	34
16	9.0	14	60	385	35	4,070	256	232	1,160	30	46	26
17	9.0	14				3,880	220	196	548	32	41	21
18	31	14				2,660	184	184	361	32	35	18
19	16	16				1,140	172	150	347	38	32	16
20	14	15				436	232	128	232	35	30	15
21	15	15			150	319	737	118	208	280	38	13
22	13	15			631	256	375	128	184	184	26	12
23	14	18			532	232	220	1,680	161	84	24	12
24	15	21			256	256	161	3,160	139	52	22	10
25	13	18			256	361	134	3,820	128	43	19	12
26	13	16	270	300	172	347	113	3,360	113	38	19	10
27	12	16			347	347	108	3,360	103	71	60	9.0
28	12	18			196	244	881	2,380	89	46	41	8.6
29	12	18			.....	184	3,060	2,500	84	375	46	8.0
30	12	24			.....	156	3,940	2,860	80	500	29	7.4
31	12	.....			.....	134	.....	2,900	.....	220	24	.....

NOTE.—No gage height record for Nov. 13, 17, and 21, and Sept. 20 and 21; discharge interpolated. Discharge Dec. 11–31 and Jan. 11 to Feb. 20 estimated, because of ice, from gage heights, observer's notes, and weather records. Braced figures show mean discharge for periods included.

Monthly discharge of Little Wabash River at Wilcox, Ill., for the year ending Sept. 30, 1917.

[Drainage area, 1,130 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	31	6.6	10.8	0.0096	0.01
November	24	9.0	14.7	.013	.01
December	.....	.....	124	.110	.13
January	4,350	.....	971	.859	.99
February	.....	.....	185	.164	.17
March	4,070	56	733	.649	.75
April	3,940	108	1,270	1.12	1.25
May	4,490	118	1,900	1.68	1.94
June	6,290	80	2,310	2.04	2.28
July	500	30	93.6	.083	.10
August	683	19	90.4	.080	.09
September	134	7.4	24.9	.022	.02
The year	6,290	6.6	645	.571	7.74

SKILLET FORK AT WAYNE CITY, ILL.

LOCATION.—In sec. 18, T. 2 S., R. 6 E., at Southern Railway bridge 1 mile east of Wayne City, Wayne County, and about 4 miles below mouth of Horse Creek.

DRAINAGE AREA.—481 square miles.

RECORDS AVAILABLE.—August 16, 1908, to December 31, 1912; June 22, 1914, to September 30, 1917.

GAGE.—Standard chain gage attached to bridge; read by J. C. Taylor.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge; in high water also from downstream side of wooden trestle about 1 mile east of main channel. Low-water measurements made by wading below gage.

CHANNEL AND CONTROL.—Channel practically permanent; rough. Control is remains of rock dam at bridge section. A determination by leveling on August 20, 1914, indicated that there would be no flow past the gage if the stage fell to 1.6 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 21.3 feet at 8 a. m. January 6 (discharge, 8,600 second-feet); minimum stage, 2.00 feet October 10 to 14 and September 25 to 30 (discharge, 0.8 second-foot).

Maximum stage recorded during periods of records, 23.1 feet August 22, 1915 (discharge, 15,800 second-feet); zero flow existed for 54 days in September to December, inclusive, of 1908.

DIVERSIONS.—About 30,000 gallons of water per day are pumped from river above gage into service tank of Southern Railway.

ACCURACY.—Stage-discharge relation permanent; affected by ice during periods in winter. Rating curve fairly well defined between 15 and 5,000 second-feet, and poorly defined beyond these limits. Gage read to hundredths once daily. Daily discharge determined by applying daily gage height to rating table. Record good for medium stages; poor for very high stages and periods affected by ice. Determinations greater than 6,000 second-feet subject to considerable error because of poor definition and flatness of rating curve.

Discharge measurements of Skillet Fork at Wayne City, Ill., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 8	H. C. Beckman	20.20	4,180	Mar. 20	G. J. Trinkaus	3.99	123
13[a]	do	3.72	87	June 25	H. C. Beckman	2.43	11.6
Mar. 20	G. J. Trinkaus	4.04	126	25	do	2.43	12.4

[a] Ice along shores and some floating.

Daily discharge, in second feet, of Skillet Fork at Wayne City, Ill., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	26	13	13	155		37	1,940	3,410	3,290	5.5	7.5	7.5
2	15	11	11	147		30	3,950	3,530	3,410	5.5	5.5	5.5
3	14	8.7	11	275		30	3,950	3,100	3,670	5.5	4.2	5.5
4	9.5	8.7	8.3	564		30	3,600	1,490	3,410	4.2	3.0	5.5
5	9.5	8.7	8.3	5,400		30	2,210	1,270	2,740	4.2	3.0	5.5
					135							
6	6.7	8.7	8.3	8,600		26	1,700	980	5,400	4.2	3.0	2.2
7	5.5	8.7	8.3	6,200		22	752	487	5,800	4.2	3.0	2.2
8	5.5	8.7	88	4,200		22	770	230	3,950	3.0	2.2	22
9	4.2	23	881	3,670		15	2,420	170	3,810	3.0	2.2	37
10	.8	24	428	1,940		15	2,270	95	3,530	2.2	2.2	22
11	.8	24	283	538		15	1,670	84	2,600	2.2	1.5	9.5
12	.8	28	170			300	684	73	843	1.5	1.5	5.5
13	.8	28				2,090	327	62	260	1.5	1.5	4.2
14	.8	32				3,290	185	52	110	1.5	1.5	2.2
15	5.5	32				3,470	162	39	52	1.5	1.5	2.2
					4							
16	5.5	28		55		3,020	92	39	37	15	1.5	1.5
17	5.5	28				1,940	73	30	30	30	1.5	1.5
18	4.2	28				499	62	30	30	9.5	1.5	1.5
19	12	28				275	56	21	30	9.5	1.5	1.5
20	12	28	16			125	52	18	26	5.5	1.5	1.5
21	26	28		55	22	245	260	15	18	5.5	1.5	1.5
22	34	28		1,720	22	309	155	30	15	5.5	7.5	1.5
23	30	39		770	44	207	125	300	15	5.5	26	1.5
24	24	66		385	59	140	40	140	15	5.5	18	1.2
25	18	50		192	37	291	37	770	11	5.5	5.5	.8
26	18	31		162	37	140	30	185	9.5	3.0	3.0	.8
27	15	20	1,700	52	37	95	30	66	9.5	291	2.2	.8
28	15	20	2,740	80	37	88	44	76	9.5	475	1.5	.8
29	15	15	1,870	635	.....	44	2,540	1,600	9.5	200	22	.8
30	15	13	564	1,420	.....	37	2,940	1,670	7.5	30	40	.8
31	15	.....	192	1,370	.....	30	.....	1,620	.....	16	15	.....

NOTE.—Discharge Dec. 13–26, Jan. 12–21, and Feb. 1–20, estimated, because of ice, from gage heights, observer's notes, and weather records. Braced figures show mean discharge for periods included.

Monthly discharge of Skillet Fork at Wayne City, Ill., for the year ending Sept. 30, 1917.

[Drainage area, 481 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	34	0.8	11.9	0.025	0.03
November	66	8.7	23.1	.048	.05
December	881	.....	297	.617	.71
January	8,600	.....	1,260	2.62	3.02
February	.....	.....	60.2	.125	.13
March	3,470	15	545	1.13	1.30
April	3,950	30	1,100	2.29	2.56
May	3,530	15	699	1.45	1.67
June	5,800	7.5	1,440	2.99	3.34
July	475	1.5	37.5	.078	.09
August	40	1.5	6.23	.013	.01
September	37	.8	5.22	.011	.01
The year	8,600	.8	459	.954	12.92

CUMBERLAND RIVER BASIN.

CUMBERLAND RIVER AT CUMBERLAND FALLS, KY.

LOCATION.—At Cumberland Falls post office, Whitley County, about 400 feet above falls, 13 miles from Parkers Lake post office and Cumberland Falls railroad station, McCreary County, on Queen & Crescent Route.

DRAINAGE AREA.—2,040 square miles (measured on maps of Kentucky and Tennessee prepared by the United States Geological Survey on scale 1:500,000).

RECORDS AVAILABLE.—August 15, 1907, to December 10, 1911; April 1, 1915, to September 30, 1917.

GAGE.—Staff, inclined and vertical, on right bank, 400 feet above brink of falls, established April 3, 1915, and read by Alice Brunson. An inclined and vertical staff gage was established in August, 1907, by Viele, Blackwell & Buck, on right bank about 300 feet above site of Survey gage; this gage was read twice daily until March 18, 1911, and once daily from March 19 to December 10, 1911, by H. C. Brunson; nothing is left of it except the bench mark to which it was referred. A staff gage reading to about 6 feet was installed in 1914 on a large boulder in the river near the left bank, practically opposite the site of the gage established in August, 1907; no readings of this gage are available.

DISCHARGE MEASUREMENTS.—Made from cable about 600 feet above gage. A reference gage on left bank near cable is used to determine depths when soundings can not be made.

CHANNEL AND CONTROL.—Solid rock; permanent. At high stages the edge of the falls serve as control, there being a vertical drop of about 68 feet at the falls at low water.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.66 feet at 5.30 p. m. March 4 (discharge, 47,000 second-feet); minimum, 1.22 feet at time of measurement on July 14 (discharge, 78 second-feet).

Highest known stage corresponds to about 12 feet on Survey gage; lowest stage, according to Wm. Taylor, a local resident in September, 1916, occurred in 1902, when entire flow of river was confined in a channel 7 feet wide, 1 foot deep, flowing fast; under these conditions the discharge would probably be about 30 second-feet.

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

REGULATION.—Low-water flow may be affected to a small extent by operation of power plant at Williamsburg, about 25 miles above the station.

ACCURACY.—Stage-discharge relation permanent. Rating curve used for 1917 well defined. Gage read to hundredths twice daily in 1917. Daily discharge from August 15, 1907, to December 10, 1911, is obtained from gage readings of the gage established by Viele, Blackwell & Buck. The rating curve is based on discharge measurements during 1907 and the relation between the old gage and the present gage as determined in 1916 and 1917 by the Geological Survey. It is considered fairly well defined. Daily discharge ascertained by applying mean daily gage height or daily gage height to rating tables except as noted. Records for 1907 to 1911 are considered good; results for 1917 are excellent.

COOPERATION.—Station maintained in cooperation with the Kentucky Geological Survey, J. B. Hoeing, State geologist.

Discharge measurements of Cumberland River at Cumberland Falls, Ky., during the years ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec.-ft.*
Jan. 7	B. E. Jones	8.85	34,100	Mar. 15	L. M. Sellier	4.82	10,700
8	do	8.25	29,700	July 13	B. E. Jones	1.23	80
Mar. 14	L. M. Sellier	5.82	14,200	14	do	1.22	78
15	do	5.03	10,700				

Daily discharge, in second-feet, of Cumberland River at Cumberland Falls, Ky., for the years ending Sept. 30, 1907–1912.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1907								
1		227	11		6,710	21	1,200	748
2		219	12		11,400	22	1,200	1,730
3		650	13		6,710	23	1,110	5,740
4		2,040	14		3,970	24	3,190	4,830
5		2,150	15	219	2,040	25	2,950	2,950
6		1,730	16	212	1,280	26	1,540	2,150
7		1,110	17	251	982	27	1,630	1,360
8		918	18	300	734	28	1,630	982
9		2,950	19	460	624	29	1,200	720
10		3,440	20	1,200	508	30	380	572
						31	300	

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1907–8.												
1	472	186	1,830	11,800	5,740	7,400	12,300	3,700	982	219	320	166
2	412	284	1,540	6,380	9,700	19,200	18,100	3,440	870	243	320	148
3	360	380	1,360	4,250	8,510	18,600	19,200	3,440	950	235	277	132
4	350	2,830	1,280	4,250	5,430	17,500	17,500	3,700	1,280	219	268	111
5	350	2,480	1,110	9,300	4,830	8,130	12,800	3,970	1,200	219	260	142
6	496	1,630	1,010	12,300	6,710	6,710	6,710	6,710	982	235	251	1,280
7	870	1,280	886	9,300	12,800	8,510	5,430	7,760	902	822	243	3,190
8	1,280	1,010	762	6,710	10,500	7,400	4,540	8,130	822	1,830	235	2,480
9	2,040	1,450	637	4,540	7,760	6,380	3,700	8,130	790	3,190	219	1,450
10	2,600	5,430	650	3,440	6,060	5,130	3,190	6,380	678	2,150	206	1,030
11	2,040	12,300	650	2,830	22,100	5,430	3,190	4,830	520	1,450	776	720
12	1,360	12,300	762	4,540	19,200	7,050	3,190	3,700	380	1,110	624	496
13	1,030	5,430	854	6,710	10,500	6,060	3,190	3,190	310	822	496	320
14	762	3,190	886	7,760	7,400	9,700	3,190	2,600	277	650	380	206
15	598	2,830	998	6,060	25,000	7,760	3,190	3,970	243	624	340	166
16	496	2,260	1,280	4,830	22,100	5,430	5,130	3,700	212	870	300	137
17	412	1,630	1,450	6,060	17,500	5,430	5,430	3,190	193	2,370	268	121
18	360	1,730	1,730	7,050	7,400	9,700	4,540	2,480	166	2,040	251	111
19	310	2,260	1,830	5,430	5,130	19,200	3,700	1,730	153	982	219	100
20	268	3,190	1,630	3,970	4,250	17,500	3,440	1,940	142	4,830	179	92
21	251	3,440	1,540	3,440	3,700	11,400	3,190	1,830	132	2,950	193	92
22	219	3,440	1,630	2,710	3,190	8,130	2,710	1,630	121	1,540	227	84
23	212	4,830	1,730	2,480	2,710	6,710	2,260	1,450	111	1,280	235	84
24	212	11,800	1,630	2,260	2,600	5,740	2,040	1,280	100	1,050	219	76
25	186	16,400	3,700	2,040	2,480	5,430	5,740	1,110	121	734	206	68
26	179	10,500	3,700	1,830	2,260	4,830	19,200	982	520	533	193	60
27	160	5,130	3,190	2,040	2,710	4,250	17,000	950	678	380	251	60
28	153	3,700	2,710	2,260	4,540	3,700	11,400	950	546	310	251	60
29	153	2,950	2,480	2,150	4,540	3,700	6,710	950	400	277	219	64
30	153	2,150	7,760	2,040	.....	4,250	4,540	1,080	235	251	206	58
31	179	.....	16,400	2,480	.....	6,060	.....	1,110	.....	268	173	.....

Daily discharge, in second-feet, of Cumberland River at Cumberland Falls, Ky., for the years ending Sept. 30, 1907–1912—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1908–9.												
1	58	84	193	3,190	1,940	5,130	9,700	10,500	870	5,130	400	153
2	58	92	219	3,190	1,630	3,970	7,400	22,100	982	7,400	822	153
3	55	100	320	2,950	1,630	3,440	4,830	12,300	1,280	6,380	1,630	148
4	55	100	762	2,950	1,540	2,950	3,190	7,400	2,260	4,250	1,940	142
5	55	92	918	3,190	1,730	2,710	2,710	6,060	3,700	2,950	2,480	142
6	55	88	918	3,700	4,250	3,440	2,480	5,130	4,250	2,040	2,150	132
7	55	84	1,080	3,700	8,900	6,710	3,970	3,970	3,440	3,700	1,450	132
8	60	80	1,280	3,700	9,300	11,400	8,130	3,190	2,950	7,400	886	126
9	96	80	2,370	3,440	7,050	22,100	7,760	2,480	2,260	11,800	472	126
10	96	96	2,370	3,190	9,700	28,000	6,380	2,040	2,040	10,500	400	132
11	92	260	1,730	3,190	17,500	25,000	5,430	2,480	3,700	6,710	424	148
12	92	227	1,540	2,950	13,800	13,800	4,250	2,830	7,050	5,430	533	142
13	92	585	4,250	3,190	8,130	13,300	3,190	3,190	7,400	6,710	637	153
14	96	822	3,700	6,060	6,710	12,800	2,950	2,600	6,710	19,200	664	179
15	76	678	2,830	12,300	6,710	11,800	2,710	2,150	7,760	13,800	706	206
16	60	496	2,040	25,000	12,300	8,130	2,950	1,730	8,900	10,500	2,710	235
17	60	380	1,830	21,500	22,100	6,060	4,250	1,450	8,900	8,130	19,200	251
18	60	284	1,730	17,500	18,100	4,830	6,060	1,280	7,760	6,060	9,300	260
19	64	235	1,630	12,800	11,000	3,700	8,900	1,030	6,380	4,540	3,700	227
20	60	219	1,540	6,710	7,050	3,970	11,800	1,020	5,130	3,190	2,480	206
21	60	206	1,360	3,970	7,050	6,710	22,100	1,000	3,970	2,040	1,540	193
22	58	206	1,280	3,190	9,700	7,400	17,500	993	2,480	1,450	934	179
23	55	193	2,480	2,950	12,800	6,710	12,800	981	1,830	1,010	484	179
24	55	193	7,050	2,710	22,100	6,710	10,100	968	2,370	598	380	173
25	55	186	7,050	2,480	37,600	22,100	8,130	956	2,950	380	320	166
26	55	179	6,060	2,260	23,900	19,800	6,380	940	3,970	330	284	160
27	55	179	5,130	2,040	11,400	17,500	6,380	932	7,400	300	235	153
28	58	166	3,700	2,040	7,400	15,300	4,830	919	8,130	284	212	148
29	60	166	2,950	2,370	.....	14,300	3,700	907	6,380	268	206	142
30	68	153	2,950	2,260	.....	11,800	3,440	894	4,250	251	179	137
31	76	.....	3,190	2,150	.....	.....	.....	882	.....	227	166	.....
1909–10.												
1	137	166	268	520	2,710	4,250	734	6,710	4,250	902	3,440	193
2	132	153	320	508	2,600	8,510	692	4,250	3,970	918	2,830	300
3	126	148	460	496	2,370	7,760	734	3,700	2,700	1,080	2,040	496
4	121	142	637	496	2,150	6,060	870	3,440	3,440	1,110	2,710	918
5	121	142	902	692	2,040	5,430	1,010	3,190	3,190	1,280	3,700	3,190
6	111	132	1,080	2,480	1,830	4,540	998	3,700	2,950	1,730	4,250	2,950
7	111	132	1,280	8,900	1,630	3,700	918	4,250	2,950	2,260	4,830	2,950
8	100	132	1,280	31,200	1,450	2,950	822	4,540	2,710	2,260	6,060	3,440
9	100	142	1,360	10,500	1,280	2,480	748	5,740	2,710	7,400	5,740	3,970
10	105	153	1,450	7,760	1,280	2,150	706	8,900	2,600	6,710	4,540	6,710
11	111	153	1,450	6,060	1,280	1,940	678	11,800	5,430	6,060	3,700	6,060
12	121	148	1,360	5,130	1,540	1,830	762	13,800	8,130	5,430	3,440	5,430
13	132	142	1,280	4,250	1,830	1,730	950	13,300	6,710	5,130	2,830	5,130
14	148	142	1,110	3,190	2,040	1,730	1,280	10,500	6,380	4,830	2,370	4,830
15	166	132	1,080	2,710	2,260	1,630	1,450	8,130	5,740	4,540	1,830	3,970
16	179	132	1,010	2,600	2,600	1,630	1,630	6,380	5,430	4,540	1,360	6,060
17	206	142	950	3,190	3,440	1,540	3,190	4,830	4,540	6,380	1,080	2,600
18	227	166	886	4,250	22,100	1,450	7,050	3,700	3,970	8,130	886	2,260
19	251	251	854	6,710	16,400	1,450	8,130	3,190	2,950	7,760	678	1,830
20	251	484	790	11,000	13,300	1,360	7,760	2,830	2,260	6,380	572	1,540
21	243	572	734	12,800	11,400	1,280	7,050	2,830	1,730	5,430	546	1,440
22	235	533	706	10,500	9,300	1,280	6,710	3,190	1,540	4,830	496	1,340
23	227	496	692	7,760	7,400	1,110	7,400	3,440	1,280	3,970	472	1,240
24	219	533	678	6,380	6,710	1,090	8,510	4,250	1,540	3,440	436	1,140
25	219	572	650	6,060	5,740	1,030	9,700	10,100	1,200	2,710	390	1,040
26	206	472	624	5,430	4,830	966	10,500	13,300	1,200	1,830	360	940
27	199	360	598	5,130	4,250	918	11,400	11,800	1,450	2,040	320	840
28	193	424	598	4,250	3,700	854	11,800	10,500	1,280	1,940	284	740
29	186	340	572	3,700	.....	822	11,400	8,130	1,080	2,040	251	640
30	179	268	546	3,190	.....	776	9,700	6,380	982	6,710	212	540
31	166	.....	533	2,950	.....	748	.....	4,540	.....	4,830	193	.....

Daily discharge, in second-feet, of Cumberland River at Cumberland Falls, Ky., for the years ending Sept. 30, 1907–1912—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1910–11.												
1	472	193	3,190	6,710	8,510	2,370	3,190	47,600	460	1,940	284	160
2	412	235	2,710	22,100	8,130	2,260	3,190	28,000	300	1,630	277	142
3	370	277	2,370	34,400	7,400	2,260	2,950	12,800	219	1,360	350	126
4	320	300	1,940	25,000	6,710	2,040	2,950	9,300	206	1,110	790	111
5	284	260	1,540	17,000	7,400	1,830	28,000	7,400	193	982	1,110	153
6	360	219	2,260	9,700	8,510	4,250	44,300	5,430	206	950	870	350
7	624	206	3,700	8,130	10,500	19,200	26,200	3,440	219	1,110	692	330
8	1,940	199	7,400	6,380	16,400	37,600	11,400	3,190	243	1,280	520	310
9	1,730	193	5,430	5,130	28,000	28,600	10,100	2,950	260	1,110	350	277
10	1,360	206	3,440	3,970	11,000	19,800	8,510	2,600	268	982	284	260
11	950	212	2,830	3,190	8,900	11,800	7,400	2,260	219	918	260	243
12	734	206	2,480	2,950	7,400	7,400	6,060	1,630	199	950	350	219
13	664	193	2,150	2,830	6,710	5,740	5,430	2,040	186	1,280	650	199
14	598	186	1,630	2,710	5,430	5,740	7,050	2,150	166	1,450	1,630	320
15	533	179	1,200	2,600	3,700	5,430	11,400	1,830	153	1,280	2,370	360
16	472	179	1,050	2,600	3,190	5,130	22,100	1,730	153	1,630	2,480	400
17	424	166	918	2,480	3,440	4,540	12,300	1,630	186	1,280	2,260	380
18	360	166	838	2,370	4,540	4,250	9,700	1,540	219	1,110	1,940	320
19	300	153	734	2,260	5,130	3,970	6,710	1,450	260	1,110	1,630	300
20	260	153	664	2,260	5,740	3,700	6,060	1,360	300	1,050	1,280	284
21	219	160	706	2,950	5,130	3,700	5,430	1,280	790	950	1,280	300
22	212	166	918	4,540	4,250	3,440	4,830	1,200	950	838	1,110	400
23	206	166	1,200	7,050	3,700	3,190	4,250	1,360	1,110	790	918	496
24	206	153	1,450	11,000	3,190	3,190	3,700	1,540	870	748	520	585
25	235	153	1,540	8,900	2,950	2,830	3,700	1,450	790	720	350	790
26	251	148	1,830	7,050	2,600	2,950	3,190	1,360	720	650	320	650
27	235	160	2,040	6,060	2,600	3,190	2,710	1,280	650	520	284	546
28	219	179	2,260	4,830	2,480	3,190	2,260	1,030	2,480	424	251	460
29	206	2,040	2,600	5,130	.....	3,440	2,040	918	2,040	390	227	400
30	193	3,440	3,190	7,050	.....	3,700	9,300	762	2,950	350	206	320
31	179	.....	4,250	8,510	.....	3,190	.....	585	.....	320	186	.....

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1911.											
1	284	380	1,730	11	520	1,630	.....	21	3,190	3,440	.....
2	260	350	1,450	12	4,830	1,540	.....	22	1,940	3,190	.....
3	219	320	1,280	13	4,250	1,730	.....	23	1,110	3,190	.....
4	186	284	1,110	14	3,700	7,050	.....	24	870	3,190	.....
5	219	227	950	15	2,710	4,830	.....	25	720	2,830	.....
6	260	199	790	16	2,260	4,250	.....	26	624	2,710	.....
7	235	624	650	17	1,830	3,190	.....	27	520	2,600	.....
8	219	2,950	624	18	2,260	2,710	.....	28	496	2,370	.....
9	243	2,480	585	19	7,050	2,830	.....	29	484	2,260	.....
10	300	1,940	546	20	4,250	3,700	.....	30	448	1,940	.....
								31	412	.....	.....

Daily discharge, in second-feet, of Cumberland River at Cumberland Falls, Ky., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	153	275	578	4,760	7,260	9,930	3,850	2,440	770	428	954	1,460
2	513	259	604	2,920	7,260	24,900	4,450	2,110	1,090	630	714	1,890
3	338	259	476	4,760	7,260	40,700	5,410	1,780	1,200	428	890	1,560
4	243	243	440	24,200	4,760	45,600	5,080	1,360	1,020	338	1,000	1,180
5	195	227	452	37,200	3,570	44,200	4,760	1,360	890	306	830	954
6	167	211	464	37,200	2,800	37,900	7,680	1,200	800	275	700	770
7	153	203	464	34,400	2,330	28,800	11,400	1,090	714	243	500	604
8	139	195	452	29,500	2,440	14,000	9,930	1,060	742	227	404	488
9	125	188	452	15,600	2,560	6,100	6,860	1,020	860	211	380	404
10	115	181	428	4,760	2,110	5,750	5,080	1,000	1,000	195	686	338
11	105	174	416	3,180	2,000	4,760	3,850	988	920	181	920	296
12	100	167	552	2,560	1,780	10,900	3,300	954	905	167	1,070	259
13	211	167	552	2,110	1,670	24,200	3,050	1,090	830	153	845	235
14	211	195	552	3,300	1,360	15,600	2,800	1,130	800	139	604	211
15	174	211	513	7,260	1,890	10,400	2,560	988	728	160	552	195
16	153	211	452	8,550	3,180	7,680	2,440	830	630	1,780	2,800	167
17	167	211	380	5,750	3,850	29,500	2,220	658	500	4,450	3,850	153
18	714	195	348	4,450	3,570	32,300	2,110	578	440	5,750	2,440	139
19	1,780	188	380	4,760	3,850	26,200	1,780	452	714	4,450	1,460	125
20	1,890	181	404	5,080	15,600	15,600	1,670	686	742	3,850	1,020	115
21	3,570	174	464	4,760	23,000	6,860	1,460	578	686	2,560	770	105
22	2,680	181	1,090	14,000	21,000	6,860	1,360	658	742	2,680	604	95
23	1,780	203	3,850	19,800	11,900	6,100	1,180	617	428	3,180	1,000	90
24	1,200	219	5,080	15,600	16,200	21,000	1,070	890	728	3,180	1,090	85
25	860	211	3,300	7,680	18,000	24,200	971	988	672	3,300	2,560	85
26	644	526	2,330	4,450	14,000	22,300	860	890	630	4,150	1,460	115
27	513	714	1,780	3,300	7,680	15,600	770	604	604	3,300	954	380
28	428	714	9,930	2,800	5,410	12,400	714	500	591	3,850	672	488
29	370	644	24,200	2,800	.....	10,900	1,140	604	714	2,920	526	770
30	338	552	22,300	7,680	.....	7,680	1,890	1,130	476	2,000	428	770
31	296	.....	15,000	7,680	.....	4,760	.....	1,020	.....	1,360	526	.....

NOTE.—On the following days the water was over the top of the gage and the gage height was estimated by comparison with the U. S. Weather Bureau readings at Burnside; determinations for single days are subject to considerable error, but the effect on the monthly mean would not be great: 1908, Feb. 11–12, 15–17, Mar, 2–4, 19–20, Apr. 2–4, 26–27; 1909, Jan. 16–18, Feb. 11, 17–18, 24–26, Mar. 9–11, 25–27, Apr. 21–22, May 2, July 14, Aug. 17; 1910, Jan. 8, Feb. 18–19; 1911, Jan. 2–5, Feb. 8–9, Mar. 7–10, Apr. 5–7, 16, May 1–2.

Monthly discharge of Cumberland River at Cumberland Falls, Ky., for years ending Sept. 30, 1907–1912, and 1917.

[Drainage area, 2,040 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1907.					
August 15–31	3,190	212	1,120	0.549	0.35
September	11,400	219	2,410	1.18	1.32
1907–1908.					
October	2,600	153	610	.299	.34
November	16,400	186	4,280	2.10	2.34
December	16,400	637	2,250	1.10	1.27
January	12,300	1,830	4,940	2.42	2.79
February	25,000	2,260	8,530	4.18	4.51
March	19,200	3,700	8,470	4.15	4.78
April	19,200	2,040	7,220	3.54	3.95
May	8,130	950	3,230	1.58	1.82
June	1,280	100	501	.246	.27
July	4,830	219	1,120	.549	.63
August	776	173	284	.139	.16
September	3,190	58	443	.217	.24
The year	25,000	58	3,470	1.70	23.10

Monthly discharge of Cumberland River at Cumberland Falls, Ky., for years ending Sept. 30, 1907–1912, and 1917—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1908–9.					
October	96	55	66.1	0.032	0.04
November	822	80	230	.113	.13
December	7,050	193	2,470	1.21	1.40
January	25,000	2,040	5,570	2.73	3.15
February	37,600	1,540	10,800	5.29	5.51
March	28,000	2,710	10,700	5.25	5.86
April	22,100	2,480	6,810	3.34	3.73
May	22,100	882	3,400	1.67	1.92
June	8,900	870	4,580	2.25	2.51
July	19,200	227	4,930	2.42	2.79
August	19,200	166	1,870	.917	1.06
September	260	126	167	.082	.09
The year	37,600	55	4,240	2.08	28.19
1909–10.					
October	251	100	169	.083	.10
November	572	132	263	.129	.14
December	1,450	268	863	.423	.49
January	31,200	496	5,830	2.86	3.30
February	22,100	1,280	4,980	2.44	2.54
March	8,510	748	2,420	1.19	1.37
April	11,800	678	4,510	2.21	2.47
May	13,800	2,830	6,620	3.25	3.75
June	8,130	982	3,240	1.59	1.77
July	8,130	902	4,020	1.97	2.27
August	6,060	193	2,030	.995	1.15
September	6,710	193	2,490	1.22	1.36
The year	31,200	100	3,110	1.52	20.71
1910–11.					
October	1,940	179	501	.246	.28
November	3,440	148	362	.177	.20
December	7,400	664	2,270	1.11	1.28
January	34,400	2,260	7,670	3.76	4.34
February	28,000	2,480	6,920	3.39	3.53
March	37,600	1,830	6,900	3.38	3.90
April	44,300	2,040	9,210	4.51	5.03
May	47,600	585	4,940	2.42	2.79
June	2,950	153	599	.294	.33
July	1,940	320	1,010	.495	.57
August	2,480	186	840	.412	.48
September	790	111	340	.167	.19
The year	47,600	111	3,440	.169	22.92
1911.					
October	7,050	186	1,510	.740	.85
November	7,050	199	2,360	1.16	1.29
December 1–10	1,730	546	972	.476	.18
1916–17.					
October	3,570	100	656	.322	.37
November	714	167	276	.135	.15
December	24,200	348	3,180	1.56	1.80
January	37,200	2,110	10,700	5.25	6.05
February	23,000	1,360	7,080	3.47	3.61
March	45,600	4,760	18,500	9.07	10.46
April	11,400	714	3,390	1.66	1.85
May	2,440	452	1,010	.495	.57
June	1,200	428	752	.369	.41
July	5,750	139	1,830	.897	1.03
August	3,850	380	1,070	.525	.61
September	1,890	85	484	.237	.26
The year	45,600	85	4,090	2.00	27.17

CUMBERLAND RIVER AT BURNSIDE, KY.

LOCATION.—Below mouth of South Fork of Cumberland River, at Burnside, Pulaski County.

DRAINAGE AREA.—4,890 square miles (measured on maps of Kentucky and Tennessee, prepared by United States Geological Survey on scale 1 : 500,000).

RECORDS AVAILABLE.—October 1, 1914, to September 30, 1917.

GAGE.—Vertical staff in two sections on piers of toll bridge across South Fork of Cumberland River about 700 feet above mouth; installed in July, 1914, by United States Weather Bureau. Readings on this gage by the Weather Bureau began January 1, 1915. Sea-level elevation of zero, 589.53 feet (Smith Shoals Survey datum, United States Engineer Corps), this datum being same as that of gage which was marked on the rails of inclines 1 and 2 leading from the South Fork to the warehouse, about 500 feet below the present gage, and which was established in 1884 and read daily until January 1, 1915. Upper part of old gage, reading from 54 to 71 feet, was spiked to office of Col. Cole. The United States Weather Bureau[1] reports that "the old river gage was changed on several unknown dates and by amounts that are uncertain, so that readings prior to January 1, 1915, are not comparable by from 0.1 to 0.7 foot." New gage is read for the United States Geological Survey by L. M. Cheeley.

DISCHARGE MEASUREMENTS.—Flow of South Fork is measured from the highway bridge; the Cumberland above the South Fork is measured from a boat, from the Queen & Crescent Railroad bridge, or by means of floats, the method used depending on the stage: flow below the South Fork is the combined flow of both streams.

CHANNEL AND CONTROL.—Channel considered permanent except for deposits of mud, which are washed away at high stages. Low-water control is crest of dam No. 21, 28 miles below Burnside; gage height of crest of dam, 1.47 feet. The dam is a recently built concrete structure, and probably little or no water leaks through dam or lock.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 51.4 feet at 4 p. m. January 5 (discharge, roughly, 115,000 second-feet); minimum, 1.97 feet, July 13 and 14, due to lowering of pool to flood steamer off bar below lock.

Maximum stage recorded, 62 feet March 31, 1886; minimum, —1.6 feet November 8 and 9, 1895; at present lowest stage possible is 1.47 feet, unless pool No. 21 is lowered.

ICE.—Stage-discharge relation seldom affected by ice.

REGULATION.—Stage at low water will be affected by any manipulation of the level of pool No. 21 at the lock.

ACCURACY.—Stage-discharge relation practically permanent; not materially affected by ice during 1915, 1916, and 1917. Rating curve fairly well defined to 30,000 second-feet (gage height approximately, 20 feet); curves extend above 30,000 second-feet and may be considerably in error. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height or daily gage height to rating table. Gage readings October 1, 1914, to February 18, 1915, obtained from gage readings at Lock No. 21, and the Weather Bureau's old and new gages. At low-water stage discharge relation may be affected by water entering between the gage and the dam due to heavy local showers in the basins of the small intervening tributaries. Results are good for discharge less than 30,000 second-feet.

COOPERATION.—Station maintained in cooperation with the Kentucky Geological Survey, J. B. Hoeing, State geologist.

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[1] Daily river stages, pt. 12, p. 29.

Discharge measurements of Cumberland River at Burnside, Ky., during the year ending Sept. 30, 1917.

]Made by B. E. Jones.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Jan. 10	11.94	12,400
11	8.63	8,380
July 13	1.95	270

Daily discharge in second-feet, of Cumberland River at Burnside, Ky., for the years ending Sept. 30, 1915-1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1914–15.												
1	510	1,230	1,230	28,500	23,000	2,580	5,570	1,890	7,820	6,500	900	5,920
2	350	1,230	1,450	17,900	74,000	2,350	5,000	1,670	6,620	7,260	955	4,420
3	350	1,010	1,450	10,900	50,700	2,240	4,420	1,890	7,260	5,460	1,230	3,380
4	350	800	2,580	7,960	29,400	2,120	4,080	4,300	10,100	5,000	2,350	2,700
5	280	700	7,540	6,380	19,700	2,460	3,730	6,260	6,870	11,800	2,580	3,040
6	280	700	24,800	5,340	19,900	5,460	3,380	5,220	5,110	13,900	2,000	5,460
7	150	700	19,700	9,300	17,600	7,820	3,160	4,190	5,000	10,400	1,450	6,870
8	150	700	11,300	18,500	13,200	7,000	2,920	3,620	10,400	7,680	1,120	5,110
9	150	700	6,030	17,800	10,400	5,920	2,810	3,270	10,500	5,920	1,010	4,080
10	280	700	5,680	12,700	8,400	5,220	2,580	2,920	7,960	4,880	1,120	3,160
11	510	700	4,540	9,300	7,000	4,650	2,920	2,460	5,570	4,880	1,560	2,580
12	1,010	700	3,730	22,200	5,800	4,190	3,500	2,120	4,190	7,820	6,030	2,120
13	1,450	700	3,500	48,600	5,340	3,730	4,420	1,890	3,500	14,100	5,680	1,780
14	3,960	700	3,380	32,400	4,650	3,380	4,300	1,670	3,160	31,000	5,220	1,450
15	6,260	700	3,160	21,100	4,650	3,160	3,960	1,560	4,300	23,000	4,650	1,230
16	47,300	700	2,920	14,600	4,650	3,380	3,500	2,450	11,300	13,000	4,880	1,120
17	29,600	700	2,580	11,800	5,110	4,650	3,160	1,230	15,000	7,960	3,730	955
18	15,900	700	2,350	14,500	4,650	6,380	2,920	1,060	9,600	6,030	5,220	900
19	15,500	700	2,700	55,600	4,650	9,450	2,700	955	6,740	4,650	9,900	850
20	10,200	700	4,760	46,000	4,300	17,600	2,460	850	5,680	4,080	7,960	700
21	6,030	510	29,400	28,100	3,960	19,500	2,350	900	7,540	10,200	7,820	1,010
22	4,880	510	34,100	17,000	3,730	15,900	2,120	900	11,500	9,000	8,550	1,340
23	3,380	510	22,400	11,800	3,500	12,900	2,120	2,120	9,300	6,030	6,380	2,000
24	3,160	510	15,400	14,300	3,270	11,700	1,890	10,200	6,500	4,190	4,420	1,780
25	2,700	510	11,000	16,300	3,160	11,500	1,780	7,400	4,650	3,040	3,270	1,400
26	2,580	510	38,200	17,800	3,040	11,500	1,670	5,570	3,380	2,240	2,460	1,180
27	2,350	510	28,100	18,700	2,920	10,200	1,670	13,900	2,700	1,780	2,120	1,010
28	2,120	510	16,600	15,700	2,700	9,750	1,670	22,000	2,000	1,450	11,300	850
29	1,780	510	12,700	13,600	.....	8,850	1,670	19,300	2,240	1,180	16,300	800
30	1,450	1,010	48,600	9,600	.....	7,260	1,890	16,100	3,160	1,060	11,500	3,160
31	1,230	.....	46,500	9,000	.....	6,140	.....	9,300	.....	955	8,250	.....

Daily discharge in second-feet, of Cumberland River at Burnside, Ky., for the years ending Sept. 30, 1915–1917—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915–16.												
1	22,800	1,560	6,380	35,300	11,000	6,030	9,900	3,960	11,000	1,060	1,890	750
2	34,800	1,450	5,570	36,500	18,300	7,820	8,250	3,620	6,740	900	1,340	900
3	22,600	1,400	5,110	37,200	18,900	14,300	7,000	3,380	4,650	750	2,460	850
4	14,500	1,280	4,650	25,900	15,000	15,700	6,260	4,540	3,620	660	2,920	800
5	12,400	1,280	4,420	17,800	12,000	13,600	5,680	6,620	2,810	650	4,650	955
6	17,400	1,120	3,840	14,300	10,900	11,200	5,000	5,460	2,460	573	3,620	955
7	12,000	1,060	3,500	25,700	10,900	11,500	4,420	4,540	3,270	555	3,730	850
8	8,100	1,060	3,160	68,900	10,400	17,900	7,260	3,730	5,460	537	7,260	750
9	5,920	1,060	2,920	47,000	10,400	18,400	15,500	3,270	5,460	600	9,150	650
10	4,650	1,890	2,810	29,000	15,700	15,000	16,100	2,810	4,420	1,400	7,680	630
11	3,500	2,120	2,700	20,300	18,100	11,200	13,600	2,460	3,620	4,190	4,650	650
12	3,040	2,000	3,730	32,700	16,100	9,000	10,700	2,120	3,620	3,620	3,960	564
13	2,580	3,500	5,460	44,200	13,000	7,000	9,000	1,890	7,540	3,960	7,540	650
14	2,240	8,700	6,260	56,000	10,500	6,260	7,680	1,670	7,260	3,270	6,030	800
15	2,000	82,800	6,260	32,400	8,100	5,680	6,620	1,560	5,680	2,460	5,800	800
16	1,890	86,700	18,300	19,900	6,870	5,680	5,920	1,670	4,880	2,120	10,500	670
17	1,780	46,000	61,900	14,600	6,260	5,460	5,920	1,670	4,760	2,000	13,000	630
18	1,780	22,200	105,000	11,200	5,800	5,000	4,760	1,450	5,220	2,580	9,300	1,400
19	3,040	26,500	99,500	8,550	5,460	4,760	4,300	1,280	4,760	3,270	6,870	1,120
20	22,200	35,300	71,500	7,400	4,880	4,420	3,840	1,120	3,960	5,570	5,220	850
21	13,600	23,500	46,000	7,260	4,420	4,300	3,500	1,060	3,380	8,250	3,730	630
22	7,540	16,100	27,400	10,900	3,960	4,420	3,500	1,060	2,810	11,200	2,810	454
23	5,340	11,000	13,200	31,700	3,840	4,190	3,620	1,120	2,460	11,200	2,350	630
24	4,300	8,250	8,400	30,800	4,190	3,960	3,620	1,280	2,000	6,870	2,000	528
25	3,380	6,620	7,960	20,700	5,800	3,730	3,730	1,780	1,670	4,540	1,670	502
26	2,920	5,570	11,500	14,300	6,870	3,730	3,620	1,780	1,560	3,500	1,670	470
27	2,460	5,110	17,900	10,900	7,260	5,800	3,620	1,780	1,450	3,040	1,400	406
28	2,240	5,920	19,500	8,550	7,260	14,300	3,840	1,670	1,340	2,810	1,230	398
29	2,000	8,700	48,600	7,820	6,500	20,300	3,960	1,280	1,280	1,890	1,060	1,010
30	1,890	7,540	77,700	8,250	.....	16,300	3,960	4,300	1,230	1,560	1,010	750
31	1,780	.....	50,700	7,820	.....	12,400	.....	20,900	.....	2,350	750	.....
1916–17.												
1	600	850	1,340	14,500	21,100	21,500	9,300	4,650	2,700	750	3,160	1,120
2	555	800	1,230	7,960	22,400	51,200	13,000	4,420	2,810	630	2,460	2,240
3	620	750	1,180	9,000	16,100	89,500	21,500	3,620	5,340	591	2,240	2,810
4	630	700	1,120	43,500	12,500	94,000	16,300	3,380	4,420	650	2,240	2,810
5	582	670	1,180	112,000	9,150	87,900	15,700	3,500	3,380	573	1,900	2,460
6	510	610	1,280	103,000	6,740	63,200	29,000	3,380	2,580	519	1,560	1,890
7	486	591	1,400	71,000	5,920	48,100	28,300	3,160	2,240	486	1,400	1,450
8	486	582	1,670	50,100	5,340	39,800	22,600	2,920	2,000	470	1,180	1,120
9	454	555	1,560	29,000	5,570	27,600	17,600	2,810	2,120	454	1,010	1,010
10	454	546	1,670	13,900	5,110	17,000	13,700	2,700	2,810	446	1,180	900
11	406	510	1,670	8,250	4,420	13,200	10,200	2,580	3,730	446	1,780	750
12	398	537	1,670	6,260	3,840	21,500	8,250	2,460	3,500	422	1,890	670
13	343	573	1,670	5,220	3,500	47,500	8,400	2,460	2,810	420	1,890	630
14	383	630	1,560	6,030	3,380	35,300	7,960	2,350	2,460	420	1,560	573
15	438	610	1,560	13,900	4,420	27,600	7,400	2,350	2,120	573	1,340	486
16	610	600	1,450	16,400	9,300	20,100	6,140	2,240	1,670	7,000	3,270	486
17	1,670	591	1,280	13,200	11,000	53,800	5,460	2,000	1,560	7,820	6,870	446
18	1,670	600	1,230	10,100	10,100	82,800	5,000	1,890	1,280	15,000	6,140	438
19	4,540	600	1,180	10,400	9,750	50,900	4,420	1,780	1,120	10,200	4,190	406
20	7,400	591	1,180	11,200	45,200	30,600	3,960	1,670	1,010	8,550	2,920	390
21	7,960	582	1,670	11,000	60,500	18,900	3,620	1,450	1,120	6,260	2,120	366
22	7,000	573	4,300	45,800	39,000	20,700	3,160	1,280	1,120	9,750	2,350	358
23	4,760	591	9,450	61,800	25,700	18,700	3,040	1,340	1,120	10,100	4,760	329
24	3,160	1,010	10,100	32,400	34,800	43,000	2,810	2,000	1,060	11,200	3,960	329
25	2,350	1,180	7,820	19,300	41,200	58,700	2,700	2,120	955	11,000	3,380	329
26	1,890	1,400	5,680	12,200	26,500	37,200	2,460	2,000	850	8,550	3,270	329
27	1,560	1,450	4,760	8,700	17,800	31,700	2,350	1,780	750	7,540	2,350	1,120
28	1,280	1,560	25,000	7,260	13,200	33,900	2,120	2,460	700	8,100	1,780	2,580
29	1,060	1,450	71,500	7,680	.....	24,800	2,120	3,840	519	8,400	1,400	2,920
30	1,010	1,400	42,500	20,700	.....	17,000	3,380	3,960	690	5,680	1,120	2,580
31	955	.....	25,900	18,700	.....	11,700	.....	3,160	.....	4,190	1,010	.....

Monthly discharge of Cumberland River at Burnside, Ky., for the years ending Sept. 30, 1915–1917.

[Drainage area, 4,890 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1914–15.					
October	47,300	150	5,360	1.10	1.27
November	1,230	510	702	.144	.16
December	48,600	1,230	13,500	2.76	3.18
January	55,600	5,340	18,800	3.84	4.43
February	74,000	2,700	12,300	2.52	2.62
March	19,500	2,120	7,390	1.51	1.74
April	5,570	1,670	3,010	.616	.69
May	22,000	850	5,100	1.04	1.20
June	15,000	2,000	6,660	1.36	1.52
July	31,000	955	7,630	1.56	1.80
August	16,300	900	4,900	1.00	1.15
September	6,870	700	2,410	.493	.55
The year	74,000	150	7,320	1.50	20.31
1915–16.					
October	34,800	1,780	7,960	1.63	1.88
November	86,700	1,060	14,200	2.90	3.24
December	105,000	2,700	24,300	4.97	5.73
January	68,900	7,260	24,000	4.91	5.66
February	18,900	3,840	9,610	1.97	2.12
March	20,300	3,730	9,340	1.91	2.20
April	16,100	3,500	6,490	1.33	1.48
May	20,900	1,060	3,120	.638	.74
June	11,000	1,230	4,010	.820	.91
July	11,200	537	3,160	.646	.74
August	13,000	750	4,430	.906	1.04
September	1,400	398	733	.150	.17
The year	105,000	398	9,310	1.90	25.91
1916–17.					
October	7,960	343	1,810	.370	.43
November	1,560	510	790	.162	.18
December	71,500	1,120	7,640	1.56	1.80
January	112,000	5,220	25,800	5.28	6.09
February	60,500	3,380	16,900	3.46	3.60
March	94,000	11,700	40,000	8.18	9.43
April	29,000	2,120	9,400	1.92	2.14
May	4,650	1,280	2,640	.540	.62
June	5,340	519	2,020	.413	.46
July	15,000	420	4,750	.971	1.12
August	6,870	1,010	2,510	.513	.59
September	2,920	329	1,140	.233	.26
The year	112,000	329	9,630	1.97	26.72

SOUTH FORK OF CUMBERLAND RIVER AT NEVELSVILLE, KY.

LOCATION.—One-fourth mile below Turkey Creek ferry, on Greenwood-Monticello pike about a mile from Nevelsville, McCreary County. Little South Fork enters on left about 1¼ miles above station.

DRAINAGE AREA.—1,260 square miles (measured on maps of Kentucky and Tennessee, compiled by United States Geological Survey, on scale 1:500,000).

RECORDS AVAILABLE.—March 10, 1915, to September 30, 1917.

GAGE.—Vertical staff gage in 5 sections bolted to rock ledges on left bank; read by Mart Keith and Ben Whitehead. A reference gage for use in referencing soundings at the measuring section, is attached to a tree on the left bank 110 feet below cable.

DISCHARGE MEASUREMENTS.—Made from cable about 2,000 feet below gage, or by wading.

CHANNEL AND CONTROL.—Channel straight above and below; bed, compact gravel. Low-water control is partly the bed of the river below gage and partly a gravel bar about 2 miles below gage. Both are probably permanent. High-water control is bed of stream for several miles below gage, and may be slightly affected by foliage along the banks.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 35.1 feet, at 5.30 p. m., March 3 (discharge, roughly, 55,000 second-feet; minimum stage, 1.82 feet, at 5.30 a. m., July 13 (discharge, 64 second-feet).

ICE.—Stage-discharge relation seldom if ever affected by ice.

REGULATION.—Operation of a small power plant short distance above gage may affect flow at extreme low water.

ACCURACY.—Stage-discharge relation probably permanent; not affected by ice during period of record. Rating curve well defined to 23,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

COOPERATION.—Station maintained in cooperation with State Geological Survey of Kentucky, J. B. Hoeing, State geologist.

Discharge measurements of South Fork of Cumberland River at Nevelsville, Ky., during the year ending Sept. 30, 1917.

[Made by B. E. Jones.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Jan. 9	7.35	3,250	July 17	17.92	17,800
July 17	12.13	9,900	18	13.27	10,200
17	16.51	15,500			

Daily discharge, in second-feet, of South Fork of Cumberland River at Nevelsville, Ky., for the years ending Sept. 30, 1915-1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915.												
1							1,410	630	1,160	3,150	430	1,740
2							1,290	523	1,410	1,950	452	1,480
3							1,220	658	1,740	1,290	800	1,100
4							1,160	4,000	1,350	4,180	860	920
5							1,040	3,000	1,040	5,850	602	1,740
6							980	1,950	1,540	6,070	430	4,880
7							920	1,410	2,860	3,230	310	4,000
8							860	1,290	4,980	2,080	256	2,570
9							800	1,160	4,470	1,480	292	1,740
10						1,480	770	980	2,710	1,220	256	1,350
11						1,350	800	800	1,680	1,040	1,350	1,100
12						1,220	1,040	685	1,350	2,080	2,430	920
13						1,100	1,680	630	1,290	2,500	1,880	712
14						980	1,540	575	1,290	6,070	1,160	602
15						920	1,290	523	3,480	3,560	2,150	499
16						1,220	1,160	430	8,860	2,360	2,010	430
17						1,880	1,040	388	4,670	2,430	1,350	388
18						2,290	920	329	2,710	1,540	3,560	348
19						3,000	860	292	1,950	1,480	4,000	310
20						5,410	740	274	1,540	1,610	3,000	292
21						4,880	712	256	1,740	17,200	4,280	388
22						3,560	658	256	2,860	5,080	3,650	920
23						3,000	630	348	2,080	2,640	1,880	860
24						2,570	575	3,000	1,350	1,680	1,480	575
25						2,290	523	1,410	980	1,220	1,100	430
26						2,150	523	1,610	770	920	800	348
27						2,010	475	5,080	630	685	1,610	292
28						2,010	452	3,480	549	602	11,800	256
29						1,810	452	2,710	499	452	5,960	1,540
30						1,610	1,040	1,740	1,220	388	4,000	1,540
31						1,480		1,220		329	2,710	

Daily discharge, in second-feet, of South Fork of Cumberland River at Nevelsville, Ky., for the years ending Sept. 30, 1915–1917—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915–16.												
1	15,600	658	1,810	6,530	3,000	1,680	2,570	800	4,090	224	348	274
2	13,100	602	1,610	15,200	5,960	2,860	2,150	740	2,220	194	1,160	274
3	4,180	549	1,480	13,400	4,570	4,670	1,950	712	1,480	228	1,680	310
4	2,500	499	1,350	6,880	3,390	4,000	1,810	1,160	1,160	188	1,100	409
5	3,560	452	1,220	4,670	2,930	3,150	1,610	1,160	1,040	161	1,040	409
6	6,300	430	1,100	4,280	2,780	2,710	1,410	1,040	860	175	1,350	169
7	3,560	409	980	19,400	2,710	3,390	1,350	920	1,480	137	1,160	274
8	2,430	409	920	27,500	2,360	5,300	2,780	800	3,150	127	920	256
9	1,740	740	860	9,140	2,360	4,280	5,190	712	1,810	348	1,680	224
10	1,350	1,740	800	5,630	3,650	3,310	4,180	630	1,220	1,950	1,410	188
11	1,100	1,160	800	4,570	3,820	2,780	3,310	549	920	2,570	980	172
12	920	1,160	1,220	4,000	3,320	2,290	2,860	499	2,080	1,810	3,000	188
13	800	3,390	1,350	16,100	2,780	1,950	2,360	452	5,960	1,950	4,880	175
14	712	7,000	1,350	14,700	2,430	1,810	2,080	430	3,310	1,220	2,710	158
15	630	57,000	1,290	5,850	1,950	1,680	1,810	452	2,150	980	2,430	155
16	602	22,700	4,380	4,570	1,740	1,610	1,610	630	1,610	800	3,230	182
17	575	7,630	10,600	3,910	1,610	1,410	1,410	475	1,350	770	4,570	452
18	549	4,280	43,000	3,000	1,540	1,350	1,350	409	1,220	1,350	3,230	329
19	5,080	15,600	22,700	2,430	1,410	1,290	1,220	368	920	1,610	2,500	256
20	17,900	13,700	7,500	2,360	1,220	1,220	1,100	348	770	2,780	1,610	188
21	5,960	6,880	4,570	2,360	1,160	1,160	1,100	329	685	5,520	1,160	158
22	3,310	4,380	3,310	3,910	1,040	1,220	1,350	310	630	6,640	920	139
23	2,290	3,150	2,710	14,400	1,040	1,160	1,410	368	575	3,390	712	152
24	1,740	2,570	2,290	7,500	1,290	1,040	1,350	475	475	2,010	602	155
25	1,410	2,150	2,500	4,670	2,360	890	1,160	1,160	452	1,290	475	132
26	1,220	1,740	6,760	3,480	2,360	1,410	1,100	740	549	1,290	452	118
27	1,040	1,740	5,850	2,860	2,150	2,640	1,100	523	409	1,040	388	107
28	920	3,150	5,190	2,430	1,880	7,500	1,100	409	348	860	329	107
29	920	2,500	25,100	2,290	1,740	6,880	980	368	310	630	368	107
30	860	2,150	25,100	2,150	.....	4,470	860	3,560	256	475	368	147
31	740	.....	8,030	1,950	.....	3,230	.....	13,100	.....	388	329	.....
1916–17.												
1	169	142	238	2,500	6,530	6,880	2,640	1,160	292	137	1,040	658
2	142	137	218	2,010	4,770	13,400	4,280	860	575	118	800	1,160
3	132	132	214	3,910	3,150	41,700	6,180	740	712	109	770	1,040
4	116	122	221	23,500	2,570	33,200	4,090	770	712	107	1,040	1,480
5	109	118	238	36,100	2,290	24,300	5,850	920	549	102	712	920
6	98	118	310	26,700	1,740	9,000	12,800	920	452	98	575	602
7	92	113	329	9,000	1,680	6,420	8,030	800	388	90	388	499
8	86	107	310	4,880	1,610	5,410	5,190	800	348	107	329	388
9	80	107	329	3,390	1,680	4,090	4,470	800	475	102	329	329
10	86	107	368	2,640	1,480	3,310	3,820	800	1,160	98	1,160	310
11	94	109	409	2,080	1,290	2,710	3,150	712	1,160	90	1,290	256
12	127	107	409	1,680	1,160	9,700	2,640	685	980	71	740	231
13	147	107	388	1,350	1,040	11,300	2,360	630	740	65	523	207
14	132	109	348	2,430	1,040	7,000	2,360	575	575	73	409	185
15	113	113	310	6,530	1,740	6,880	2,080	523	452	920	575	169
16	116	113	292	4,280	2,860	5,850	1,740	475	368	5,960	3,910	158
17	113	109	256	3,310	3,150	33,300	1,540	430	310	9,000	3,650	152
18	118	107	256	2,930	2,860	25,300	1,350	388	274	10,100	2,500	144
19	169	105	256	3,820	4,980	8,030	1,220	348	238	4,380	1,540	348
20	292	102	221	3,650	13,400	4,880	1,100	329	256	2,640	1,040	172
21	430	105	329	3,390	22,000	4,570	1,040	310	214	3,080	800	120
22	409	102	2,220	20,100	7,240	8,300	980	310	207	7,000	1,220	107
23	368	113	3,000	15,800	4,470	6,420	860	452	228	6,880	1,350	221
24	310	164	2,080	6,300	12,100	22,200	800	549	238	7,120	1,220	188
25	256	204	1,480	4,090	7,500	18,600	740	499	235	5,410	740	109
26	214	329	1,160	3,000	4,380	7,000	712	388	207	3,820	549	98
27	178	348	980	2,360	3,310	10,300	658	368	164	2,930	409	185
28	164	274	11,800	2,150	2,860	13,400	602	348	137	3,000	348	1,100
29	142	256	30,600	3,150	.....	6,880	1,040	329	164	2,640	310	1,740
30	142	238	6,420	14,700	.....	4,570	1,040	292	137	2,010	292	860
31	147	.....	3,560	6,530	.....	3,310	.....	256	.....	1,410	274	.....

Monthly discharge of South Fork of Cumberland River at Nevelsville, Ky., for years ending Sept. 30, 1915–1917.

[Drainage area, 1,260 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1915.					
March 10-31	5,410	920	2,190	1.74	1.42
April	1,680	452	919	.729	.81
May	5,080	256	1,340	1.06	1.22
June	8,860	499	2,160	1.71	1.91
July	17,200	329	2,790	2.21	2.55
August	11,800	256	2,160	1.71	1.97
September	4,880	256	1,140	.905	1.01
1915–16.					
October	17,900	549	3,340	2.65	3.06
November	57,000	409	5,680	4.51	5.03
December	43,000	800	6,380	5.06	5.83
January	27,500	1,950	7,170	5.69	6.56
February	5,960	1,040	2,430	1.93	2.08
March	7,500	980	2,720	2.16	2.49
April	5,190	860	1,850	1.47	1.64
May	13,100	310	1,120	.889	1.02
June	5,960	256	1,450	1.15	1.28
July	6,640	127	1,390	1.10	1.27
August	4,880	329	1,520	1.21	1.40
September	452	107	212	.168	.19
The year	57,000	107	2,950	2.34	31.85
1916–17.					
October	430	80	171	0.136	0.16
November	348	102	147	.117	.13
December	30,600	214	2,240	1.78	2.05
January	36,100	1,350	7,360	5.84	6.73
February	22,000	1,040	4,460	3.54	3.69
March	41,700	2,710	11,900	9.44	10.88
April	12,800	602	2,850	2.26	2.52
May	1,160	256	573	.455	.52
June	1,160	137	432	.343	.38
July	10,100	65	2,570	2.04	2.35
August	3,910	274	995	.790	.91
September	1,740	98	471	.374	.42
The year	41,700	65	2,850	2.26	30.74

CANEY FORK NEAR ROCK ISLAND, TENN.

LOCATION.—About 100 feet downstream from power house of Tennessee Power Co., half a mile downstream from mouth of Collins River, and 1 mile northwest of Rock Island, Warren County.

DRAINAGE AREA.—1,640 square miles (measured on Post Route Map).

RECORDS AVAILABLE.—November 14, 1911, to September 30, 1917.

GAGE.—Bristol water-stage recorder, known as gage No. 3, 100 feet downstream from power house and about half a mile downstream from Rock Island dam; this gage has been used to determine the mean daily stage since January 1, 1917. From March 26 to December 31, 1916, a Bristol water-stage recorder installed March 26, 1916, at site of staff gage known as gage B (No. 2), half a mile upstream from gage No. 3 and 300 feet downstream from Rock Island dam, was used for determining mean daily stages. The closing of sluice gates in dam on December 8, 1916, and diversion of flow through tunnel on December 12 made gage B useless after December 7, 1916. Prior to March 26, 1916, daily mean stage was determined from a water-stage recorder known by the Billesby Co., as gage A, 400 feet upstream from gage B, just above point at which dam is now built; date of installation of recorder not known. Backwater from dam began to affect stage-discharge relation at gage A March 26, 1916.

DISCHARGE MEASUREMENTS.—Formerly made from cable at gage B or from sluiceways in dam. No discharge measurements have been made since closing of the sluiceways December 8, 1916.

CHANNEL AND CONTROL.—Bed of stream above and below gage consists chiefly of solid rock; probably permanent.

EXTREMES OF DISCHARGE.—Maximum discharge during year, about 55,000 second-feet (estimated by comparison with flow of Collins River); March 4, stage unknown; minimum stage, 0.35 foot November 20 (discharge, 330 second-feet).

1911–1917: Maximum stage recorded, 13.2 feet April 2, 1912 (discharge, 107,000 second-feet); minimum stage 0.20 foot September 17, 20, 21, and October 4, 5, 10, 1914 (discharge, 220 second-feet).

REGULATION.—Prior to December 8 only slight diurnal fluctuation caused by operation of small mills upstream. After that date considerable regulation resulted from storage in reservoir above.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve used prior to December 8 well defined between 300 and 25,000 second-feet, and extended above. Above 4,700 second-feet and below 430 second-feet curve is based on rating curve constructed by the H. M. Billesby Engineering Co., Chicago, Ill. Rating curve used subsequent to January 1 developed by means of simultaneous gage readings at gage B (No. 2) and gage No. 3, and based upon the above curve, is fairly well defined between 300 and 9,000 second-feet and extended above. Mean daily gage heights computed by Tennessee Power Co. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except for extreme high stages.

COOPERATION.—Gage-height record furnished by Tennessee Power Co.

The following discharge measurement was made by L. J. Hall:

November 10, 1916: Gage height (gage No. 2 B), 0.41 foot; discharge, 367 second-feet.

Daily discharge, in second-feet, of Caney Fork near Rock Island, Tenn., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	510	510	510	5,260	9,090	7,220	4,870	1,490	1,260	1,490	1,490	1,090
2	430	510	600	4,350	9,770	36,100	5,260	1,450	1,570	1,300	2,040	1,060
3	470	430	690	4,520	6,670	50,900	4,030	1,370	1,950	1,160	1,490	2,220
4	510	430	690	13,800	5,470	55,000	4,190	1,410	1,950	1,090	1,490	2,040
5	470	395	690	14,200	4,690	39,700	17,300	1,450	2,040	985	1,490	1,490
6	430	360	740	21,700	3,730	20,900	23,700	1,370	1,530	820	1,410	1,410
7	430	360	790	12,600	3,320	10,100	14,500	1,370	1,530	760	1,370	1,410
8	430	395	.....	8,440	3,190	6,160	12,600	1,120	1,200	730	1,410	1,410
9	690	395	.....	5,690	3,320	3,190	12,600	1,450	5,260	700	1,410	1,410
10	690	430	.....	4,350	2,950	4,190	8,760	1,370	4,520	450	1,410	1,340
11	555	395	.....	3,320	2,620	4,350	4,870	1,300	5,470	450	1,410	1,300
12	555	395	.....	2,840	2,520	5,690	5,470	1,340	4,030	591	1,300	1,260
13	470	360	.....	2,420	2,220	13,000	4,030	1,160	1,530	510	1,200	1,120
14	430	430	.....	3,190	2,180	16,100	4,190	1,200	1,450	332	985	1,020
15	430	395	.....	4,870	2,420	16,900	3,590	1,120	1,450	450	880	1,020
16	360	395	.....	4,870	3,450	12,600	3,730	1,120	1,370	1,300	1,160	675
17	430	360	.....	4,350	4,870	30,500	2,620	1,120	1,370	29,300	1,300	730
18	510	430	.....	4,690	5,470	25,300	2,620	1,020	1,410	18,500	1,340	625
19	510	395	.....	5,690	10,400	15,300	1,770	985	1,090	10,100	1,300	600
20	690	330	.....	5,260	18,100	9,770	1,730	950	1,060	6,410	1,260	600
21	890	360	.....	4,690	18,900	9,430	2,570	1,020	5,060	4,350	1,300	470
22	1,070	395	.....	23,700	11,900	12,600	2,080	985	1,900	3,190	1,340	470
23	890	430	.....	19,700	8,440	12,200	1,900	1,060	1,650	4,350	1,300	470
24	790	360	.....	10,800	6,160	22,500	1,690	1,090	2,320	4,350	1,340	470
25	740	555	.....	7,810	6,670	23,300	1,650	985	1,370	3,320	1,340	470
26	645	600	.....	5,470	4,870	16,500	1,530	985	1,300	2,000	1,340	470
27	555	555	.....	4,030	3,320	22,100	1,450	915	1,200	3,730	1,300	490
28	430	555	.....	3,880	2,370	17,300	1,450	2,180	1,300	6,940	1,300	2,220
29	430	510	.....	23,700	.....	9,770	1,530	3,730	1,200	4,690	1,300	3,320
30	430	555	.....	19,700	.....	8,120	1,530	3,190	1,340	3,070	880	2,840
31	470	.....	.....	12,600	.....	6,940	.....	1,490	.....	1,490	700	.....

NOTE.—Records Oct. 1 to Dec. 7 obtained from gage B (No. 2) at site immediately below dam, which represents normal flow. Dec. 8 to 31 the flow past gage B was regulated by closing of sluice gates in dam. Diversion of water through tunnel at power house, about half a mile below gage B, was begun Dec. 12. Records for this period omitted. Discharge Mar. 3 and 4 estimated by comparison with records of flow of Collins River.

Records Jan. 1 to Sept. 30, obtained from gage No. 3 at site 100 feet below power house and about half a mile below gage B, represent total flow, which is however, subject to considerable regulation from dam above.

Monthly discharge of Caney Fork near Rock Island, Tenn., for the year ending Sept. 30, 1917.

[Drainage area, 1,640 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,070	360	559	0.341	0.39
November	600	330	432	.263	.29
December 1–7	790	510	673	.410	.11
January	23,700	2,420	8,790	5.36	6.18
February	18,900	2,180	6,040	3.68	3.83
March	55,000	3,190	17,500	10.7	12.34
April	23,700	1,450	5,330	3.25	3.63
May	3,730	915	1,380	.842	.97
June	5,470	1,060	2,060	1.26	1.41
July	29,300	332	3,840	2.34	2.70
August	2,040	700	1,310	.799	.92
September	3,320	470	1,180	.720	.80

COLLINS RIVER NEAR ROWLAND, TENN.

LOCATION.—At Hennessee's iron highway bridge, 1 mile below Mountain Creek, 2½ miles northeast of Rowland, Warren County, 5 miles southwest of Rock Island, and about 8 miles upstream, by river, from junction of Collins River with Caney Fork, a tributary of Cumberland River.

DRAINAGE AREA.—800 square miles (measured by Tennessee Power Co.).

RECORDS AVAILABLE.—April 1, 1916, to September 30, 1917.

GAGE.—Standard chain gage on downstream side of bridge at middle of second span from right bank; read by Joe Keathley. Zero of gage, 795.86 feet, above sea level.

DISCHARGE MEASUREMENTS.—Made from upstream handrail of bridge, or at extremely low stages, by wading. A stay wire about 100 feet upstream is used to make high-water measurements.

CHANNEL AND CONTROL.—Bed composed of rock, boulders and sand. Channel fairly straight for a considerable distance above and below gage; right bank is a steep rock bluff; left bank is low and subject to overflow above a stage of 8 feet. A series of rock and boulder riffles beginning just below bridge forms the control; probably permanent.

EXTREMES OF DISCHARGE.—1916–17: Maximum stage recorded, 14.1 feet at 12 m. March 4, 1917 (discharge, 28,900 second-feet); minimum stage, 1.10 feet several days in November, 1916 (discharge, 120 second-feet).

By means of levels the elevation of marks of the flood of 1854 (exact date unknown), reported by old residents nearby, indicates that the river rose to stage 32.6 feet (discharge estimated at 82,200 second-feet). Elevation of marks of the flood of 1902 (exact date unknown), obtained in the same manner, indicates a stage of 27.2 feet (estimated discharge, 66,600 second-feet).

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

REGULATION.—Small mills upstream probably cause some diurnal fluctuation.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice. Rating curve well defined below 8,000 second-feet and extended above that point. Gage read to hundredths twice daily; oftener during high water. Daily discharge ascertained by applying mean daily gage height to rating table. Records good. Determination of discharge above stage of overflow (about 8 feet, discharge, 11,300 second-feet) subject to error.

COOPERATION.—Gage-height record furnished by Tennessee Power Co.

Discharge measurements of Collins River near Rowland, Tenn., during the years ending Sept. 30, 1916 and 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1916.		*Feet.*	*Sec.-ft.*	1916.		*Feet.*	*Sec.-ft.*
Mar. 24	L. J. Hall	1.98	782	Aug. 19	L. J. Hall	1.61	491
30	do	3.18	2,150	22	do	1.55	409
Apr. 19	Warren E. Hall and L. J. Hall	1.98	801	Sept. 14	Warren E. Hall and L. J. Hall	1.32	241
26	L. J. Hall	2.25	1,080	20	L. J. Hall	1.35	263
May 18	do	1.55	408	26	do	1.28	222
24	do	2.37	1,220	1916–17.			
June 16	do	2.54	1,420	Oct. 25	do	1.30	221
19	do	2.05	867	Nov. 11	do	1.18	143
23	do	1.95	768	15	do	1.20	158
July 19	do	3.54	2,600	Jan. 10	do	2.94	1,910
21	do	3.85	2,930	31	do	4.56	3,930
22	do	4.32	3,590	Feb. 24	do	3.70	2,720
24	do	2.96	1,890	Mar. 28	do	5.99	6,510
Aug. 12	do	1.86	727	Apr. 11	do	3.73	2,920
14	do	2.28	1,110	May 18	do	1.62	469
17	do	1.82	658				

Daily discharge, in second-feet, of Collins River near Rowland, Tenn., for the years ending Sept. 30, 1916 and 1917.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1916.							1916.						
1....	1,450	744	726	494	708	334	16....	964	462	1,520	2,610	744	438
2....	1,270	636	494	478	735	717	17....	900	414	1,250	2,070	636	334
3....	1,180	672	771	398	800	494	18....	860	406	1,050	3,100	528	286
4....	1,270	860	1,200	422	840	478	19....	810	390	860	2,480	462	270
5....	1,150	997	920	422	800	382	20....	762	390	931	2,940	462	256
6....	1,040	820	1,030	478	564	374	21....	1,470	390	1,160	3,100	462	242
7....	997	699	2,090	430	840	318	22....	1,930	494	880	3,300	430	228
8....	1,520	636	1,430	1,160	780	446	23....	1,650	840	771	2,670	486	214
9....	1,780	582	880	10,900	840	374	24....	1,400	1,210	780	1,880	478	214
10....	1,630	494	681	11,600	830	358	25....	1,210	942	636	1,510	462	200
11....	1,510	510	744	9,320	708	334	26....	1,100	690	582	1,250	446	214
12....	1,370	478	3,300	7,430	681	294	27....	986	510	502	1,180	390	193
13....	1,210	470	4,300	6,330	900	294	28....	900	430	462	1,460	366	200
14....	1,120	470	2,550	7,320	1,050	334	29....	850	382	422	1,030	398	186
15....	1,050	438	1,650	3,790	910	681	30....	771	1,490	462	1,120	350	193
							31....	.....	975	.....	870	342	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916–17.												
1.....	186	214	173	2,450	4,150	6,540	2,130	681	920	398	1,030	1,790
2.....	160	214	207	1,730	4,000	16,200	2,550	753	690	406	820	1,600
3.....	186	180	214	1,970	2,850	28,000	2,310	762	636	366	762	1,480
4.....	180	180	214	5,920	2,310	27,700	2,530	1,160	920	334	654	975
5.....	180	167	256	4,800	2,050	18,500	9,080	800	1,120	326	582	762
6.....	173	152	214	9,080	1,710	4,890	11,200	726	820	294	546	609
7.....	167	173	214	4,890	1,490	4,800	6,020	762	690	286	510	494
8.....	173	173	221	3,010	1,470	3,790	4,460	744	1,030	270	510	454
9.....	310	173	235	2,330	1,450	2,920	4,630	672	3,860	256	406	953
10.....	228	180	228	1,850	1,290	2,550	3,440	681	3,440	256	462	699
11.....	214	160	302	1,610	1,150	2,940	2,790	645	2,620	242	430	502
12.....	186	173	302	1,300	1,140	3,440	2,330	600	1,780	249	414	438
13.....	173	152	302	1,080	964	5,720	2,090	546	1,240	242	366	406
14.....	173	160	270	1,930	953	6,220	1,890	555	964	256	390	342
15.....	180	140	263	2,330	1,120	5,820	1,770	528	780	302	690	366
16.....	152	120	242	2,130	1,530	4,150	1,480	510	672	2,350	2,120	334
17.....	173	144	228	1,930	1,420	18,500	1,370	446	582	11,100	1,180	358
18.....	214	136	214	2,010	1,530	9,080	1,270	430	537	4,890	870	302
19.....	228	180	228	2,410	2,770	4,630	1,220	462	478	3,720	654	294
20.....	358	144	214	2,300	6,120	3,510	1,070	446	528	2,270	564	278
21.....	302	173	342	2,050	6,980	3,580	1,020	422	1,010	2,050	470	286
22.....	242	152	502	7,200	4,150	4,720	931	519	942	2,000	502	717
23.....	249	160	771	6,540	3,100	4,630	830	591	681	2,310	681	470
24.....	242	160	850	3,930	2,770	8,840	870	528	582	1,930	564	374
25.....	214	160	681	2,850	2,290	8,360	771	510	462	1,510	478	326
26.....	200	160	690	2,290	1,930	5,160	790	478	398	1,470	430	286
27.....	207	167	1,210	1,830	1,710	9,320	627	414	430	2,500	390	1,490
28.....	193	160	10,200	2,360	1,640	6,120	663	414	382	3,170	350	5,530
29.....	200	193	11,600	6,980	.....	4,150	762	430	502	1,900	350	2,060
30.....	152	186	4,300	7,200	.....	3,170	699	446	528	1,450	390	1,260
31.....	200	.....	2,670	4,000	.....	2,560	.....	672	.....	1,210	1,050	.....

Monthly discharge of Collins River near Rowland, Tenn., for the years ending Sept. 30, 1916 and 1917.

[Drainage area, 800 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1916.					
April	1,930	762	1,200	1.50	1.67
May	1,490	382	643	.804	.93
June	4,300	422	1,170	1.46	1.63
July	11,600	398	3,020	3.78	4.36
August	1,050	342	627	.784	.90
September	717	186	329	.411	.46
1916–17.					
October	358	152	206	.258	.30
November	214	120	166	.208	.23
December	11,600	173	1,240	1.55	1.79
January	9,080	1,080	3,360	4.20	4.84
February	6,980	953	2,360	2.95	3.07
March	28,000	2,550	7,760	9.70	11.18
April	11,200	627	2,450	3.06	3.41
May	1,160	414	591	.739	.85
June	3,860	382	1,010	1.26	1.41
July	11,100	242	1,620	2.02	2.33
August	2,120	350	633	.791	.91
September	5,530	278	874	1.09	1.22
The year	28,000	120	1,860	2.32	31.54

TENNESSEE RIVER BASIN.

FRENCH BROAD RIVER AT ASHEVILLE, N. C.

LOCATION.—At new concrete highway bridge which replaced old Smith's bridge; washed out July 16, 1916, about a mile below Southern Railway station at Asheville, N. C., and 2 miles below mouth of Swannanoa River.

DRAINAGE AREA.—987 square miles.

RECORDS AVAILABLE.—March 19, 1903 (determinations of daily discharge from Jan. 1, 1905) to July 16, 1916; January 1 to September 30, 1917. A record was obtained at Bingham School bridge about three miles west of Ashville from 1895 to 1905.

GAGES.—A temporary vertical staff a short distance above the old Smith's bridge was used January 1 to September 30, 1917. Original gages, a vertical staff attached to one of the piers of the old Smith's bridge, and an auxiliary chain gage (for obtaining readings below zero) attached to that bridge, were used until the flood in July, 1916. Readings from the temporary gage have been reduced to the datum of the original gage.

DISCHARGE MEASUREMENTS.—Formerly made from downstream side of highway bridge.

CHANNEL AND CONTROL.—Bed composed chiefly of rock; practically permanent. Control formed by rock shoal and concrete piers of Southern Railway bridge; permanent, though piers of bridge may become choked with débris during extreme floods, so that stage-discharge relation at gage may be affected by backwater for short periods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.2 feet March 5 and 25 (discharge, 9,770 second-feet); minimum stage recorded during year, −0.7 foot August 30 (discharge, 680 second-feet).

1905–1917: Maximum stage recorded, 24.13 feet July 16, 1916, determined from flood marks by levels November 21, 1917 (discharge not determined); stage-discharge relation probably affected by backwater from drift lodged against the Southern Railway bridge. Maximum stage recorded before or after the flood in July, 1916, 7.8 feet January 23, 1906 (discharge, 25,800 second-feet). Minimum stage recorded, −0.7 foot September 16 and 20, 1907 (discharge, 380 second feet.)

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

REGULATION.—Slight diurnal fluctuations may be caused by the operation of small mills upstream.

ACCURACY.—Stage-discharge relation changed slightly by the flood in July, 1916. Rating curve based on four discharge measurements made in 1918; well defined below 10,800 second-feet. Gage read to tenths once daily. Daily discharge determined by applying daily gage height to rating table. Records fair.

COOPERATION.—Gage-height record furnished by United States Weather Bureau.

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

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

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,640	2,100	2,360	1,860	1,860	1,210	930	1,210	7,020
2	1,530	2,810	3,300	1,640	1,860	1,420	930	1,110	5,750
3	1,640	1,980	4,430	1,750	1,750	1,530	1,050	1,750	5,750
4	1,640	1,640	6,760	1,420	1,640	1,420	1,420	1,210	2,650
5	1,640	1,860	9,770	4,050	2,100	1,210	1,310	1,110	1,980
6	2,810	1,640	8,620	7,020	1,860	1,310	1,210	1,110	1,750
7	2,360	1,530	4,630	4,840	1,640	1,110	1,020	1,020	1,420
8	1,980	1,530	3,860	3,860	1,980	1,210	1,210	1,420	1,310
9	1,860	1,640	3,480	4,240	1,860	1,530	1,110	1,640	1,530
10	1,640	1,420	2,810	3,300	1,640	2,500	930	1,980	2,100
11	1,530	1,310	2,650	2,970	1,530	1,640	930	1,420	1,640
12	1,310	1,310	2,500	2,810	1,530	1,310	930	1,110	1,310
13	1,310	1,310	2,970	2,810	1,640	1,310	1,020	1,110	1,310
14	1,310	1,210	2,500	2,650	1,420	1,210	840	930	1,210
15	2,500	1,310	2,360	2,500	1,420	1,310	840	1,980	1,110
16	3,480	1,640	2,360	2,650	1,530	1,310	930	1,420	1,210
17	3,300	1,310	2,500	2,360	1,420	1,110	840	1,110	1,110
18	2,650	1,310	3,480	2,360	1,420	1,110	1,210	1,020	1,020
19	2,500	2,100	2,650	2,360	1,530	1,110	1,860	1,020	1,110
20	2,230	3,480	2,360	2,230	1,310	1,310	2,100	840	1,020
21	1,980	4,840	2,360	2,100	1,310	1,210	2,100	840	1,020
22	1,980	3,130	2,650	2,100	1,310	1,640	2,230	1,020	1,210
23	2,360	2,650	2,500	2,230	2,230	1,420	2,100	930	1,420
24	1,980	2,970	7,800	1,980	1,640	1,110	2,500	930	1,310
25	1,750	3,130	9,770	1,980	1,420	1,020	2,230	840	1,110
26	1,750	2,650	9,190	2,230	1,980	1,110	1,750	840	1,110
27	1,640	2,360	7,020	2,100	1,420	1,020	1,530	760	1,020
28	1,530	2,360	6,760	1,860	1,420	1,110	1,750	760	3,130
29	1,640	.....	5,060	1,980	1,530	1,210	1,310	760	3,480
30	1,980	.....	4,050	1,860	1,310	1,110	1,110	680	2,100
31	1,640	.....	2,100	.....	1,210	.....	1,020	760	.....

Monthly discharge of French Broad River at Asheville, N. C., for the year ending Sept. 30, 1917.

[Drainage area, 987 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	3,480	1,310	1,970	2.00	2.31
February	4,840	1,210	2,090	2.12	2.21
March	9,770	2,100	4,370	4.43	5.11
April	7,020	1,420	2,670	2.71	3.02
May	2,230	1,210	1,600	1 62	1.87
June	2,500	1,020	1,300	1.32	1.47
July	2,500	840	1,360	1.38	1.59
August	1,980	680	1,120	1.13	1.30
September	7,020	1,020	2,010	2.04	2.28

TENNESSEE RIVER AT CHATTANOOGA, TENN.

LOCATION.—At Walnut Street Bridge in Chattanooga, Hamilton County, 3 miles above mouth of Chattanooga Creek, 4 miles below mouth of Chickamauga Creek, and 33 miles upstream from Hales Bar dam.

DRAINAGE AREA.—21,400 square miles (measured on topographic maps).

RECORDS AVAILABLE.—April 1, 1873, to October 21, 1913; March 1, 1915, to September 30, 1917.

GAGES.—Two gages, 7 miles apart and set to the same datum, are used at this station to determine variation in slope of water surface caused by operation of power plant and locks at Hales Bar dam, as the station is within influence of backwater from the dam. Gage No. 1 consists of a sloping section of a railroad T rail, bolted to rock, and a vertical section of timber attached to the rock cliff on the left bank about 200 feet upstream from the Walnut Street Bridge; read by O. B. Gladish and L. M. Andress. Gage No. 2 is a vertical staff in three sections, fastened to trees on left bank about 100 feet above the Cincinnati Southern Railroad bridge 7 miles upstream from Chattanooga; gage is read by C. A. Brown.

Prior to October 21, 1913, gage No. 1 was used alone, but on that date backwater from Hales Bar dam began to affect the stage-discharge relation, and the station was abandoned until March 1, 1915, when gage No. 2 was installed.

DISCHARGE MEASUREMENTS.—Made from downstream footway of Walnut Street Bridge.

CHANNEL AND CONTROL.—Channel practically permanent. Control now formed by Hales Bar lock and dam and power plant.

EXTREMES OF DISCHARGE.—Maximum stage during year, from records of United States Weather Bureau, 47.7 feet at 8.40 a. m. March 7, (discharge, 313,000 second-feet); minimum mean daily discharge, 11,000 second-feet, October 8.

1874–1917: Maximum stage recorded, 64.0 feet at 7 a. m. March 1, 1875 (discharge 361,000 second-feet); minimum stage recorded, zero on gage September 11–14, 1881, and September 19, 1883 (discharge, 4,800 second-feet).

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

REGULATIONS.—See "Accuracy."

ACCURACY.—Stage-discharge relation affected by changes in slope of water surface caused by operation of power plant at Hales Bar dam and by rising and falling stages. Discharge determined by slope method (see Water-Supply Paper 345). Rating curve well defined between 11,500 and 363,000 second-feet. Gages read to hundredths twice daily. Records fair.

Discharge measurements of Tennessee River at Chattanooga, Tenn., during the year ending Sept. 30, 1917.

[Made by L. J. Hall.]

Date.	Gage height in feet.		Discharge.	Date.	Gage height in feet.		Discharge.
	Gage No. 1.	Gage No. 2.			Gage No. 1.	Gage No. 2.	
Oct. 14[a]	7.42	9.57	11,200	Mar. 10	35.93	38.60	195,000
Mar. 9	44.20	46.50	276,000	31	23.38	26.49	113,000
9	42.80	45.20	262,000				

[a] Three-foot flash boards on Hales Bar dam.

Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	13,500	13,300	15,200	90,300	96,100	78,300	90,700	28,300	20,200	18,300	26,700	18,200
2	13,100	13,500	16,800	68,500	98,100	117,000	79,900	31,700	21,200	17,400	23,900	29,600
3	13,100	13,700	17,600	51,600	92,000	224,000	72,800	33,000	22,100	16,200	22,900	34,000
4	13,100	13,300	15,800	54,500	76,200	223,000	63,200	33,000	21,800	16,200	24,100	32,900
5	12,800	12,300	15,200	73,800	65,800	237,000	72,000	33,000	21,000	14,500	23,900	31,300
6	12,500	12,500	15,000	109,000	64,300	280,000	84,400	32,600	20,200	14,600	21,900	26,900
7	11,800	11,600	14,500	132,000	49,500	309,000	96,500	28,800	19,400	14,400	18,000	21,400
8	11,000	11,800	14,500	141,000	43,500	310,000	91,000	27,800	20,800	14,000	16,400	18,100
9	11,400	11,500	14,500	129,000	42,200	266,000	95,300	27,000	28,000	13,500	14,500	16,700
10	11,500	11,500	14,000	93,400	40,300	191,000	94,700	25,800	29,300	14,100	17,000	14,800
11	12,000	11,400	16,000	65,100	38,300	123,000	81,900	25,100	29,600	15,000	20,900	14,000
12	11,900	11,400	16,700	50,800	36,200	88,000	70,900	24,400	31,000	13,600	24,100	15,500
13	12,000	12,100	16,400	43,000	33,200	82,200	64,100	23,600	30,100	13,900	20,000	14,100
14	11,700	11,900	16,400	42,600	28,800	104,000	58,300	23,400	27,800	14,600	17,800	15,200
15	11,200	12,000	16,500	48,400	28,100	113,000	55,600	23,500	26,900	15,700	16,400	14,300
16	11,200	12,400	16,400	59,300	29,500	109,000	53,500	23,400	25,000	17,000	16,400	13,200
17	11,600	13,300	16,000	62,000	31,400	100,000	52,400	22,900	23,100	51,000	19,700	12,900
18	11,200	13,000	15,300	66,400	35,400	136,000	48,000	22,300	21,500	84,500	23,000	12,100
19	13,200	12,500	13,900	63,200	52,000	151,000	44,500	21,200	22,900	65,800	23,900	12,400
20	14,800	12,400	13,200	60,700	88,400	144,000	40,700	19,700	22,800	48,600	20,100	11,900
21	16,700	12,400	13,600	55,200	123,000	129,000	38,200	18,000	25,000	44,100	17,400	11,600
22	19,600	12,300	13,800	56,600	150,000	120,000	35,500	15,900	25,200	56,800	15,500	11,600
23	23,200	12,900	15,000	91,600	144,000	117,000	32,900	15,500	22,400	74,800	15,000	11,500
24	20,700	13,100	21,100	102,000	127,000	115,000	31,100	16,800	22,600	63,100	14,900	11,500
25	17,200	13,000	24,300	101,000	104,000	154,000	29,900	18,900	21,500	51,200	20,400	12,200
26	14,800	15,300	30,500	90,000	83,400	184,000	29,100	18,300	19,600	45,400	26,400	12,500
27	14,400	14,500	31,500	72,000	82,500	191,000	27,600	19,500	17,600	41,800	20,800	12,800
28	13,600	14,200	35,400	59,600	84,800	196,000	26,500	20,000	16,600	42,500	17,200	13,400
29	13,400	14,200	75,400	49,900	.....	196,000	26,000	19,500	15,800	40,600	14,800	15,500
30	12,700	14,100	103,000	61,300	.....	144,000	25,700	18,900	16,200	36,200	13,400	21,700
31	13,000	.....	96,300	92,900	.....	113,000	.....	19,600	.....	30,400	12,500	.....

Monthly discharge of Tennessee River at Chattanooga, Tenn., for the year ending Sept. 30, 1917.

[Drainage area, 21,400 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	23,200	11,000	13,700	0.640	0.74
November	15,300	11,400	12,800	.598	.67
December	103,000	13,200	24,800	1.16	1.34
January	141,000	42,600	75,400	3.52	4.06
February	150,000	28,100	70,300	3.29	3.43
March	310,000	78,300	163,000	7.62	8.78
April	96,500	25,700	57,100	2.67	2.98
May	33,000	15,500	23,600	1.10	1.27
June	31,000	15,800	22,900	1.07	1.19
July	84,500	13,500	32,900	1.54	1.78
August	26,700	12,500	19,400	.907	1.05
September	34,000	11,500	17,100	.799	.89
The year	310,000	11,000	44,400	2.07	28.18

TENNESSEE RIVER AT FLORENCE, ALA.

LOCATION.—At Southern Railway bridge at lower end of Pattons Island, just below foot of Little Muscle Shoals, 1 mile south of Florence, Lauderdale County.

DRAINAGE AREA.—30,800 square miles.

RECORDS AVAILABLE.—November 7, 1871, to September 30, 1917.

GAGE.—Rod gage consisting of four sections of steel, three-eighths inch by 7½ inches, attached to right face of stone draw pier, which has batter of 1 inch to the foot. These sections form one continuous gage, graduated from −1.92 to 33.5 feet. Zero of gage, 400.85 feet above sea level. Gage read by R. E. Coburn. For description of gages used prior to September 30, 1913, see Water-Supply Paper 353, p. 151.

DISCHARGE MEASUREMENTS.—Made from downstream side of highway section (the low-level or through section) of 17-span combined railway and highway bridge. Special care necessary to counteract effect of obstruction of current by piers.

CHANNEL AND CONTROL.—Bed rocky, rough, and uneven; probably permanent. Control practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 24.7 feet at 6 p. m., March 12 (discharge, 319,000 second-feet); minimum stage, 0.1 foot at 7 a. m. and 6 p. m., September 26, and 7 a. m., September 27 (discharge, 12,100 second-feet).

1871–1917: Maximum stage recorded, 32.5 feet at 10 and 12 p. m., March 19, 1897 (discharge, 499,000 second-feet); minimum stage, −0.80 foot September 18, 1878 (discharge, 7,350 second-feet).

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

REGULATION.—The operation of Hales Bar lock and dam, 175 miles upstream, may cause some diurnal fluctuation in low-stage flow.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined above 12,000 second-feet. Gage read to tenths twice daily; oftener during high water. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

COOPERATION.—Gage-height record furnished by Mississippi River Commission.

Discharge measurements of Tennessee River at Florence, Ala., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 17	L. J. Hall	0.30	13,800
Feb. 28	do	12.30	130,000
Mar. 11	W. E. Hall, L. J. Hall, and O. P. Hall	24.30	310,000
12	do	24.60	319,000

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	12,600	14,100	16,800	113,000	106,000	125,000	240,000	37,800	26,200	23,200	47,100	21,800
2	12,600	14,100	16,800	112,000	140,000	154,000	234,000	36,900	27,700	20,400	42,800	21,800
3	13,600	13,600	16,800	105,000	150,000	196,000	205,000	36,000	29,300	19,800	39,400	23,200
4	13,600	13,600	17,900	97,400	146,000	250,000	163,000	40,300	29,300	20,400	36,000	29,300
5	14,600	13,600	18,500	92,600	135,000	271,000	191,000	45,400	28,500	21,800	33,500	36,000
6	14,600	13,600	19,200	98,600	114,000	279,000	208,000	49,800	28,500	21,100	32,600	37,800
7	14,600	13,600	19,800	111,000	97,400	279,000	199,000	46,200	27,700	20,400	31,000	36,000
8	14,600	13,600	19,800	125,000	84,300	285,000	178,000	42,800	27,700	20,400	30,100	32,600
9	14,600	13,600	19,200	142,000	68,300	285,000	164,000	41,200	32,600	19,200	29,300	29,300
10	14,100	13,600	18,500	150,000	62,400	295,000	152,000	37,800	48,000	17,900	28,500	27,700
11	13,600	13,600	19,200	149,000	57,000	311,000	140,000	36,000	58,800	16,800	27,700	24,600
12	13,100	13,100	19,800	126,000	53,400	317,000	129,000	34,400	53,400	16,200	26,200	21,100
13	13,100	13,100	20,400	84,300	51,600	309,000	109,000	32,600	48,000	15,600	23,900	19,200
14	12,600	12,600	20,400	73,300	49,800	295,000	99,800	31,800	43,700	15,600	24,600	17,300
15	12,600	12,600	21,100	65,300	48,000	266,000	85,400	31,000	40,300	16,800	26,200	16,800
16	13,100	12,600	20,400	62,400	48,000	221,000	76,600	31,000	39,400	15,600	25,400	16,800
17	13,600	13,100	20,400	68,300	48,900	205,000	73,300	31,000	37,800	21,800	25,400	19,200
18	14,100	13,100	19,800	76,600	51,600	205,000	70,300	30,100	33,500	31,000	24,600	17,900
19	14,100	13,100	19,800	84,300	60,600	190,000	66,300	30,100	31,000	48,000	23,900	16,800
20	14,100	13,600	19,200	90,200	106,000	175,000	62,400	29,300	29,300	85,400	24,600	16,200
21	14,600	14,100	19,200	90,200	152,000	202,000	57,900	28,500	27,700	79,900	26,200	15,600
22	15,600	13,600	19,200	92,600	166,000	212,000	53,400	27,700	26,900	70,300	26,900	14,100
23	17,300	13,600	19,200	112,000	172,000	223,000	49,800	26,900	28,500	66,300	26,200	13,600
24	19,200	13,100	19,800	124,000	178,000	234,000	48,000	26,900	31,000	78,800	24,600	13,100
25	20,400	13,600	20,400	130,000	182,000	240,000	46,200	26,200	30,100	93,800	21,800	12,600
26	23,200	14,100	22,500	135,000	175,000	240,000	42,800	24,600	27,700	90,200	19,200	12,100
27	23,200	14,100	29,300	130,000	154,000	252,000	42,000	23,900	26,900	77,700	17,900	16,800
28	20,400	14,600	53,400	114,000	133,000	253,000	41,200	23,200	26,200	66,300	20,400	26,200
29	17,300	16,800	78,800	102,000	.....	250,000	39,400	24,600	24,600	59,700	26,200	26,200
30	16,200	17,900	85,400	97,400	.....	250,000	38,600	23,900	23,200	57,000	26,200	25,400
31	15,600	.....	97,400	92,600	.....	247,000	.....	24,600	.....	51,600	23,200	.....

Monthly discharge of Tennessee River at Florence, Ala., for the year ending Sept 30, 1917.

[Drainage area, 30,800 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	23,200	12,600	15,400	0.500	0.58
November	17,900	12,600	13,800	.448	.50
December	97,400	16,800	27,400	.890	1.03
January	150,000	62,400	105,000	3.41	3.93
February	182,000	48,000	107,000	3.47	3.61
March	317,000	125,000	242,000	7.86	9.06
April	240,000	38,600	110,000	3.57	3.98
May	49,800	23,200	32,700	1.06	1.22
June	58,800	23,200	33,100	1.07	1.19
July	93,800	15,600	41,300	1.34	1.54
August	47,100	17,900	27,800	.903	1.04
September	37,800	12,100	21,900	.711	.79
The year	317,000	12,100	64,700	2.10	28.47

TENNESSEE RIVER AT JOHNSONVILLE, TENN.[1]

LOCATION.—At Nashville, Chattanooga & St. Louis Railway freight elevator, about 1,000 feet below railway bridge at Johnsonville, Humphreys County, 96 miles from mouth of Tennessee River and 160 miles below Florence, Ala.

DRAINAGE AREA.—38,500 square miles.

RECORDS AVAILABLE.—October 1, 1875, to September 30, 1917. Records from October 1, 1875, to September 30, 1913, published in Water-Supply Paper 353.

[1] For detailed history of this station see Water-Supply Paper 353, pp. 195–201.

GAGE.—Staff at freight elevator on right bank, about 1,000 feet below the Nashville, Chattanooga & St. Louis Railway bridge.

DISCHARGE MEASUREMENTS.—Made from downstream and upstream side of through railway bridge of six spans and draw span.

CHANNEL AND CONTROL.—No information concerning control. Channel at measuring section at bridge composed of boulders and coarse gravel; apparently permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 38.9 feet March 18, caused partly by backwater from the Ohio River; minimum stage, 1.3 feet November 16–20 (discharge, 13,400 second-feet).

The highest unquestioned record of stage is 48 feet March 24, 1897.

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

ACCURACY.—Stage-discharge relation is considered permanent except for effect of backwater from Ohio River. No discharge measurements made at this station since August 1, 1914. Not affected by ice during the year. Rating curve well defined between discharges 9,370 and 302,000 second-feet. Gage read once daily to tenths. Daily discharge ascertained by applying daily gage heights to rating table except for period when flow was affected by backwater from Ohio River (see footnote to table of daily discharge). Records good except those estimated which are fair.

COOPERATION.—Gage-height record furnished by United States Weather Bureau.

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

Daily discharge, in second-feet, of Tennessee River at Johnsonville, Tenn., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	14,500	17,800	17,400			185,000		42,500	31,000	27,700	62,800	26,500
2	14,500	16,500	17,800					41,800	34,200	25,900	57,300	25,300
3	14,500	16,100	17,800		160,000			40,400	37,000	24,700	52,000	24,100
4	14,800	15,200	17,800					38,300	39,000	23,500	46,100	24,100
5	14,800	15,200	17,800					43,200	37,600	22,900	41,800	25,300
6	15,200	15,200	18,300		166,000			46,800	34,900	23,500	39,700	28,400
7	15,600	15,200	19,700		156,000			50,500	34,200	24,100	36,300	34,200
8	16,100	15,600	20,700		138,000			50,500	39,000	24,100	34,200	36,300
9	15,600	15,600	20,700		117,000			47,600	48,300	23,500	32,900	37,000
10	15,600	15,200	21,300	120,000	99,300			44,700	64,400	21,800	31,600	34,200
11	15,600	15,200	21,300		78,600		168,000	42,500	75,200	21,300	31,000	31,000
12	15,600	14,500	21,300		70,200			40,400	79,500	20,700	30,300	29,000
13	14,800	13,700	21,300		70,200			38,300	78,600	19,700	29,000	25,900
14	14,500	13,700	21,800		60,400			37,000	71,000	18,700	25,900	22,400
15	14,100	13,700	21,800		57,300			36,300	61,200	17,400	24,100	20,700
16	13,700	13,400	21,800		58,800	291,000		35,600	52,800	18,700	25,300	19,200
17	13,700	13,400	21,800		59,600			34,900	48,300	20,700	27,700	19,200
18	14,100	13,400	21,800		60,400			34,200	44,700	20,700	27,700	19,200
19	15,200	13,400	21,800	88,900	60,400			32,900	40,400	23,500	26,500	20,200
20	15,200	13,400	21,300	95,800	65,200			32,200	37,000	33,600	25,900	19,700
21	15,200	13,700	21,300	105,000	90,600		77,800	31,600	33,600	61,200	25,900	18,700
22	15,200	14,500	20,700	133,000	135,000		71,000	31,600	32,900	89,800	25,900	17,800
23	15,200	14,800	20,700	150,000	167,000		65,200	32,200	30,300	93,200	27,700	16,900
24	16,100	15,200	23,500	163,000	180,000		61,200	32,200	29,600	94,100	27,700	15,600
25	17,400	15,200	24,100	168,000	185,000		53,500	31,600	31,000	95,800	27,700	15,600
26	18,700	14,800	24,100		192,000		53,500	30,300	30,300	103,000	25,900	15,200
27	20,200	14,800	24,100		194,000		50,500	30,300	29,600	107,000	23,500	14,500
28	22,400	15,200	34,200	132,000	193,000		47,600	31,000	29,600	102,000	21,800	14,100
29	23,500	15,600	64,400		.....		46,100	29,600	29,600	92,400	21,300	18,300
30	21,300	16,100	98,400		.....		44,700	29,000	29,000	83,800	23,500	32,200
31	19,200	.....	117,000		.....		.....	29,000	.....	71,000	25,900	.....

NOTE.—Daily discharge estimated, because of backwater effect from Ohio River, from the flow at Florence as follows: Jan. 1–18, 26–31: Feb. 1–5: Mar. 2–31: Apr. 1–20. Braced quantities are the estimated means for the indicated periods.

Monthly discharge of Tennessee River at Johnsonville, Tenn., for the year ending Sept. 30, 1917.

[Drainage area, 38,500 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	23,500	13,700	16,200	0.421	0.49
November	17,800	13,400	14,800	.384	.43
December	117,000	17,400	28,300	.735	.85
January	.....	.....	124,000	3.22	3.71
February	.....	.....	123,000	3.19	3.32
March	.....	.....	288,000	7.48	8.62
April	.....	.....	131,000	3.40	3.79
May	50,500	29,000	37,100	.964	1.11
June	79,500	29,000	43,100	1.12	1.25
July	107,000	17,400	46,800	1.22	1.41
August	62,800	21,300	31,800	.826	.95
September	37,000	14,100	23,400	.608	.68
The period	.....	13,400	75,500	1.96	26.61

SOUTH FORK OF HOLSTON RIVER AT BLUFF CITY, TENN.

LOCATION.—At highway bridge at Bluff City, Sullivan County, 300 feet below Virginia & Southwestern Railway bridge, 1 mile below mouth of Indian Creek, and about 10 miles upstream from mouth of Watauga River.

DRAINAGE AREA.—828 square miles.

RECORDS AVAILABLE.—July 17, 1900, to September 30, 1917.

GAGE.—Vertical staff attached to downstream side of bridge pier, nearest the right bank.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge; also from railroad bridge 300 feet above where the section is much better except at low stages when the current becomes sluggish.

CHANNEL AND CONTROL.—Bed of river very rough. Control consists of a shallow ledge; probably permanent. Depth and velocity of current very irregular.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.3 feet at noon, March 5 (discharge, 15,600 second-feet); minimum stage recorded zero, August 28 and 29 (discharge, 135 second-feet).

1900–1917: Maximum stage recorded, 11.45 feet February 28, 1902 (discharge, 33,000 second-feet); minimum stage recorded, −0.1 foot October 16–19, 21–25, 26, 28–31, and November 1, 1904 (discharge, 150 second-feet).

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

REGULATION.—Some diurnal fluctuation caused by operation of small mills upstream.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined below 25,700 second-feet. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good, except those for stages below 800 second-feet, which are only fair, owing to lack of discharge measurements for checking the rating curve at low water.

COOPERATION.—Gage-height record furnished by United States Weather Bureau.

Daily discharge, in second-feet, of South Fork of Holston River at Bluff City, Tenn., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	590	420	590	1,680	3,040	2,900	1,790	1,380	650	475	530	370
2	475	370	530	1,190	2,760	7,410	1,680	1,380	715	420	650	370
3	420	325	475	1,280	2,250	7,200	1,580	1,190	650	370	530	325
4	420	325	475	6,180	2,010	8,490	1,480	1,020	715	370	530	325
5	370	370	475	8,720	1,790	14,200	1,900	1,020	715	420	420	285
6	370	370	475	8,050	1,580	7,410	4,560	1,020	590	370	370	245
7	370	325	420	5,080	1,580	4,900	3,610	860	590	370	325	212
8	325	325	370	3,610	1,480	3,760	2,760	1,020	530	420	325	245
9	325	325	370	2,630	1,480	3,320	2,500	1,280	590	590	370	940
10	530	370	420	2,250	1,190	2,760	2,130	1,380	785	420	420	785
11	530	370	420	1,790	1,190	2,500	1,900	1,280	1,020	370	420	475
12	475	370	475	1,580	1,100	2,370	1,680	1,380	940	370	370	370
13	420	370	475	1,380	1,020	5,440	1,680	1,280	785	420	325	325
14	370	420	530	1,580	1,020	4,220	1,900	1,190	650	370	325	285
15	370	420	590	2,130	1,020	3,760	1,580	1,100	3,180	785	325	285
16	420	420	420	2,010	1,280	3,040	1,480	1,020	1,480	1,280	530	285
17	420	420	370	1,790	1,380	5,440	1,380	860	1,020	2,010	590	245
18	715	370	420	1,790	1,900	7,410	1,280	785	940	1,100	530	245
19	530	370	420	1,790	2,010	4,730	1,196	650	785	860	420	285
20	650	325	530	1,790	3,460	3,460	1,190	650	715	715	370	245
21	650	325	590	1,580	5,260	2,900	1,100	650	650	650	370	245
22	590	325	1,020	6,380	3,460	3,040	1,020	650	590	715	325	212
23	590	325	1,380	6,780	2,500	2,500	1,020	715	590	1,580	370	245
24	530	370	1,280	3,760	4,560	5,990	940	785	530	1,380	325	212
25	530	420	1,100	2,760	5,260	7,830	940	650	420	1,680	325	212
26	475	370	940	2,250	3,460	4,560	940	650	475	1,900	285	212
27	420	325	715	1,900	2,900	3,610	860	590	420	1,900	245	212
28	370	370	860	1,480	2,370	3,040	860	2,010	785	1,190	185	475
29	370	370	6,580	2,010	.....	2,500	860	1,020	590	860	185	475
30	370	650	3,320	4,900	.....	2,250	860	860	590	715	245	370
31	420	.....	1,680	3,610	.....	2,010	.....	785	.....	650	325	.....

Monthly discharge of South Fork of Holston River at Bluff City, Tenn., for the year ending Sept. 30, 1917.

[Drainage area, 828 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	715	325	465	0.562	0.65
November	650	325	374	.452	.50
December	6,580	370	926	1.12	1.29
January	8,720	1,190	3,090	3.73	4.30
February	5,260	1,020	2,300	2.78	2.90
March	14,200	2,010	4,680	5.65	6.51
April	4,560	860	1,620	1.96	2.19
May	2,010	590	1,000	1.21	1.40
June	3,180	420	790	.954	1.06
July	2,010	370	830	1.00	1.15
August	650	185	383	.463	.53
September	940	212	334	.403	.45
The year	14,200	185	1,400	1.69	22.93

HOLSTON RIVER NEAR ROGERSVILLE, TENN.

LOCATION.—At Virginia & Southwestern Railway bridge near Austin Mill, Hawkins County, half a mile below new county highway bridge, 2 miles downstream from mouth of Dodson Creek, 3 miles south of Rogersville, and 11 miles northeast of Bulls Gap, Tenn.

DRAINAGE AREA.—3,060 square miles.

RECORDS AVAILABLE.—March 10, 1902 (daily discharge record beginning January 1, 1904) to September 30, 1917.

GAGE.—Vertical staff attached to right side of bridge pier nearest the right bank.

DISCHARGE MEASUREMENTS.—Made from the steel highway bridge, about half a mile upstream from gage.

CHANNEL AND CONTROL.—Bed of stream composed of solid rock, boulders and gravel. Right bank high and not subject to overflow; left bank high, but subject to overflow at extremely high stages. Control formed by rock shoals below bridge; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 17.1 feet at 8 a. m. March 5 (discharge, 56,300 second-feet); minimum stage recorded, 1.4 feet at 8 a. m., November 9, 10, December 18, and September 17–27 (discharge, 850 second-feet).

1904–1917: Maximum stage recorded, 19.1 feet, March 28, 1913 (discharge, about 67,000 second-feet); minimum stage recorded, 1.0 foot October 23 to November 3, 1904 (discharge, 490 second-feet).

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

REGULATION.—Operation of power plants a long distance upstream causes some diurnal fluctuations in stage.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice. Rating curve well defined below 33,000 second-feet; extended above that point. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records fair.

Discharge measurements of Holston River near Rogersville, Tenn., during the year ending Sept. 30, 1917.

[Made by L. J. Hall.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Oct. 28	1.59	1,120
Dec. 14	1.94	1,800
Mar. 3	10.78	32,200

Daily discharge, in second-feet, of Holston River near Rogersville, Tenn., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,780	1,570	1,570	5,630	9,850	11,700	6,840	4,500	1,950	1,760	2,350	1,570
2	1,950	1,570	1,950	4,230	9,850	31,200	6,230	4,770	1,950	1,570	1,950	1,950
3	1,570	1,390	1,760	4,500	9,140	33,100	5,930	4,500	2,150	1,570	2,350	1,760
4	1,570	1,390	1,760	15,400	6,840	40,700	5,340	3,720	2,150	1,570	1,950	1,390
5	1,390	1,210	1,760	26.600	6,230	56,300	5,930	3,470	2,150	1,570	1,950	1,210
6	1,210	1,210	1,760	33,100	5,980	36,900	10,200	3,470	1,950	1,390	1,760	1,030
7	1,030	1,030	1,760	21,700	5,980	19,100	11,300	3,230	1,760	1,390	1,570	1,030
8	1,030	1,030	1,760	12,800	5,580	14,300	9,140	3,230	1,760	1,210	1,570	1.030
9	1,210	850	1,570	9,140	9,850	12,100	8,460	3,470	1,760	1,950	1,570	1,030
10	1,210	850	1,570	7,150	4,500	9,850	7,790	4,230	1,950	1,760	1,950	3,000
11	1,030	1,030	1,760	5,930	3,970	8,460	6,840	4,230	2,780	1,760	1,760	2,150
12	1,210	1,030	1,760	5,340	3,970	8,120	5,930	4,230	2,780	1,570	1,570	1,760
13	1,210	1,210	1,760	4,230	3,230	16,900	6,230	4,500	2,350	1,570	1,570	1,570
14	1,210	1,030	1,950	4,500	3,000	15,000	6,530	3,970	1,950	1,570	1,390	1,210
15	1,030	1,390	1,760	5,050	3,470	13,600	6,230	3,720	2,560	1,760	1,390	1,030
16	1,030	1,390	2,350	5,930	3,970	10,600	5,340	3,470	6,230	3,970	1,390	1,030
17	1,030	1,390	1,390	5,630	5,050	17,600	4,770	3,000	3,970	7,470	1,950	850
18	1,210	1,210	850	5,050	5,340	25,900	4,500	2,780	2,780	6,230	2,150	850
19	2,150	1,210	1,390	5,050	7,150	18,000	4,230	2,780	2,560	4,230	1,570	850
20	1,950	1,210	1,950	4,770	13,600	12,400	3,970	2,560	2,150	3,970	1,570	850
21	2,780	1,210	1,950	4,770	21,000	10,200	3,720	2,350	2,150	2,560	1,390	850
22	2,150	1,030	2,780	10.600	14,300	10,600	3,720	2,150	2,150	2,560	1,210	850
23	1,760	1,030	5,340	22,.00	9,850	9,140	3,720	2,350	1,950	2,560	5,930	850
24	1,760	1,210	5,630	13,600	15,400	17,600	3,470	2,350	1,950	5,340	1,950	850
25	1,570	1,390	3,970	9,140	19,100	29,700	3,230	2,350	1,760	5,050	1,760	850
26	1,390	1,760	3,000	7,470	13,900	18,400	3,000	2,150	1,760	6,530	1,760	850
27	1,390	1,760	2,780	6,530	10,200	13,200	3,000	1,950	1,570	5,050	1,390	850
28	1,390	1,390	5,340	5,630	8,120	12,100	3,000	1,950	1,570	3,970	1,390	1,210
29	1,210	1,570	16,100	8,800	.....	9,490	3,000	3,230	2,350	4,230	1,210	1,950
30	1,390	1,390	13,900	17,200	.....	7,790	3,230	2,560	1,950	3,470	1,030	1,760
31	1,390	.....	7,470	12,400	.....	7,150	.....	2,150	.....	2,560	1,390	.....

NOTE.—Discharge, Feb. 6-8, estimated by comparison with records of flow for South Fork of Holston River at Bluff City, Tenn.

Monthly discharge of Holston River near Rogersville, Tenn., for the year ending Sept. 30, 1917.

[Drainage area, 3,060 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,780	1,030	1,490	0.487	0.56
November	1,760	850	1,260	.412	.46
December	16,100	850	3,300	1.08	1.24
January	33,100	4,230	10,000	3.27	3.77
February	21,000	3,000	8,520	2.78	2.90
March	56,300	7,150	18,000	5.88	6.78
April	11,300	3,000	5,490	1.79	2.00
May	4,770	1,950	3,210	1.05	1.21
June	6,230	1,570	2,290	.748	.83
July	7,470	1,210	3,020	.987	1.14
August	5,930	1,030	1,800	.588	.68
September	3,000	850	1,270	.415	.46
The year	56,300	850	4,970	1.62	22.03

LITTLE TENNESSEE RIVER AT JUDSON, N. C.

LOCATION.—At footbridge near Southern Railway Station at Judson, Swain County.

DRAINAGE AREA.—668 square miles (measured by Knoxville Power Co. on topographic maps).

RECORDS AVAILABLE.—April 16, 1912, to September 30, 1915; January 1, 1916, to September 30, 1917; June 25, 1896, to September 30, 1913, at old station of Geological Survey at Southern Railway bridge.

GAGE.—Friez water-stage recorder about 500 feet below footbridge.

CHANNEL AND CONTROL.—Practically permanent.

EXTREMES OF DISCHARGE.—Maximum mean daily discharge during year, 23,000 second-feet, March 4; minimum mean daily stage, 17.53 feet, August 29 (discharge, 602 second-feet).

1892–1912: Maximum stage recorded (old Geological Survey station) 13.92 feet, December 29, 1901 (discharge, 57,500 second-feet); minimum stage recorded, 2.10 feet, October 13 to November 1 and December 20, 1904 (discharge, 275 second-feet).

1913–1917: Maximum mean daily discharge (Knoxville Power Co.'s station), 23,000 second-feet March 4, 1917; minimum mean daily stage recorded, 17.1 feet, September 17, October 1 and 2, 1914 (discharge, 380 second-feet).

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

COOPERATION.—Daily discharge record furnished by Knoxville Power Co.

Daily discharge, in second-feet, of Little Tennessee River at Judson, N. C., for the years ending Sept. 30, 1916 and 1917.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916.									
1	3,468	5,508	1,823	1,104	1,048	1,449	1,216	2,416	1,008
2	3,202	8,874	2,416	1,279	1,024	1,326	1,270	2,966	1,120
3	2,922	7,587	2,680	1,459	1,016	1,402	1,261	2,636	1,146
4	2,647	6,033	2,328	1,656	1,072	1,384	1,146	2,383	1,032
5	2,482	3,662	2,086	1,421	1,032	1,497	1,104	2,889	970
6	2,757	3,373	1,987	1,586	985	1,440	1,048	2,526	963
7	2,856	3,054	2,207	1,507	925	3,166	1,080	2,636	940
8	2,801	2,801	2,229	1,921	910	2,086	2,394	2,229	925
9	2,559	2,680	1,932	1,866	889	1,586	10,228	2,471	1,000
10	2,383	2,702	1,855	1,697	875	1,449	14,980	2,372	1,280
11	2,416	2,448	1,781	1,636	868	1,478	11,840	2,229	1,180
12	2,361	2,328	1,676	1,556	861	2,042	7,986	2,042	940
13	3,440	2,372	1,626	1,488	1,032	1,987	5,676	1,950	889
14	3,262	2,251	1,586	1,431	1,048	1,844	4,226	1,873	896
15	2,801	2,108	1,606	1,374	868	2,394	3,426	1,775	955
16	2,757	2,042	1,497	1,336	840	2,768	6,390	1,700	882
17	2,680	2,009	1,440	1,440	847	2,713	7,944	1,660	840
18	2,529	1,976	1,412	1,317	847	2,108	5,067	1,850	819
19	2,529	1,823	1,412	1,252	917	1,791	4,563	1,650	903
20	2,462	1,770	1,364	1,225	903	1,707	5,466	1,450	896
21	2,448	1,739	1,440	1,364	875	1,707	5,991	1,402	868
22	3,528	1,666	1,393	1,279	1,297	1,440	5,046	1,355	868
23	3,584	1,707	1,317	1,216	7,814	1,326	5,613	1,355	770
24	2,911	1,932	1,279	1,198	7,052	1,656	4,500	1,383	742
25	2,658	1,910	1,279	1,252	3,442	1,866	4,245	1,450	721
26	2,570	1,686	1,317	1,207	2,536	1,536	3,496	1,146	714
27	2,658	1,616	1,954	1,180	2,065	1,469	3,840	1,137	700
28	2,625	1,596	1,686	1,138	1,770	1,345	3,262	1,112	700
29	2,427	1,718	1,497	1,121	1,739	1,326	2,966	1,112	1,760
30	2,273	.....	1,412	1,080	1,976	1,326	2,724	1,129	970
31	2,350	.....	1,355	.....	1,739	.....	2,559	1,040	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916–17.												
1	819	955	1,080	1,686	2,559	5,676	3,599	1,976	1,225	925	1,040	3,142
2	784	721	978	1,596	2,207	4,836	3,386	1,666	1,770	889	1,298	1,910
3	749	763	910	2,317	2,174	9,367	3,142	1,556	1,298	882	1,154	1,760
4	735	770	882	2,944	2,174	23,000	3,032	1,760	1,207	910	1,008	1,279
5	721	749	1,040	3,010	2,119	11,766	5,802	1,770	1,080	847	.....	1,032
6	756	735	940	3,510	2,064	8,196	5,214	1,566	1,024	847	.....	889
7	735	721	875	2,713	2,250	6,096	4,046	1,536	1,138	840	910	910
8	693	707	882	2,284	2,174	3,466	3,678	1,606	1,374	903	940	875
9	714	700	1,718	2,009	1,844	4,226	3,468	1,478	1,823	798	.....	889
10	798	784	1,478	1,802	1,606	3,652	3,098	1,440	2,537	756	1,171	847
11	721	728	1,243	1,680	1,636	3,482	2,933	1,402	1,760	742	889	770
12	686	721	1,225	1,487	1,536	3,286	2,801	1,374	1,440	728	805	735
13	673	812	1,100	1,487	1,469	3,228	2,867	1,307	1,279	728	770	707
14	666	985	1,010	2,944	1,440	3,286	2,658	1,279	1,307	714	749	707
15	666	1,000	1,000	2,504	1,954	2,955	2,482	1,270	1,364	728	784	700
16	700	860	805	3,412	1,739	2,856	2,372	1,234	1,146	728	819	875
17	714	812	.....	2,944	1,586	3,599	2,284	1,216	1,000	861	854	770
18	756	784	.....	2,669	3,286	3,554	2,229	1,180	978	970	714	779
19	1,540	749	.....	2,581	3,440	3,043	2,141	1,146	1,279	1,048	673	660
20	1,540	735	.....	2,306	7,776	2,944	2,075	1,112	1,440	1,048	798	634
21	1,030	721	.....	2,252	6,516	3,482	2,042	1,096	1,288	1,326	666	647
22	819	721	1,596	3,823	3,959	3,454	1,976	1,129	1,412	2,460	634	854
23	749	1,146	1,383	2,944	3,874	3,524	1,910	1,636	1,104	1,516	647	1,104
24	721	1,459	1,198	2,614	4,322	.....	1,866	1,180	1,024	1,345	686	826
25	693	1,064	1,129	2,284	3,310	.....	1,823	1,112	940	1,120	647	749
26	673	889	1,080	2,251	2,944	6,852	1,888	1,216	903	1,008	621	700
27	647	847	1,137	2,086	2,779	9,433	1,760	1,252	925	948	615	840
28	634	861	2,944	1,899	2,614	7,146	1,697	1,279	1,104	925	608	3,142
29	647	1,171	3,087	2,449	.....	5,508	1,760	1,189	1,421	861	602	1,616
30	1,355	1,243	2,185	2,339	.....	4,500	1,749	1,064	1,040	847	647	1,207
31	1,270	.....	1,770	2,086	.....	3,942	.....	1,088	.....	947	1,791	.....

Monthly discharge of Little Tennessee River at Judson, N. C., for the years ending Sept. 30, 1916 and 1917.

[Drainage area, 668 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1916.					
January	3,580	2,270	2,750	4.12	4.75
February	8,870	1,600	2,860	4.28	4.62
March	2,680	1,280	1,710	2.56	2.95
April	1,920	1,080	1,390	2.08	2.32
May	7,810	840	1,650	2.47	2.85
June	3,170	1,330	1,750	2.62	2.92
July	15,000	1,050	4,600	6.89	7.94
August	2,970	1,040	1,850	2.77	3.19
September	1,760	700	947	1.42	1.58
1916–17.					
October	1,540	634	819	1.23	1.42
November	1,460	700	864	1.29	1.44
January	3,820	1,490	2,420	3.62	4.17
February	7,780	1,440	2,760	4.13	4.30
March	23,000	2,860	.....	.....	.....
April	5,800	1,700	2,730	4.09	4.56
May	1,980	1,060	1,360	2.04	2.35
June	2,540	903	1,290	1.93	2.15
July	2,460	714	974	1.46	1.68
August	.....	602	.....	.....	.....
September	3,140	634	1,090	1.63	1.82
The year	23,000	602	.....	.....	.....

NOTE.—Monthly discharge computed by engineers of the Geological Survey from daily discharge record furnished by the Knoxville Power Co.

TUCKASEGEE RIVER AT BRYSON, N. C.

LOCATION.—At highway bridge in Bryson, Swain County, half a mile below mouth of Deep Creek and about 15 miles above junction of Tuckasegee River with Little Tennessee River.

DRAINAGE AREA.—673 square miles (measured by Knoxville Power Co. on topographic maps).

RECORDS AVAILABLE.—November 7, 1897, to September 30, 1915; January 1, 1916, to September 30, 1917.

GAGE.—Friez water-stage recorder, installed February 3, 1914 by the Knoxville Power Co., about 200 feet below the bridge to which old staff gage of the Geological Survey was attached. The old staff gage was used prior to installation of Friez gage.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Bed probably changes slightly after each flood, but conditions quickly become normal. Control composed of boulders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum mean daily stage recorded during year, 10.7 feet March 4 (discharge, 23,200 second-feet); minimum mean daily stage, 1.22 feet November 8 and 9 (discharge, 616 second-feet).

1898–1917: Maximum stage recorded, 11.0 feet (old Geological Survey gage) March 19, 1899 (discharge, 38,600 second-feet); minimum discharge recorded, 300 second-feet several days in September, October, and November, 1899, and August 25, 1902.

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

COOPERATION.—Daily-discharge record furnished by the Knoxville Power Co.

Daily discharge, in second-feet, of Tuckasegee River at Bryson, N. C., for the years ending Sept. 30, 1916 and 1917.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916.									
1	3,711	5,020	1,646	1,454	.....	1,440	1,454	1,958	1,148
2	3,235	7,111	2,168	1,454	.....	1,333	1,481	2,402	1,175
3	3,099	5,105	2,555	1,604	.....	1,454	1,646	2,334	1,241
4	2,776	3,966	2,119	1,746	.....	1,333	1,333	2,300	1,135
5	2,589	3,405	1,943	1,563	.....	1,214	1,254	2,912	1,109
6	2,912	3,065	1,943	1,805	.....	1,481	1,188	2,300	1,122
7	3,813	2,878	2,623	1,646	.....	2,912	1,188	2,521	1,083
8	3,371	2,623	2,555	2,006	.....	1,660	1,835	2,201	1,109
9	2,895	2,640	2,086	1,866	.....	1,413	6,737	2,022	1,280
10	2,691	2,504	1,974	1,646	.....	1,320	7,145	1,974	1,280
11	2,589	2,250	1,866	1,632	.....	1,387	5,598	1,881	1,346
12	2,521	2,184	1,775	1,618	.....	2,623	4,034	1,618	1,083
13	3,507	2,250	1,761	1,660	.....	1,990	3,082	1,927	1,018
14	2,861	2,022	1,746	1,563	1,005	1,590	2,674	2,038	1,044
15	2,521	1,912	1,881	1,494	927	2,912	2,504	1,776	1,122
16	2,521	1,866	1,688	1,427	876	3,099	3,694	1,660	1,044
17	2,725	1,835	1,604	1,481	889	2,963	4,765	1,805	1,018
18	3,813	1,776	1,590	1,333	876	2,151	3,660	1,820	1,031
19	2,691	1,660	1,590	1,293	940	1,850	3,456	1,576	966
20	2,555	1,632	1,549	1,241	876	1,761	4,408	1,494	927
21	2,521	1,576	1,732	1,360	839	1,703	4,901	1,427	876
22	2,521	1,535	1,660	1,254	1,307	1,508	4,119	1,400	814
23	2,657	1,563	1,535	1,188	5,615	1,427	3,609	1,400	779
24	2,487	1,791	1,454	.....	3,762	1,850	3,235	1,373	721
25	2,267	1,850	1,440	.....	2,167	1,943	3,320	1,307	689
26	2,317	1,563	1,494	.....	1,703	1,590	2,878	1,280	678
27	2,487	1,535	2,283	.....	1,440	1,467	2,844	1,241	678
28	2,402	1,563	1,866	.....	1,481	1,373	2,521	1,214	678
29	2,217	1,632	1,646	.....	1,618	1,387	2,402	1,201	1,563
30	2,054	.....	1,563	.....	2,151	1,333	2,135	1,346	889
31	2,119	.....	1,508	.....	1,761	.....	2,038	1,201	.....

Daily discharge, in second-feet, of Tuckasegee River at Bryson, N. C., for the years ending Sept. 30, 1916 and 1917—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916–7.												
1	733	744	1,214	1,688	4,595	5,260	3,541	2,086	1,227	1,044	1,161	2,844
2	678	689	1,057	1,549	3,218	4,510	3,320	1,746	1,333	979	1,467	1,632
3	668	678	979	4,306	2,742	9,380	3,099	1,674	1,161	1,031	1,660	1,703
4	657	647	966	4,255	2,417	23,180	2,946	1,927	1,188	1,018	1,229	1,333
5	668	657	1,241	3,082	2,007	9,980	3,218	1,805	1,096	966	1,096	1,148
6	699	647	1,109	3,184	1,974	6,295	4,391	1,646	1,070	927	992	1,044
7	668	626	992	2,436	1,820	5,068	3,745	1,646	1,267	1,083	1,070	966
8	668	616	966	2,103	1,788	4,850	3,626	1,732	1,413	1,173	1,135	914
9	689	616	1,674	1,866	1,746	4,055	3,541	1,618	1,912	953	1,175	889
10	733	721	1,360	1,703	1,467	3,725	3,201	1,590	2,470	889	1,109	863
11	699	647	1,161	1,578	1,522	3,336	2,980	1,563	1,618	889	979	839
12	668	626	1,188	1,347	1,388	3,558	2,861	1,618	1,400	826	902	814
13	657	841	1,031	1,413	1,333	3,575	3,133	1,549	1,280	839	889	779
14	647	1,096	.....	3,524	1,333	3,490	2,776	1,521	1,467	802	863	767
15	647	966	.....	2,385	1,834	3,201	2,572	1,481	1,413	1,214	1,057	767
16	1,031	814	.....	3,439	1,535	3,048	2,453	1,440	1,188	1,280	1,188	779
17	779	755	1,018	2,696	1,467	4,187	2,351	1,400	1,135	1,267	1,031	791
18	814	744	.....	2,623	3,320	3,728	2,283	1,360	1,057	1,508	902	755
19	2,385	710	.....	2,523	3,942	3,320	2,234	1,333	1,227	1,508	826	733
20	1,387	710	.....	2,167	6,380	3,065	2,168	1,307	1,346	1,440	863	721
21	1,044	699	1,057	2,086	4,467	3,779	2,119	1,280	1,241	1,896	889	733
22	901	688	1,576	6,706	3,422	3,371	2,070	1,320	1,373	2,470	814	940
23	839	1,135	1,267	3,162	3,012	3,371	2,006	1,549	1,135	1,850	814	927
24	790	1,400	1,148	2,674	3,878	7,955	1,958	1,293	1,109	1,731	814	837
25	755	927	1,096	2,351	3,081	5,496	1,896	1,214	1,070	1,494	721	802
26	721	839	1,070	2,070	2,793	4,952	2,070	1,254	1,005	1,508	688	755
27	710	839	1,400	1,846	2,735	7,026	1,850	1,293	1,005	1,467	668	876
28	678	876	4,935	1,702	2,334	5,547	1,790	1,453	1,148	1,604	657	2,691
29	721	1,241	3,490	2,810	.....	4,748	2,135	1,320	1,508	1,333	668	1,373
30	1,096	1,400	2,267	2,317	.....	4,187	1,990	1,201	1,214	1,201	721	1,083
31	901	.....	1,790	2,030	.....	3,796	.....	1,175	.....	1,175	1,494	.....

Monthly discharge of Tuckasegee River at Bryson, N. C., for the years ending Sept. 30, 1916 and 1917.

[Drainage area, 673 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1916.					
January	3,810	2,050	2,760	4.10	4.73
February	7,110	1,540	2,490	3.70	3.99
March	2,620	1,440	1,830	2.72	3.14
April 1–23	2,010	1,190	1,540	2.29	1.96
May 14–31	5,620	839	1,680	2.50	1.67
June	3,100	1,210	1,780	2.64	2.94
July	7,140	1,190	3,130	4.65	5.36
August	2,910	1,200	1,770	2.63	3.03
September	1,560	678	1,020	1.52	1.70
1916–17.					
October	2,380	647	830	1.23	1.42
November	1,400	616	820	1.22	1.36
January	6,710	1,350	2,570	3.82	4.40
February	6,380	1,330	2,630	3.91	4.07
March	23,200	3,050	5,320	7.90	9.11
April	4,390	1,790	2,680	3.98	4.44
May	2,090	1,180	1,500	2.23	2.57
June	2,470	1,000	1,300	1.93	2.15
July	2,470	802	1,270	1.89	2.18
August	1,660	657	985	1.46	1.68
September	2,840	721	1,070	1.59	1.77

NOTE.—Monthly discharge computed by engineers of U. S. Geol. Survey from daily-discharge records furnished by Knoxville Power Co.

HIWASSEE RIVER AT MURPHY, N. C.

LOCATION.—At highway bridge 100 feet upstream from Louisville & Nashville Railroad bridge, 300 feet from railroad station, which is on right side of river, four blocks from Murphy post office, Cherokee County, and half a mile upstream from mouth of Valley River.

DRAINAGE AREA.—410 square miles.

RECORDS AVAILABLE.—June 26, 1896, to August 8, 1897; October 19, 1897, to June 30, 1917.

GAGE.—Chain gage attached to downstream side of bridge; read by Miss Willie Mingus.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge.

CHANNEL AND CONTROL.—At gage the bed is mostly solid rock, and river is confined by masonry bridge abutments. Below gage the bed of stream is composed largely of sand and gravel. Low-water control is formed by a gravel and boulder riffle; high-water control is formed partly by masonry piers of railroad bridge and the riffles below. Control is changeable, owing to shifting of material that forms upper riffle.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 14.7 feet at noon, March 4 (discharge, 19,700 second-feet); minimum stage recorded, 5.2 feet at 7 a. m. October 13–18, 28 and 29 (discharge, 375 second-feet).

1896–1917: Maximum stage recorded, 18.4 feet March 19, 1899 (discharge, 22,400 second-feet); minimum stage recorded, 4.8 feet September 18, 1914 (discharge, 140 second-feet).

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

REGULATION.—Negligible.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve fairly well defined below 3,700 second-feet. Gage read to half-tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records fair.

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

[Made by L. J. Hall.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Oct. 4	5.28	426
Dec. 13	5.73	787
Feb. 12	5.90	979

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	510	590	590	850	4,100	2,580	2,000	1,390	850
2	475	510	550	1,080	2,130	3,310	2,270	1,210	1,300
3	440	475	550	985	1,670	6,190	1,770	1,080	940
4	440	440	550	2,270	1,480	15,000	1,770	1,120	985
5	440	440	590	1,570	1,390	9,700	3,310	1,300	805
6	440	408	550	1,880	1,300	4,500	3,310	1,210	760
7	408	408	510	1,570	1,210	3,310	2,580	1,120	760
8	408	408	510	1,300	1,210	2,930	2,130	1,210	760
9	408	440	1,210	1,210	1,210	2,270	2,130	1,080	1,030
10	408	440	895	1,030	1,030	2,000	1,880	1,030	1,880
11	408	440	760	985	1,030	1,880	1,770	1,030	1,120
12	408	408	760	850	985	1,770	1,670	1,030	985
13	375	510	670	850	940	1,880	1,770	940	895
14	375	670	590	1,480	895	1,770	1,570	940	805
15	375	715	630	1,120	1,120	1,670	1,570	895	940
16	375	590	510	1,880	1,080	1,570	1,480	895	805
17	375	510	550	1,770	985	1,770	1,390	895	760
18	375	475	590	1,480	2,000	2,000	1,390	850	715
19	2,000	440	590	1,770	2,270	1,670	1,390	850	715
20	670	440	510	1,570	6,630	1,670	1,300	805	850
21	510	440	590	1,390	3,700	2,270	1,300	805	760
22	440	440	805	2,930	1,670	3,120	1,210	805	805
23	440	475	760	2,000	2,000	3,310	1,210	760	670
24	440	760	715	1,570	2,750	19,200	1,210	805	630
25	408	590	670	1,480	2,000	6,850	1,210	760	590
26	408	550	630	1,300	1,770	3,700	1,390	760	590
27	408	510	590	1,210	1,670	6,410	1,210	805	630
28	375	510	1,210	1,210	1,570	4,100	1,120	805	715
29	375	850	1,770	1,210	.....	3,310	1,120	805	760
30	670	715	1,300	1,390	.....	2,580	1,390	715	590
31	760	.....	1,030	1,300	.....	2,270	.....	670	.....

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

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,000	375	495	1.21	1.40
November	850	408	520	1.27	1.42
December	1,770	510	733	1.79	2.06
January	2,930	850	1,440	3.51	4.05
February	6,630	895	1,850	4.51	4.70
March	19,200	1,570	4,080	9.95	11.47
April	3,310	1,120	1,690	4.12	4.60
May	1,390	670	948	2.31	2.66
June	1,880	590	847	2.07	2.31

VALLEY RIVER AT TOMOTLA, N. C.

LOCATION.—At steel highway bridge 600 feet from Tomotla post office, Cherokee County, on Southern Railway, 5 miles northeast of Murphy, N. C.; half a mile upstream from Rodgers Creek, and 1 mile downstream from Colvards Creek.

DRAINAGE AREA.—120 square miles.

RECORDS AVAILABLE.—June 29, 1904, to December 31, 1909; January 21, 1914, to April 30, 1917, when station was discontinued temporarily.

GAGE.—In two sections; lower section, 0.0 to 5.4 feet, is on a sloping timber which is bolted to marble bedrock; upper section, 5.4 to 10 feet, is a vertical staff bolted to timber on old bridge pier. This is the same gage that was in use when station was discontinued in 1909. Gage read by J. T. Hayes.

DISCHARGE MEASUREMENTS.—Made from new single-span steel bridge over site of old footbridge.

CHANNEL AND CONTROL.—Bed of channel composed of gravel, which shifts during big floods. Control, which was at first thought to be a permanent rock ledge just below bridge, now seems to be partly formed by gravel bars in conjunction with the ledge; shifts during great floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 15.9 feet at noon, March 4 (discharge, 10,100 second-feet); minimum stage recorded, 1 foot at 6 p. m. October 13, and 7 a. m. and 6 p. m., October 14–16 (discharge, 60 second-feet).

1904–1909 and 1914–1917: Maximum stage recorded, 17.3 feet November 19, 1906 (discharge, about 10,400 second-feet); minimum stage recorded, 0.7 foot October 28 to November 2, 1904 (discharge, 22 second-feet).

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

REGULATION.—Very little diurnal fluctuation caused by operation of small mills upstream.

ACCURACY.—Stage-discharge relation probably permanent during year. Rating curve fairly well defined between 60 and 400 second-feet; extension of curve above 400 second-feet not considered accurate. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair for stages below 500 second-feet.

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

[Made by L. J. Hall.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Oct. 5	1.09	72.6
Dec. 8	1.40	132

Daily discharge, in second-feet, of Valley River at Tomotla, N. C., for the period Oct. 1, 1916, to Apr. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1	75	95	200	355	2,990	3,690	660
2	75	85	165	312	1,210	2,080	620
3	75	75	145	660	545	5,260	510
4	75	75	135	750	545	8,060	510
5	75	75	188	800	510	4,620	1,270
6	75	75	145	910	475	3,940	1,090
7	75	75	135	660	385	3,270	660
8	75	75	135	385	385	2,600	750
9	75	85	288	385	340	1,926	580
10	75	105	212	312	300	1,250	580
11	75	75	200	300	300	580	510
12	75	95	212	250	275	660	510
13	68	125	188	225	250	580	510
14	60	250	155	660	250	660	445
15	60	200	135	620	385	545	385
16	60	145	135	800	300	545	385
17	75	115	135	620	325	1,210	355
18	85	105	135	750	1,330	855	340
19	165	95	135	660	2,010	660	325
20	105	95	135	580	3,690	580	300
21	75	95	165	510	1,660	1,330	300
22	75	75	275	1,870	855	1,030	300
23	75	385	212	910	750	855	275
24	75	175	200	660	970	3,480	275
25	75	135	188	445	750	1,870	275
26	75	135	175	415	580	2,220	300
27	75	135	188	385	545	3,980	250
28	75	188	1,270	340	2,710	1,800	250
29	75	212	750	580	.....	1,270	300
30	165	200	445	510	.....	910	250
31	105	.....	325	445	.....	750	.....

NOTE.—No gage-height record from afternoon of Mar. 5 to Mar. 10; discharge estimated.

Monthly discharge of Valley River at Tomotla, N. C., for the period Oct. 1, 1916, to Apr. 1, 1917.

[Drainage area, 120 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	165	60	81.4	0.678	0.78
November	385	75	128	1.07	1.19
December	1,270	135	242	2.02	2.33
January	1,870	225	583	4.86	5.60
February	3,690	250	915	7.62	7.94
March	8,060	545	2,030	16.92	19.48
April	1,270	250	469	3.91	4.36

NOTTELY RIVER NEAR RANGER, N. C.

LOCATION.—About half a mile downstream from Ranger, Cherokee County, which is on Louisville & Nashville Railroad, 7½ miles from Murphy, N. C., and 8 miles upstream from Hiwassee River, to which Nottely River is tributary.

DRAINAGE AREA.—272 square miles.

RECORDS AVAILABLE.—February 16, 1901, to December 31, 1905; January 22, 1914, to April 30, 1917, when station was discontinued temporarily.

GAGE.—Rod gage fastened to a large birch tree on left bank 75 feet upstream from highway bridge; zero same as for original gage which was destroyed by fire in 1913, when a new steel bridge replaced old wooden one. Gage read by A. D. Kilpatrick.

DISCHARGE MEASUREMENTS.—Made from downstream side of steel highway bridge on road from Ranger to Murphy, N. C. Measuring section is poor and uneven and current somewhat erratic, necessitating very careful measurements.

CHANNEL AND CONTROL.—Bed composed of boulders, gravel, and sand; permanent. Right bank high; left bank subject to overflow beyond bridge end at stages above 18 feet. Control is formed by a low shoal about 300 feet downstream from gage; permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 17.4 feet (estimated by observer) at 7 a. m. March 1 (discharge, about 5,780 second-feet); minimum stage recorded, 3.0 feet October 4–18, 23–31, and November 19–22 (discharge, 265 second-feet).

1901–1905 and 1914–1917: Maximum stage recorded, 19.4 feet at 10 a. m. July 10, 1916 (discharge, 6,580 second-feet); minimum stage recorded, 2.1 feet July 2 and 3, August 9, September 9–11, 14–16, 29 and 30, and October 1–4, 1914 (discharge, 89 second-feet).

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

REGULATION.—The operation of small mills upstream may cause slight diurnal fluctuations, but not enough to affect accuracy of determinations.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined below but extended above 800 second-feet. Gage read to tenths twice daily; gage not extended for use above stage 10 feet; determinations of flood stages subject to error, as they are obtained by measuring from reference point. Daily discharge ascertained by applying mean daily gage height to rating table. Records for stages below 800 second-feet, fair; for those above, poor.

Discharge measurements of Nottely River near Ranger, N. C., during the year ending Sept. 30, 1917.

[Made by L. J. Hall.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Oct 6	3.01	263
Dec. 11	3.69	414
Feb. 13	4.00	522

Daily discharge, in second-feet, of Nottely River near Ranger, N. C., for the period Oct. 1, 1916, to Apr. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1	359	524	653	555	1,620	5,780	1,230
2	310	790	524	587	1,380	1,620	1,230
3	287	653	465	1,230	862	2,420	1,190
4	265	653	359	1,160	790	4,980	1,120
5	265	587	359	862	755	4,580	2,020
6	265	524	359	790	721	2,020	1,740
7	265	465	359	721	637	1,620	1,420
8	265	359	334	653	653	1,580	1,380
9	265	310	524	653	620	1,340	1,310
10	265	310	494	620	587	1,160	1,270
11	265	310	465	587	555	1,120	1,230
12	265	310	410	555	555	1,080	1,160
13	265	359	359	524	524	1,160	1,040
14	265	524	359	1,160	524	1,160	1,040
15	265	465	359	1,010	524	1,190	1,010
16	265	359	334	934	524	524	1,010
17	265	310	334	862	524	1,460	971
18	265	310	334	790	1,510	1,230	934
19	1,190	265	465	653	1,620	1,120	898
20	524	265	410	524	4,580	934	862
21	410	265	410	465	2,420	1,940	826
22	310	265	384	1,380	1,230	1,580	826
23	265	862	384	1,160	862	1,980	790
24	265	653	359	1,080	1,620	4,180	790
25	265	524	334	1,010	1,190	2,620	755
26	265	410	334	934	1,080	1,980	971
27	265	359	334	862	1,010	3,380	790
28	265	359	1,620	790	934	2,300	755
29	265	862	826	653	.....	1,620	755
30	265	790	755	587	.....	1,460	1,190
31	265	.....	620	524	.....	1,310	.....

NOTE.—Gage heights, Feb. 20, Mar. 1, 4, 5, 24, and 27, estimated by observer; discharge may be considerably in error.

Monthly discharge of Nottely River near Ranger, N. C., for the period Oct. 1, 1916, to Apr. 30, 1917.

[Drainage area, 272 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,190	265	315	1.16	1.34
November	862	265	467	1.72	1.92
December	1,620	334	472	1.74	2.01
January	1,380	465	802	2.95	3.40
February	4,580	524	1,090	4.01	4.18
March	5,780	524	2,010	7.39	8.52
April	2,020	755	1,080	3.97	4.43

TOCCOA RIVER NEAR DIAL, GA.

LOCATION.—About 2,600 feet above Shallow Ford, 1 mile above Stanley Creek, 2½ miles below Big Creek, 3½ miles below Noontootley Creek, about 4 miles northwest of Dial, Fannin County, and about 12 miles by river above gaging station at Morganton.

DRAINAGE AREA.—175 square miles (measured on topographic maps).

RECORDS AVAILABLE.—January 1, 1913, to September 30, 1917. Records were obtained at Butts Bridge about 2 miles above Dial May 17, 1907, to June 30, 1908.

GAGE.—Bristol water-stage recorder. Sea-level elevation of zero of auxiliary staff gage, 1,781.13 feet.

DISCHARGE MEASUREMENTS.—Made from cable about 1,000 feet upstream from gage.

CHANNEL AND CONTROL.—Bed of stream consists of gravel and boulders; fairly smooth. Left bank is overflowed at a stage of about 12 feet. Control is formed by the head of rapids just below gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum mean daily stage during year, 6.47 feet March 4 (discharge, 4,700 second-feet); minimum stage, daily mean, 1 foot September 19 and 20 (discharge, 195 second-feet).

1913–1917: Maximum stage recorded, 10 feet at 6 p. m. July 9, 1916 (discharge 9,200 second-feet); minimum stage, 0.55 foot October 13, 29, and 30, 1914 (discharge, 109 second-feet).

REGULATION.—There are slight diurnal fluctuations due to operation of small mills upstream.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 4,000 second-feet; extended above 4,000 second-feet. Stage-discharge relation never affected by ice. Daily discharge ascertained by applying to the rating table mean daily gage height determined by inspecting gage-height graph. Records excellent.

Discharge measurements of Toccoa River near Dial, Ga., during the year ending Sept. 30, 1917.

[Made by L. J. Hall.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 2	1.24	278	Dec. 27	1.40	342
Nov. 1	1.35	317	Feb. 10	1.94	582
Dec. 6	1.27	282			

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	295	312	312	522	1,580	1,100	1,420	785	570	350	312	785
2	295	278	295	478	1,060	1,130	1,500	728	522	330	278	410
3	278	260	295	570	875	1,980	1,380	700	500	330	312	370
4	260	260	278	570	815	4,700	1,460	1,160	478	330	295	278
5	260	260	312	755	755	3,880	2,450	845	455	330	278	278
6	260	242	278	700	728	2,020	1,840	755	478	370	278	260
7	260	242	278	620	672	1,580	1,500	755	455	330	330	242
8	260	242	278	570	700	1,580	1,540	728	755	330	545	225
9	260	242	455	522	672	1,380	1,500	700	968	312	455	242
10	260	242	370	500	595	1,270	1,380	672	700	312	350	242
11	260	225	350	478	595	1,200	1,300	672	570	295	295	225
12	242	260	350	432	570	1,160	1,270	645	500	295	278	225
13	242	278	312	455	570	1,130	1,300	620	478	295	278	210
14	225	330	295	815	570	1,100	1,100	620	645	295	260	210
15	225	295	312	755	700	1,030	1,060	595	522	312	350	210
16	225	260	278	1,000	595	1,000	1,030	595	478	330	370	278
17	225	242	278	815	570	1,420	1,000	570	455	432	370	210
18	295	225	370	785	845	1,160	968	570	432	432	278	210
19	432	225	330	700	1,750	1,030	935	545	432	370	260	195
20	330	225	312	645	2,200	968	935	545	455	370	260	195
21	295	225	350	672	1,380	1,580	905	522	478	522	242	210
22	260	225	478	1,030	1,100	1,300	875	570	455	500	242	410
23	242	500	390	845	1,100	1,500	845	545	370	390	260	295
24	242	432	350	755	1,240	4,460	845	522	370	330	242	225
25	242	312	350	700	1,100	2,400	845	500	350	312	225	210
26	225	295	330	645	1,000	2,110	905	785	370	410	210	210
27	225	278	370	595	905	2,900	815	522	390	350	210	545
28	225	312	1,380	595	905	2,060	785	595	410	312	210	1,200
29	242	410	875	875	.....	1,840	785	522	390	330	210	478
30	700	370	570	700	.....	1,620	755	500	350	295	225	370
31	390	.....	522	645	.....	1,500	.....	620	.....	312	455	.....

Monthly discharge of Toccoa River near Dial, Ga., for the year ending Sept. 30, 1917.

[Drainage area, 175 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	700	225	280	1.60	1.84
November	500	225	283	1.62	1.81
December	1,380	278	397	2.27	2.62
January	1,030	432	669	3.82	4.40
February	2,200	570	934	5.34	5.56
March	4,700	968	1,780	10.20	11.76
April	2,450	755	1,170	6.69	7.46
May	1,160	500	645	3.69	4.25
June	968	350	493	2.82	3.15
July	522	295	349	1.99	2.29
August	545	210	296	1.69	1.95
September	1,200	195	322	1.84	2.05
The year	4,700	195	633	3.62	49.14

TOCCOA RIVER NEAR MORGANTON, GA.

LOCATION.—At highway bridge on road from Blueridge, Ga., to Morganton, half a mile downstream from mouth of Star Creek, 2 miles west of Morganton post office, Fannin County, 4 miles east of Blueridge, 12 miles downstream from Dial gaging station, 14 miles upstream from Georgia-Tennessee State line at Copperhill, Tenn., and 28 miles upstream from gaging station on Ocoee River at Emf, Tenn. At State line name of river is changed from Toccoa to Ocoee.

DRAINAGE AREA.—231 square miles (measured on topographic maps).

RECORDS AVAILABLE.—November 25, 1898, to March 31, 1903, and April 1, 1913, to September 30, 1917. Records 1898 to 1903 published in Water-Supply Paper 197, under "Toccoa River near Blueridge, Ga.

GAGE.—Bristol water-stage recorder on right bank 200 feet downstream from bridge and 150 feet downstream from the old vertical staff which was used from 1898 to 1903. Zeros of both gages, 1,544.5 feet above sea level, but on account of the slope in water surface the readings of the two gages do not agree for all stages. The water-stage recorder was installed in 1914 (exact date not recorded). A rod gage has been placed at site of automatic gage. Observer visits gage every day and checks record sheet with rod reading.

DISCHARGE MEASUREMENTS.—Made from cable about 1,800 feet downstream from gage.

CHANNEL AND CONTROL.—Bed composed of gravel and bowlders. Banks high; left subject to overflow at about gage height 15 feet; right bank not subject to overflow. Low-water control is a low shoal or riffle just below gage; high-water control is combination of shoals and banks. Control subject to small shifts at low stages.

EXTREMES OF DISCHARGE.—Maximum mean daily stage during year, 10.2 feet March 4 (discharge, 9,410 second-feet); minimum stage, mean from water-stage recorder, 2.50 feet October 15 (discharge, 285 second-feet).

1913–1917: Maximum stage recorded, 13.0 feet at 9 p. m. July 9, 1916 (discharge, 13,900 second-feet); minimum stage, 1.8 feet September 10, 14–17, 29, 30, and October 1, 1914 (discharge, 129 second-feet).

REGULATION.—Slight diurnal fluctuations probably caused by operation of small mills upstream.

ACCURACY.—Stage-discharge relation for stages below 870 second-feet changed during highwater March 4, 1917. Rating curve used to March 4 well defined below 3,500 second-feet and an extension above that point; curve used subsequent to March 4 is well defined below 3,500 second-feet and coincides with previous curve above 870 second-feet; change below 870 second-feet due to slight shift in low-water control. Stage-discharge relation not affected by ice. Daily discharge ascertained by applying to the rating table mean daily gage height obtained by inspecting gage-height graph. Records good.

Discharge measurements of Toccoa River near Morganton, Ga., during the year ending Sept. 30, 1917.

[Made by L. J. Hall.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Nov. 3	2.65	339	Dec. 28	4.70	1,720
Dec. 4	2.68	347	Feb. 6	3.44	766

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	338	395	395	575	1,980	1,500	1,700	982	729	429	456	1,220
2	338	355	375	545	1,260	1,380	1,660	834	663	404	404	632
3	320	320	355	605	982	2,380	1,580	834	632	404	483	483
4	320	320	355	665	945	9,410	1,580	1,340	632	404	378	404
5	320	320	375	870	835	2,950	1,740	982	600	404	331	354
6	320	320	355	870	835	2,220	2,140	870	600	456	331	331
7	320	302	320	698	765	1,940	1,820	870	632	404	378	331
8	320	302	355	635	800	1,940	1,900	870	908	404	663	354
9	338	302	575	575	765	1,700	1,780	798	1,340	378	632	331
10	320	338	440	545	665	1,580	1,660	798	1,020	354	483	331
11	320	302	395	518	665	1,500	1,580	764	729	354	483	310
12	302	320	395	465	665	1,500	1,540	764	663	331	378	290
13	302	375	355	490	635	1,420	1,540	729	663	331	354	290
14	302	440	338	1,100	605	1,380	1,300	729	945	354	331	290
15	285	375	355	870	835	1,300	1,260	696	663	404	331	331
16	320	320	320	1,260	698	1,220	1,220	696	570	404	404	456
17	302	320	338	1,020	665	1,780	1,180	663	600	456	456	354
18	320	302	395	908	1,020	1,460	1,140	663	600	540	354	290
19	800	302	395	870	1,820	1,340	1,140	663	600	512	331	290
20	418	302	355	730	2,740	1,260	1,100	663	600	483	331	290
21	338	302	395	800	1,540	1,980	1,100	663	600	982	310	290
22	320	302	490	605	1,420	1,660	1,060	663	600	729	310	456
23	320	665	440	782	1,420	1,860	1,020	696	570	600	331	429
24	302	575	418	870	1,660	6,530	982	632	570	483	310	310
25	302	395	395	800	1,380	2,740	982	632	570	456	290	290
26	302	355	375	730	1,180	2,460	1,060	870	570	540	290	290
27	302	338	375	665	1,860	3,200	945	663	570	512	290	456
28	302	395	1,580	665	1,820	2,380	908	729	600	483	290	1,500
29	302	545	1,020	1,020	.....	2,220	945	632	600	456	290	570
30	945	465	698	870	.....	2,740	945	632	456	429	331	429
31	518	.....	605	730	.....	1,740	.....	798	.....	404	834	.....

Monthly discharge of Toccoa River near Morganton, Ga., for the year ending Sept. 30, 1917.

[Drainage area, 231 square miles.]

Month	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	945	285	361	1.56	1.80
November	665	302	366	1.58	1.76
December	1,580	320	462	2.00	2.31
January	1,260	465	753	3.26	3.76
February	2,740	605	1,160	5.02	5.23
March	9,410	1,220	2,280	9.87	11.38
April	2,140	908	1,350	5.84	6.52
May	1,340	632	768	3.32	3.83
June	1,340	456	670	2.90	3.24
July	982	331	461	2.00	2.31
August	834	290	393	1.70	1.96
September	1,500	290	433	1.87	2.09
The year	9,410	285	786	3.40	46.19

OCOEE RIVER AT McHARGE, TENN.

LOCATION.—At Rogers Ferry county highway bridge, Polk County, about half a mile downstream from McHarge railroad siding, half a mile downstream from mouth of Potato Creek, and 2½ miles downstream from Copperhill, Tenn.

DRAINAGE AREA.—451 square miles (measured on topographic maps).

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

GAGE.—Vertical staff bolted to left downstream side of concrete bridge pier on left bank; read by B. V. Karaivanoff.

CHANNEL AND CONTROL.—Left bank subject to overflow at extreme stages, but water will always pass under bridge. Channel straight for about 300 feet above and 700 feet below gage. Control consists of solid rock riffle about 300 feet below gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of records, 6.0 feet, at 4 p. m., August 30 (discharge not determined); minimum stage recorded, 0.7 foot at 4 p. m., September 14 and 7 a. m., September 15 (discharge, 445 second-feet).

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined between 400 and 2,000 second-feet; extended above 2,500 second-feet. Gage read to half-tenths twice daily; oftener during high water. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Ocoee River at McHarge, Tenn., during the year ending Sept. 30, 1917.

[Made by L. J. Hall.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 27	2.35	1,760	Aug. 28	.73	461
June 2	1.69	1,140	Sept. 19	.78	481
July 18	1.75	1,220			

Daily discharge, in second-feet, of Ocoee River at McHarge, Tenn., for the year ending Sept. 30, 1917.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1	1,710	1,340	770	770	2,250	16	1,250	1,070	700	700	700
2	1,610	1,250	700	1,430	1,160	17	1,200	915	770	700	665
3	1,520	1,250	700	700	1,070	18	1,160	915	1,030	598	617
4	2,370	1,160	735	770	840	19	1,160	915	878	565	505
5	1,710	990	630	630	770	20	1,160	1,160	805	665	505
6	1,610	952	770	630	700	21	1,070	990	1,250	665	553
7	1,610	1,250	770	735	630	22	1,810	1,030	1,340	617	617
8	1,610	1,810	700	3,020	617	23	1,430	878	840	598	805
9	1,520	2,020	700	1,200	617	24	1,250	840	840	630	617
10	1,430	2,020	630	1,200	598	25	1,160	805	990	565	553
11	1,430	1,430	598	805	565	26	1,910	770	915	535	517
12	1,380	1,160	598	840	517	27	1,300	770	990	535	3,020
13	1,340	1,070	598	665	493	28	1,160	915	700	505	3,830
14	1,300	1,610	565	630	457	29	1,160	805	3,150	493	1,160
15	1,250	1,250	700	700	457	30	1,070	770	770	5,290	878
						31	1,250	.....	770	3,280	.....

Monthly discharge of Ocoee River at McHarge, Tenn., for the year ending Sept. 30, 1917.

[Drainage area, 451 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
May	2,370	1,070	1,420	3.15	3.63
June	2,020	770	1,140	2.53	2.82
July	3,150	565	868	1.92	2.21
August	5,290	493	1,020	2.26	2.61
September	3,830	457	909	2.02	2.25

OCOEE RIVER AT EMF, TENN.

LOCATION.—About 600 feet below Tennessee Power Co.'s plant No. 2, known as the "Caney Creek plant," half a mile upstream from Emf post office, Polk County, 1½ miles downstream from mouth of Goforth Creek, and 8 miles upstream from Parksville, Tenn.

DRAINAGE AREA.—530 square miles (determined by Tennessee Power Co.).

RECORDS AVAILABLE.—January 1, 1913, to September 30, 1917.

GAGE.—Bristol water-stage recorder on left bank; checked daily with a staff gage which is bolted to rock near the Bristol. Readings from gage give elevation above sea-level.

DISCHARGE MEASUREMENTS.—Made from cable at first good section one-half mile downstream from gage, near Emf post office.

CHANNEL AND CONTROL.—Bed of stream for several hundred feet below gage is composed of boulders, gravel and solid rock. Banks high, subject to small overflow. Control is formed by a shoal and island 700 feet downstream from gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum mean daily stage during year, 12.7 feet March 4 (discharge, 19,200 second-feet); minimum stage, mean for day, from water-stage recorder, 3.15 feet on October 8 (discharge, 440 second-feet).

1913, 1917: Maximum stage recorded, 13.7 feet at 12.30 a. m. July 10, 1916 (discharge, 21,400 second-feet); minimum stage, 2.77 feet September 15–17, 1914 (discharge, 285 second-feet).

REGULATION.—The operation of plant No. 2 causes considerable fluctuation at times, but, as a rule, this plant runs on a steady load, the quantity of water used depending largely on stage of river. Storage at diversion dam very small. When plant is shut down water overflows dam in a short time, so that periods of fluctuation will be short.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice. Rating curve well defined between 400 and 8,000 second-feet; above 8,000 second-feet curve is extended as a tangent. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting gage-height graph. Records excellent.

Discharge measurements of Ocoee River at Emf, Tenn., during the year ending Sept. 30, 1917.

[Made by L. J. Hall.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 12	3.26	594	Aug. 29	3.26	513
Feb. 20	7.22	7,110	Sept. 16	3.36	592
Aug. 23	3.39	676			

NOTE.—Discharge measurements, Aug. 29, and Sept. 16, were made from the suspension bridge 1,200 feet downstream from gage; measuring section good. All measurements at this station prior to Aug. 29, 1917, were made from the cable, 2,000 feet downstream from gage; measuring section rough. Discharge measurements made at the new section indicate that measurements at the old section gave too high results for stages below 2,000 second-feet.

Daily discharge, in second-feet, of Ocoee River at Emf, Tenn., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	501	673	776	1,130	3,900	5,260	3,700	1,890	1,240	802	758	2,550
2	466	568	673	1,170	2,920	4,740	3,600	1,720	1,220	784	706	1,690
3	466	530	623	1,360	1,960	4,320	3,400	1,690	1,180	802	681	875
4	459	523	592	1,570	1,700	19,200	3,200	2,370	1,180	811	741	848
5	459	516	623	1,570	1,960	12,600	6,420	2,200	1,100	767	656	750
6	447	479	648	1,890	1,640	5,060	5,580	1,720	1,030	793	623	698
7	453	472	576	1,460	1,690	8,830	4,110	1,640	1,320	838	681	698
8	440	466	776	1,320	1,420	5,060	4,110	1,630	1,890	776	1,690	706
9	447	472	1,130	1,130	1,430	5,370	4,110	1,590	1,760	706	1,740	903
10	487	545	961	1,040	1,280	3,500	3,600	1,570	1,630	681	1,640	681
11	538	494	820	980	1,240	3,110	3,200	1,510	1,460	640	903	607
12	487	501	741	922	1,160	3,020	3,020	1,490	1,290	640	723	592
13	487	508	698	913	1,110	3,200	3,020	1,420	1,110	631	681	568
14	479	811	615	2,280	1,110	3,020	2,820	1,400	1,180	640	689	568
15	466	784	640	1,690	1,340	2,820	2,730	1,380	1,460	673	715	508
16	479	553	615	2,730	1,360	2,550	2,550	1,330	1,110	723	875	706
17	472	561	592	2,370	1,280	4,220	2,370	1,300	1,130	793	961	951
18	553	523	673	1,820	2,640	3,600	2,280	1,290	1,080	1,960	732	592
19	1,590	494	866	1,820	4,220	2,820	2,200	1,820	980	1,080	723	615
20	922	472	741	1,570	8,170	2,550	2,120	1,240	1,180	884	848	508
21	656	472	706	1,480	5,580	4,740	2,120	1,210	1,130	1,320	829	501
22	576	472	970	3,300	3,600	4,320	2,040	1,490	1,100	2,820	640	584
23	530	866	866	2,460	3,200	5,790	1,960	1,470	980	1,130	615	838
24	516	1,240	866	1,890	3,500	5,580	1,820	1,220	884	884	607	623
25	516	758	793	1,630	2,550	8,390	1,690	1,180	838	820	553	508
26	501	640	758	1,470	2,200	6,850	2,040	1,180	793	932	538	523
27	466	584	741	1,360	2,120	6,850	1,960	1,310	942	838	523	793
28	466	648	3,600	1,300	1,890	6,630	1,890	1,320	932	793	530	2,920
29	479	848	2,730	2,200	.....	5,160	2,200	1,210	884	706	600	1,510
30	1,070	875	1,430	1,960	.....	4,420	2,120	1,100	838	750	1,200	932
31	990	.....	1,160	1,690	.....	3,900	.....	1,120	.....	706	1,890	.....

Monthly discharge of Ocoee River at Emf, Tenn., for the year ending Sept. 30, 1917.

[Drainage area, 530 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,590	440	576	1.09	1.26
November	1,240	466	612	1.15	1.28
December	3,600	576	935	1.76	2.03
January	3,300	913	1,660	3.13	3.61
February	8,170	1,110	2,430	4.58	4.77
March	19,200	2,550	5,400	10.2	11.76
April	6,420	1,690	2,930	5.53	6.17
May	2,370	1,100	1,480	2.79	3.22
June	1,890	793	1,160	2.19	2.44
July	2,820	631	907	1.71	1.97
August	1,890	523	848	1.60	1.84
September	2,920	501	878	1.66	1.85
The year	19,200	440	1,650	3.11	42.20

BIG BEAR RIVER NEAR RED BAY, ALA.

LOCATION.—At Norman Bridge 2½ miles east of Red Bay, Franklin County, 3 miles east of Mississippi State line, 4 miles downstream from mouth of Blue Creek, and 35 miles upstream from junction with Tennessee River.

DRAINAGE AREA.—254 square miles (measured on map compiled by United States Geological Survey, 1912; scale, 1:500,000).

RECORDS AVAILABLE.—August 24, 1913, to September 30, 1917.

GAGE.—Vertical staff attached to a sweet-gum tree on left bank, 25 feet upstream from bridge; read by Ed Bullen. On February 27, 1917, gage was found to have settled 0.27 foot. Gage was correct on January 2, 1915, when it was checked with bench mark. Flood of July, 1916, is assumed to have undermined tree to which gage is attached, causing it to settle. On April 9 and 11, 1918, settlement of gage was found to have increased to 0.53 foot at gage height 1.5 feet, the error increasing to 0.66 foot at 8.0-foot mark on gage, owing to inclination of gage. A gradual settlement of gage from July, 1916, to April 9, 1918, has been assumed and corrections applied to observer's gage readings before determining discharge.

CHANNEL AND CONTROL.—Bed of river consists of gravel; probably shifting. During extreme low water current is sluggish and irregular. Left bank subject to overflow at stages above 12 feet. Control is a gravel bar 100 feet downstream; practically permanent except for a shift which probably occurred in April, 1917.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 13.9 feet April 6 (discharge, 4,760 second-feet); minimum discharge, 20 second-feet September 13, 15, and 26.

1913–1917: Maximum stage recorded, 14.2 feet at 7 p. m. July 9, 1916 (discharge, 5,720 second-feet); minimum discharge, 15 second-feet July 7, 8, and September 18, 1914.

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

ACCURACY.—Stage-discharge relation practically permanent from 1913 until the high water in April, 1916, when the shift in control indicated by current-meter measurements made in April, 1918, probably occurred. Rating curve used August 24, 1913, to April 5, 1917, well defined between 400 and 3,000 second-feet and fairly well defined outside these limits. Curve used April 6 to September 30, 1917, well defined between 80 and 4,000 second-feet; poorly defined below 80 second-feet. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good from August, 1913, to probably June, 1916. Records from July to December, 1916, are only fair, and at low stages may be considerably in error, owing to large percentage errors introduced by small errors in gage-height corrections noted in paragraph concerning gage. Records from January to March, 1917, probably good; those from April to September, 1917, only fair, and discharge determinations for low stages should be used with caution.

The following discharge measurement was made by L. J. Hall:

February 27, 1917: Gage height, 3.23 feet (referred to original datum of gage); discharge, 572 second-feet.

Daily discharge, in second-feet, of Big Bear River near Red Ray, Ala., for the years ending Sept. 30, 1913–1917.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1913.			1913.			1913.		
1	.....	27	11	.....	27	21	.....	110
2	.....	27	12	.....	27	22	.....	74
3	.....	27	13	.....	27	23	.....	59
4	.....	27	14	.....	27	24	39	52
5	.....	27	15	.....	27	25	46	52
6	.....	27	16	.....	27	26	39	39
7	.....	27	17	.....	27	27	39	39
8	.....	27	18	.....	74	28	39	39
9	.....	27	19	.....	110	29	33	148
10	.....	27	20	.....	119	30	33	461
						31	27	.....

Daily discharge, in second-feet, of Big Bear River near Red Bay, Ala., for the years ending Sept. 30, 1913–1917—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1913–14.												
1	414	52	82	158	158	368	4,520	280	66	27	66	119
2	158	52	82	158	218	346	3,580	238	66	27	52	82
3	100	52	66	138	178	302	2,360	238	66	27	82	82
4	82	52	66	138	138	280	1,450	218	52	27	66	259
5	66	39	66	138	178	280	974	218	52	27	280	178
6	52	39	66	119	585	302	735	259	391	27	178	119
7	46	39	82	119	2,160	302	535	280	660	27	119	82
8	39	52	82	119	1,450	280	710	510	760	15	100	52
9	39	52	82	100	735	280	660	585	259	15	82	39
10	39	52	82	100	510	259	510	437	178	82	52	39
11	52	52	66	100	836	259	437	280	138	100	52	27
12	52	52	66	100	918	368	535	238	218	158	52	27
13	52	52	66	82	660	1,090	1,060	198	238	82	100	27
14	39	52	66	82	685	710	735	178	119	52	368	39
15	39	52	82	82	735	560	1,030	158	119	39	324	27
16	39	52	100	82	560	461	760	158	280	862	138	27
17	39	52	100	82	510	391	610	138	391	1,360	82	27
18	39	52	100	82	437	324	510	158	238	461	66	15
19	39	66	82	82	391	302	391	158	138	238	52	27
20	52	66	82	66	437	280	368	138	119	100	52	52
21	52	52	82	66	510	280	324	119	100	66	39	82
22	52	52	66	66	391	238	280	100	82	66	52	66
23	39	52	66	66	324	218	280	100	82	52	66	52
24	82	52	82	66	414	198	259	100	66	52	66	39
25	100	52	119	82	461	178	238	100	52	52	52	437
26	82	52	218	119	414	178	238	82	52	39	39	178
27	66	52	238	119	368	218	218	82	39	39	66	119
28	66	52	198	100	391	238	198	82	39	39	100	82
29	66	52	178	82	.....	238	238	82	39	39	138	66
30	52	66	178	82	.....	1,120	302	82	39	39	391	52
31	52	.....	178	100	.....	4,420	.....	66	.....	119	158	.....
1914–15.												
1	52	52	391	1,240	4,120	368	368	119	100	218	27	198
2	52	39	218	785	5,020	368	324	138	178	158	27	158
3	66	39	158	635	3,050	346	280	138	138	158	27	119
4	66	39	198	510	1,660	324	280	119	119	259	27	100
5	52	39	280	437	1,330	585	259	100	100	302	27	100
6	52	27	238	437	1,570	1,450	259	100	100	461	27	82
7	52	27	178	414	1,210	1,030	238	198	82	280	27	82
8	39	39	158	368	974	785	238	585	82	198	27	66
9	39	52	158	346	810	635	218	368	66	510	52	82
10	82	82	138	302	685	535	218	259	66	760	82	368
11	52	82	119	324	585	485	238	198	52	302	238	280
12	66	82	119	1,060	510	437	585	368	52	218	510	138
13	119	66	138	1,450	461	391	437	760	52	158	391	100
14	302	66	218	890	585	368	324	535	82	119	280	82
15	485	66	238	710	760	346	280	437	66	100	158	82
16	391	52	218	585	760	368	280	324	66	82	100	66
17	198	52	198	660	635	391	259	259	52	82	82	66
18	158	52	178	1,690	510	368	238	238	52	82	66	52
19	100	52	178	2,920	461	324	218	218	39	66	82	52
20	82	52	198	1,880	437	346	198	178	39	82	810	52
21	82	39	218	1,120	414	324	178	158	39	82	346	82
22	66	39	218	1,030	414	302	178	138	39	66	198	66
23	66	39	238	1,240	437	280	218	138	52	82	119	52
24	66	52	280	2,850	461	280	198	119	52	82	218	52
25	52	52	1,810	2,040	391	259	178	100	52	52	100	39
26	52	52	4,120	1,270	368	238	158	100	52	52	280	39
27	52	52	2,590	946	346	238	138	82	39	52	635	39
28	39	66	1,120	760	346	259	138	82	52	39	1,570	39
29	39	119	1,480	635	.....	259	138	82	52	39	461	39
30	39	302	3,580	585	.....	280	119	119	560	39	280	82
31	39	.....	2,130	635	.....	302	.....	119	.....	27	238	.....

Daily discharge, in second-feet, of Big Bear River near Red Bay, Ala., for the years ending Sept. 30, 1913–1917—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915–16.												
1	2,390	138	461	1,880	1,240	918	461	238	368	100	259	100
2	2,790	138	391	1,780	1,120	974	437	238	218	510	238	82
3	685	119	346	2,000	890	1,150	890	259	178	218	238	82
4	437	119	302	1,660	735	862	1,630	391	158	346	346	82
5	1,030	100	280	1,210	660	685	1,060	461	158	635	760	82
6	1,120	100	280	946	610	635	810	346	138	280	368	82
7	635	100	259	785	635	635	685	280	461	1,330	280	66
8	414	100	259	685	585	610	1,090	259	346	5,420	324	66
9	302	82	259	560	535	510	1,300	238	259	5,600	974	66
10	259	82	238	510	1,330	461	918	218	198	5,320	560	82
11	238	82	238	485	1,060	414	760	198	158	3,580	437	119
12	218	100	218	461	862	368	635	178	158	4,420	346	100
13	198	198	259	918	760	346	535	178	138	3,420	280	82
14	198	198	238	1,330	660	346	461	158	138	2,890	368	66
15	218	735	218	974	585	368	414	158	368	2,790	302	66
16	218	1,630	218	735	535	346	368	178	259	2,660	259	66
17	198	710	259	660	510	324	346	461	368	1,690	218	66
18	178	485	1,210	610	485	302	324	391	238	1,880	178	66
19	158	1,360	2,230	535	461	302	302	280	178	1,510	158	66
20	1,330	1,540	1,210	510	414	280	302	238	158	1,910	158	66
21	685	810	785	510	391	280	485	218	138	1,060	198	66
22	414	535	560	1,360	368	259	710	238	119	974	178	66
23	302	461	510	4,720	368	259	437	610	119	785	158	66
24	238	391	461	2,960	437	238	368	437	346	610	158	119
25	218	346	760	1,570	414	238	324	368	535	485	178	100
26	198	368	1,750	1,120	368	918	302	280	198	414	158	82
27	178	1,450	1,120	946	346	1,840	280	238	158	368	138	82
28	178	1,180	862	1,120	324	1,060	280	218	138	324	138	66
29	158	810	2,720	1,030	324	760	259	198	119	302	119	66
30	158	535	4,720	862	.....	610	259	198	100	346	100	66
31	158	.....	2,590	735	.....	510	.....	391	.....	302	100	.....
1916–17.												
1	82	52	302	560	2,330	1,150	660	185	1,670	130	148	78
2	82	52	218	535	3,580	2,960	710	185	646	148	223	95
3	66	66	158	1,120	1,630	2,920	862	166	326	112	933	78
4	66	66	138	1,150	974	4,320	760	185	243	78	646	62
5	66	66	119	1,000	810	4,820	4,520	369	204	78	305	62
6	66	66	119	1,420	635	2,960	4,760	284	185	166	223	78
7	66	52	119	918	535	1,720	2,570	204	223	130	166	62
8	66	52	158	685	535	1,210	1,730	185	722	204	204	62
9	66	52	302	560	485	974	1,580	166	2,500	223	391	46
10	66	82	259	461	437	810	1,070	148	3,290	148	347	46
11	82	82	238	414	368	946	826	130	1,860	112	223	32
12	82	82	198	368	280	1,210	696	130	774	95	166	32
13	82	66	158	324	302	1,060	622	130	481	95	148	20
14	66	66	119	368	324	1,360	574	130	369	78	130	32
15	66	66	100	735	437	1,570	504	112	263	62	112	20
16	52	66	100	660	1,120	1,150	458	112	223	62	95	32
17	52	66	119	535	810	1,060	413	112	204	62	95	112
18	66	66	138	585	974	1,510	369	112	204	78	130	95
19	82	66	158	660	2,200	1,000	326	95	185	95	95	78
20	119	66	198	760	3,670	810	305	95	166	78	78	62
21	138	66	178	810	4,220	890	284	95	166	391	62	46
22	138	100	158	1,540	2,360	2,290	263	148	148	166	243	32
23	119	178	158	2,520	1,450	2,230	243	130	148	1,100	185	32
24	100	158	138	1,450	1,030	2,890	223	130	130	671	391	32
25	100	198	138	1,000	810	4,320	204	148	130	574	166	32
26	82	138	158	785	685	2,390	204	166	130	369	112	20
27	82	100	198	635	635	1,840	185	148	112	204	78	62
28	66	100	3,420	560	610	1,600	185	166	95	166	62	879
29	66	82	3,180	510	.....	1,150	166	166	112	148	46	527
30	66	138	1,150	485	.....	918	166	130	112	204	62	185
31	66	.....	660	535	.....	735	.....	879	.....	166	62	.....

Monthly discharge of Big Bear River near Red Bay, Ala., for the years ending Sept. 30, 1913–1917.

[Drainage area, 254 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1913.					
September	461	27	61.2	0.241	0.27
1913–14.					
October	414	39	70.5	.278	.32
November	66	39	52.1	.205	.23
December	238	66	102	.402	.46
January	158	66	99.2	.391	.45
February	2,160	138	563	2.22	2.31
March	4,420	178	493	1.94	2.24
April	4,520	198	835	3.29	3.67
May	585	66	195	.768	.89
June	760	39	171	.673	.75
July	1,360	15	140	.551	.64
August	391	39	114	.449	.52
September	437	15	84.0	.331	.37
The year	4,520	15	240	.945	12.85
1914–15.					
October	485	39	99.9	.393	.45
November	302	27	62.3	.245	.27
December	4,120	119	700	2.76	3.18
January	2,920	302	992	3.91	4.51
February	5,020	346	1,050	4.13	4.30
March	1,450	238	428	1.69	1.95
April	585	119	246	.969	1.08
May	760	82	222	.874	1.01
June	560	39	85.7	.337	.38
July	760	27	168	.661	.76
August	1,570	27	242	.953	1.10
September	368	39	95.1	.374	.42
The year	5,020	27	363	1.43	19.41
1915–16.					
October	2,790	158	519	2.04	2.35
November	1,630	82	500	1.97	2.20
December	4,720	218	846	3.33	3.84
January	4,720	461	1,170	4.61	5.32
February	1,330	324	621	2.44	2.63
March	1,840	238	574	2.26	2.61
April	1,630	259	581	2.29	2.56
May	610	158	282	1.11	1.28
June	535	100	220	.866	.97
July	5,600	100	1,690	6.65	7.67
August	974	100	280	1.10	1.27
September	119	66	77.7	.306	.34
The year	5,600	66	618	2.43	33.04
1916–17.					
October	138	52	79.5	.313	.36
November	198	52	85.2	.335	.37
December	3,420	100	418	1.65	1.90
January	2,520	324	795	3.13	3.61
February	4,220	280	1,220	4.80	5.00
March	4,820	735	1,830	7.20	8.30
April	4,760	166	881	3.47	3.87
May	879	95	179	.705	.81
June	3,290	95	534	2.10	2.34
July	1,100	62	206	.811	.94
August	933	46	204	.803	.93
September	879	20	101	.398	.44
The year	4,820	20	541	2.13	28.87

INDEX.

STREAM-GAGING STATIONS

AND

PUBLICATIONS RELATING TO WATER RESOURCES

PART III.—OHIO RIVER BASIN

STREAM-GAGING STATIONS AND PUBLICATIONS RELATING TO WATER RESOURCES.

INTRODUCTION.

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

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

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

HOW GOVERNMENT REPORTS MAY BE OBTAINED OR CONSULTED.

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

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

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

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

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

Boston, Mass., 2500 Customhouse.
Albany, N. Y., 704 Journal Building.
Atlanta, Ga., Post Office Building.
Madison, Wis., care of Railroad Commission of Wisconsin.
Austin, Tex., Capitol Building.
Helena, Mont., Montana National Bank Building.
Boise, Idaho, 615 Idaho Building.
Topeka, Kans., 23 Federal Building.
Denver, Colo., 403 New Post Office Building.
Tucson, Ariz., University of Arizona.
Salt Lake City, Utah, 313 Federal Building.
Tacoma, Wash., 406 Federal Building.
Portland, Oreg., 606 Post Office Building.
San Francisco, Calif., 328 Customhouse.
Los Angeles, Calif., 619 Federal Building.
Honolulu, Hawaii, 25 Capitol Building.

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

STREAM-FLOW REPORTS.

Stream-flow records have been obtained at more than 4,240 points in the United States, and the data obtained have been published in the reports tabulated on page 2.

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

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

Report.	Character of data.	Year.
10th A, pt. 2	Descriptive information only	
11th A, pt. 2	Monthly discharge and descriptive information	1884 to Sept., 1890.
12th A, pt. 2	do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
W 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
W 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
W 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
W 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
W 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
W 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
W 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
W 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
W 75	Monthly discharge	1901.
W 82 to 85	Complete data	1902.
W 97 to 100	do	1903.
W 124 to 135	do	1904.
W 165 to 178	do	1905.
W 201 to 214	do	1906.
W 241 to 252	do	1907–8.
W 261 to 272	do	1909.
W 281 to 292	do	1910.
W 301 to 312	do	1911.
W 321 to 332	do	1912.
W 351 to 362	do	1913.
W 381 to 394	do	1914.
W 401 to 414	do	1915.
W 431 to 444	do	1916.
W 451 to 464	do	1917.

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

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

The following table gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1917. The data for any particular station will be found in the reports covering the years during which the station was maintained. For example, data from 1902 to 1917 for any station in the area covered by Part III are published in Water-Supply Papers 83, 98, 128, 169, 205, 243, 263, 283, 303, 323, 353, 383, 403, 433, and 453 which contain records for the Ohio River basin for those years.

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

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

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

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

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

PART III. OHIO RIVER BASIN.

PRINCIPAL STREAMS.

The Ohio River basin includes Ohio River with all its tributaries, the most important being Allegheny, Monongahela, Beaver, Muskingum, New (or Kanawha), Scioto, Miami, Kentucky, Wabash, Cumberland, and Tennessee rivers. The streams drain parts of the States of Alabama, Georgia, Illinois, Indiana, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia.

In addition to the list of gaging stations and the annotated list of publications relating specifically to the Ohio River basin, the following pages contain a similar list of reports that are of general interest in many sections and cover a wide range of hydrologic subjects, and also brief references to reports published by State and other organizations. (See pp. xix–xx.)

GAGING STATIONS.

NOTE.—Dash following a date indicates that the station was being maintained September 30, 1917. Period after date indicates discontinuance.

Allegheny River (head of Ohio River) at Red House, N. Y., 1903–
Allegheny River at Kittanning, Pa., 1904–1913.
Ohio River at Wheeling, W. Va., 1905–6.
Conewango Creek:
Chadakoin River (Chatauqua Lake outlet) near Jamestown, N. Y., 1904–5.
Kiskiminitas River at Avonmore, Pa., 1907–1913.
Kiskiminitas River at Salina, Pa., 1904–5.
Blacklick Creek at Blacklick, Pa., 1904–1906; 1907–1913.
Tygart River (head of Monongahela River) near Dailey, W. Va., 1915–
Tygart River at Belington, W. Va., 1907–
Tygart River at Fetterman, W. Va., 1907–
Monongahela River at Lock 15, Hoult, W. Va., 1915–
Monongahela River at Morgantown, W. Va., 1914–15.
Monongahela River at Lock No. 4, Pa., 1886–1905. Flood-stage record only.
Middle Fork at Midvale, W. Va., 1915–
Buckhannon River at Hall, W. Va., 1907–1909; 1915–
West Fork at Butcherville, W. Va., 1915–
West Fork at Enterprise, W. Va., 1907–
Elk Creek near Clarksburg, W. Va., 1910–
Buffalo Creek at Barrackville, W. Va., 1907–8; 1915–
Deckers Creek at Morgantown, W. Va., 1914–15.
Cheat River near Parsons, W. Va., 1913–
Cheat River at Rowlesburg, W. Va., 1912–
Cheat River near Morgantown, W. Va., 1899–1900; 1902–1905; 1908–
Blackwater River at Hendricks, W. Va., 1911–
Shavers Fork at Parsons, W. Va., 1910–
Big Sandy Creek at Rockville, W. Va., 1909–

Ohio River tributaries—Continued.
Rolling Fork of Salt River (head of Salt River) at New Haven, Ky., 1905–6.
Green River at Munfordville, Ky., 1915–
Wabash River at Logansport, Ind., 1903–1906.
Wabash River at La Fayette, Ind., 1901–1903.
Wabash River at Terre Haute, Ind., 1902–1904; 1905–6.
Wabash River at Mount Carmel, Ill., 1909–1913.
Eel River at Logansport, Ind., 1903.
Tippecanoe River at Springboro, near Delphi, Ind., 1903–1906; 1908.
Vermilion River near Danville, Ill., 1914–
Embarrass River near Oakland, Ill., 1909–1912; 1914–15.
Embarrass River at Ste. Marie, Ill., 1909–1912; 1914–
White River, West Branch (head of White River) near Noblesville, Ind., 1915–
White River, West Branch at Indianapolis, Ind., 1904–1906.
Eel River at Cataract, Ind., 1903–1906.
East Branch of White River at Shoals, Ind., 1903–1906; 1909–1916.
Little Wabash River near Clay City, Ill., 1908–1912.
Little Wabash River at Wilcox, Ill., 1914–
Little Wabash River near Golden Gate, Ill., 1908–1912.
Little Wabash River at Carmi, Ill., 1908–1912.
Skillet Fork at Wayne City, Ill., 1908–1912; 1914–
Skillet Fork near Mill Shoals, Ill., 1908–1912.
Cumberland River at Cumberland Falls, Ky., 1907–1911; 1915–
Cumberland River at Burnside, Ky., 1915–
Cumberland River at Nashville, Tenn., 1902–1904.
South Fork of Cumberland River at Nevelsville, Ky., 1915–
Caney Fork near Rock Island, Tenn., 1911–
Collins River near Rowland, Tenn., 1916–
French Broad River (head of Tennessee River) at Rosman, N. C., 1907–1909.
French Broad River at Horseshoe, N. C., 1904–1906.
French Broad River at Asheville, N. C., 1895–
French Broad River at Oldtown, near Newport, Tenn., 1900–1905; 1907.
Tennessee River at Knoxville, Tenn., 1900–1912.
Tennessee River at Chattanooga, Tenn., 1873–1913; 1915–
Tennessee River at Florence, Ala., 1871–
Tennessee River at Johnsonville, Tenn., 1875–
Davidson River near Davidson River, N. C., 1904–1909.
Little River at Calhoun, N. C., 1907–8.
Mills River, South Fork (head of Mills River), near Sitton, N. C., 1904–1909.
North Fork of Mills River at Pinkbed, N. C., 1904–1909.
Mud Creek at Naples, N. C., 1907.
Swannanoa River at Swannanoa, N. C., 1907–1909.
Swannanoa River at Biltmore, N. C., 1904.
Ivy River at Democrat, N. C., 1907.
Pigeon River at Canton, N. C., 1907–1909.
Pigeon River at Newport, Tenn., 1900–1901; 1903–1905; 1906–1909.
Nolichucky River at Chucky Valley, Tenn., 1900–1901.
Nolichucky River at Greenville, Tenn., 1903–1908.
North Toe River at Spruce Pine, N. C., 1907–8.
Holston River, South Fork (head of Holston River), near Chilhowie, Va., 1907–1909.
Holston River, South Fork, at Bluff City, Tenn., 1900–
Holston River near Rogersville, Tenn., 1902–
Middle Fork of Holston River at Chilhowie, Va., 1907–1909.
Watauga River at Butler, Tenn., 1900-1901.
Watauga River near Elizabethton, Tenn., 1903–1908.
Elk Creek at Lineback, Tenn., 1900–1901.

Ohio River tributaries—Continued.
Tennessee River tributaries—Continued.
Holston River tributaries—Continued.
Roane Creek at Butler, Tenn., 1900–1901.
Doe River at Blevins, Tenn., 1911–1915.
Doe River at Valley Forge, Tenn., 1911–1916.
Doe River at Elizabethton, Tenn., 1907–8; 1912.
North Fork of Holston River at Saltville, Va., 1907–8.
Little Tennessee River near Franklin, N. C., 1907–1910.
Little Tennessee River at Judson, N. C., 1896–
Little Tennessee River at McGhee, Tenn., 1905–1914.
Cullasagee River at Cullasagee, N. C., 1907–1909.
Nantahala River near Nantahala, N. C., 1907–1909.
Tuckasegee River near East Laport, N. C., 1907–1909.
Tuckasegee River at Bryson, N. C., 1897–
Scott Creek near Dillsboro, N. C., 1907–8.
Oconalufty River near Cherokee, N, C., 1907–8.
Cheoah River at Millsaps, N. C., 1907–8.
Clinch River at Clinchport, Va., 1907–1909.
Hiwassee River near Hayesville, N. C., 1907–1909.
Hiwassee River at Murphy, N. C., 1896–1917.
Hiwassee River at Reliance, Tenn., 1900–1913.
Hiwassee River at Charleston, Tenn., 1899–1902.
Tusquitee Creek near Hayesville, N. C., 1907–1909.
Valley River at Tomotla, N. C., 1904–1909; 1914–1917.
Nottely River near Ranger, N. C., 1901–1905; 1914–1917.
Toccoa River (head of Ocoee River) near Dial, Ga., 1907–8; 1913–
Toccoa River near Morganton, Ga., 1898–1903; 1913–
Ocoee River at McCays (Copper Hill), Tenn., 1903–1913.
Ocoee River at McHarge, Tenn., 1917–
Ocoee River at Emf, Tenn., 1913–
Ocoee River at Parksville, Tenn., 1911–1916.
Big Bear River near Red Bay, Ala., 1913–
Elk River near Elkmont, Ala., 1904–1908.
Duck River at Columbia, Tenn., 1904–1908.

REPORTS ON WATER RESOURCES OF THE OHIO RIVER BASIN.[1]

PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY.

WATER-SUPPLY PAPERS.

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

*21. Wells of northern Indiana, by Frank Leverett. 1899. 82 pp., 2 pls. (Continued in No. 26.)

Discusses by counties the glacial deposits and the sources of well waters; gives many well sections.

*24. Water resources of the State of New York, Part I, by G. W. Rafter. 1899. 99 pp., 13 pls. 15c.

*25. Water resources of the State of New York, Part II, by G. W. Rafter. 1899. 100 pp., 12 pls. 15c.

No. 24 contains descriptions of the principal rivers of New York and their more important tributaries, and data on temperature, precipitation, evaporation, and stream flow.

No. 25 contains discussion of water-storage projects on Genesee and Hudson rivers, power development at Niagara Falls, descriptions and early history of State canals, and a chapter on the use and value of the water power of the streams and canals: also brief discussion of the water yield of sand areas of Long Island.

[1] For stream-measurement reports see tables on p. VI.

*26. Wells of southern Indiana (continuation of No. 21), by Frank Leverett. 1899. 64 pp. 5c.

Discusses by counties the glacial deposits and the sources of well water; contains many well sections.

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

Gives elevations and distances along rivers of the United States, and brief descriptions of many of the streams, including Ohio River and a number of its tributaries.

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

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

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

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

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

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

79. Normal and polluted waters in northeastern United States, by M. O. Leighton. 1903. 192 pp. 10c.

Defines essential qualities of water for various uses, the impurities in rain, surface, and ground waters, the meaning and importance of sanitary analyses, and the principal sources of pollution; chiefly "a review of the more readily available records" of examination of water supplies derived from streams in the Merrimack, Connecticut, Housatonic, Delaware, and Ohio, River basins; contains many analyses.

91. The natural features and economic development of the Sandusky, Maumee, Muskingum, and Miami drainage areas in Ohio, by B. H. and M. S. Flynn. 1904. 130 pp. 10c.

Describes the topography, geology, and soils of the areas and discusses stream flow, dams, water powers, and public water supplies.

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

Contains notes on early floods in Mississippi Valley.

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

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

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

Cites statutory restrictions of water pollution in Alabama, Indiana, Illinois, Kentucky, Maryland, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia.

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

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

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

Water resources of the Middlesboro-Harlan region of southeastern Kentucky, by George H. Ashley. Describes topographic features of the area and the water supply of Middlesboro and Pineville.

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

113. The disposal of strawboard and oil-well wastes, by R. L. Sackett and Isaiah Bowman. 1905. 52 pp., 4pls. 5c.

Contains a brief report on the topography, drainage, geology, and the pollution of wells and streams by oil waste and brine in an area drained by Mississinewa River, a tributary of the Wabash.

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

Contains brief reports relating to Ohio River drainage areas, as follows:
Tennessee and Kentucky, by L. C. Glenn.
Ohio, by Frank Leverett.
Illinois, by Frank Leverett.
West Virginia, by M. L. Fuller.
Indiana, by Frank Leverett.
North Carolina, by M. L. Fuller.
South Carolina, by L. C. Glenn.
Georgia, by S. W. McCallie.
Alabama, by E. A. Smith.

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

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

Contains results of surveys made to determine location of undeveloped power sites. Gives elevations and distances along Hiwassee, Nottely, and Toccoa rivers.

144. The normal distribution of chlorine in the natural waters of New York and New England, by D. D. Jackson. 1905. 31 pp., 5 pls. 10c.

Discusses common salt in coast and inland waters, salt as an index to pollution of streams and wells, the solutions and methods used in chlorine determinations, and the use of the normal chlorine map; gives charts and tables for chlorine in the New England States and New York.

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

Contains "Water resources of the Nicholas quadrangle, West Virginia," by George H. Ashley Describes topography, geology, and domestic water supply of the hilly region in central West Virginia, a little east of New and Kanawha rivers.

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

Describes Wabash River flood, Indiana, causes of flood discharge, damage, and prevention of damage; also the drought in the Ohio River basin, its causes and effects; flood in Scottdale Valley, caused by failure of dam on Jacobs Creek (tributary to the Ohio through Youghiogheny River).

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

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

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

Cites statutory restrictions of water pollution in Alabama, Illinois, Indiana, Kentucky, Maryland, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia.

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

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

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

Gives accounts of floods on Allegheny and Ohio rivers, and estimates of flood discharge and frequency on Monongahela, Youghiogheny, and Tennessee rivers.

*164. Underground waters of Tennessee and Kentucky west of Tennessee River and of an adjacent area in Illinois, by L. C. Glenn. 1906. 173 pp., 7 pls. 25c.

Describes static level and uses of waters, artesian conditions, and source and properties of ground water; discusses topography, geology, and water resources by counties; gives logs of wells, analyses of waters, and bibliography of most important reports.

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

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

*233. Water resources of the Blue Grass region, Kentucky, by G. C. Matson, with a chapter on the quality of the waters, by Chase Palmer. 1909. 223 pp., 3 pls. 20c.

Describes the geologic formations, physiographic features, soils, and surface waters of the region; the source, conditions of occurrence, amount and recovery of the ground waters, collection and storage of rain water, municipal water supplies, and conditions in each county; discusses under "Quality" the industrial uses of the water, comparative hardness, and mineral and table waters; many analyses.

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

Describes collection of samples, method of examination, preparation of solutions, accuracy of estimates, and expression of analytical results; gives results of analyses of waters of Allegheny, Cumberland, Kentucky, Miami, Wabash, and Tennessee rivers and some of their tributaries.

*239. The quality of the surface waters of Illinois, by W. D. Collins. 1910. 94 pp., 3 pls. 10c.

Discusses the natural and economic features that determine the character of the streams; describes the larger drainage basins and the methods of collecting and analyzing the samples of water, and discusses each river in detail with reference to its source, course, and quality of water; includes short chapters on municipal supplies and industrial uses.

254. The underground waters of north-central Indiana, by S. R. Capps, with a chapter on the chemical character of the waters, by R. B. Dole. 1910. 279 pp., 7 pls. 40c.

Describes relief, drainage, vegetation, soils, and crops, industrial development, and geologic formations; source, movements, occurrence and volume of ground water: methods of well construction and lifting devices: discusses in detail for each county surface features and drainage; geology and ground water, city, village, and rural supplies, and gives records of wells and analyses of waters. Discusses also, under chemical character, methods of analyses and expression of results, mineral constituents, effect of the constituents on waters for domestic, industrial, and medicinal uses, methods of purification, chemical composition; many analyses and field assays

259. The underground waters of southwestern Ohio, by M. L. Fuller and F. G. Clapp, with a discussion of the chemical character of the waters, by R. B. Dole. 1912. 228 pp., 9 pls. 35c.

Describes the topography, climate, and geology of the region, the water-bearing formations, the source, mode of occurrence, and head of the waters, and municipal supplies; gives details by counties; discusses in supplement, under chemical character, method of analyses and expression of results, mineral constituents, effect of the constituents on waters for domestic, industrial, or medicinal uses, methods of purification, chemical composition; many analyses and field assays. The matter in the supplement was also published in Water-Supply Paper 254 (The underground waters of north-central Indiana).

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

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

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

Contains analyses of spring and well waters from Pennsylvania, West Virginia, Kentucky, Tennessee, and Illinois, and of mine waters from Ducktown, Tenn.

ANNUAL REPORTS.

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

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

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

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

Seventeenth Annual Report of the United States Geological Survey, 1895–96, Charles D. Walcott, Director. 1896. 3 parts in 4 vols. *Pt. II. Economic geology and hydrography, pp. xxv, 864, 113 pls. $2.35. Contains:

*The water resources of Illinois, by Frank Leverett, pp. 695–849, pls. 108 to 113. Describes the physical features of the State, and the drainage basins, including tributaries of the Mississippi in western Illinois, and tributaries of the Wabash; discusses the rainfall and run-off, navigable waters and water powers, the wells supplying water for rural districts, and artesian wells; contains tabulated artesian well data and water analyses.

Eighteenth Annual Report of the United States Geological Survey, 1896–97, Charles D. Walcott, Director. 1897. (Pts. II and III, 1898.) 5 parts in 6 vols. *Pt. IV, Hydrography, pp. x, 756, 102 pls. $1.75. Contains:

*The water resources of Indiana and Ohio, by Frank Leverett, pp. 419–560, pls. 33 to 37. Describes the Wabash, Whitewater, Great Miami, Little Miami, Scioto, Hocking, Muskingum, and Beaver rivers and lesser tributaries of the Ohio in Indiana and Ohio, the streams discharging into Lake Erie and Lake Michigan, and streams flowing to the upper Mississippi through the Illinois; discusses shallow and drift wells, the flowing wells from the drift and deeper artesian wells, and gives records of wells at many of the cities; describes the mineral springs, and gives analyses of the waters; contains also tabulated lists of cities using surface waters for waterworks, and of cities and villages using shallow and deep well waters; discusses the source and quality of the city and village supplies; and gives precipitation tables for various points.

Nineteenth Annual Report of the United States Geological Survey, 1897–98, Charles D. Walcott, Director. 1898. (Pts. II, III, and V, 1899.) 6 parts in 7 vols. and separate case for maps with Pt. V. *Pt. IV, Hydrography, pp. viii, 814, 118 plates. $1.85. Contains:

*The rock waters of Ohio, by Edward Orton, pp. 633–717, pls. 71 to 73. Describes the principal geologic formations of Ohio and the waters from the different strata; discusses the flowing wells at various points and the artesian wells of pre-Glacial channels in Allen, Auglaize, and Mercer counties; discusses city and village supplies; gives analyses of waters from various formations.

MONOGRAPHS.

Monographs are of quarto size. They are not distributed free, but may be obtained from the Geological Survey or from the SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C., at the prices indicated. An asterisk (*) indicates that the Survey's stock of the paper is exhausted.

41. Glacial formations and drainage features of the Erie and Ohio basins, by Frank Leverett. 1902. 802 pp., 26 pls. $1.75.

Treats of an area extending westward from Genessee Valley in New York across northwestern Pennsylvania and Ohio, central and southern Indiana, and southward from Lakes Ontario and Erie to the vicinity of Allegheny and Ohio rivers.

PROFESSIONAL PAPERS.

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

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

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

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

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

BULLETINS.

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

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

Discusses the importance of accurate well records to the driller, to owners of oil, gas, and water wells, and to the geologist; describes the general method of work; gives tabulated records of wells in Illinois, Indiana, New York, Ohio, Pennsylvania, Tennessee, West Virginia, and Kentucky, and detailed records of wells in Delaware and Jay counties, Ind.; Greene, Warren, and Washington counties, Pa.; and Kanawha, Ritchie, and Wetzel counties, W. Va. These records were selected because they give definite stratigraphic information.

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

Gives an account of progress in the collection of well records and samples; contains tabulated records of wells in Alabama, Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia, and detailed records of wells in Madison County, Ala., Crawford County, Ill.; Delaware, Martin, Randolph, and Vanderburg counties, Ind.; Hopkins and Metcalfe counties, Ky.; Hocking, Noble, Tuscarawas, and Wayne counties, Ohio; Armstrong, Greene, Somerset, Warren, and Washington counties, Pa.; and Cabell, Harrison, Marion, Monongalia, Wayne, and Wetzel counties, W. Va. The wells of which detailed records are given were selected because they afford definite stratigraphic information.

GEOLOGIC FOLIOS.

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

A folio is designated by the name of the principal town or of a prominent natural feature within the quadrangle. Each folio includes maps showing the topography, geology, underground structure, and mineral deposits of the area mapped and several pages of descriptive text. The text explains the maps and describes the topographic

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

and geologic features of the country and its mineral products. The topographic map shows roads, railroads, waterways, and, by contour lines, the shapes of the hills and valleys and the height above sea level of all points in the quadrangle. The areal-geology map shows the distribution of the various rocks at the surface. The structural-geology map shows the relations of the rocks to one another underground. The economic-geology map indicates the location of mineral deposits that are commercially valuable. The artesian-water map shows the depth to underground-water horizons. Economic-geology and artesian-water maps are included in folios if the conditions in the areas mapped warrant their publication. The folios are of special interest to students of geography and geology and are valuable as guides in the development and utilization of mineral resources.

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

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

An asterisk (*) indicates that the stock of the folio is exhausted.

*16. Knoxville folio, Tennessee-North Carolina.

*67. Danville folio, Illinois-Indiana.
Discusses the shallow dug or open wells, the tubular wells, and the flowing wells; gives also tabulated data concerning depth, head, water-bearing bed, etc., of the wells in the quadrangle.

84. Ditney folio, Indiana. 5c.

90. Cranberry folio, North Carolina-Tennessee.

102. Indiana folio, Pennsylvania. 5c.
Indicates promising localities for artesian water.

105. Patoka folio, Indiana-Illinois. 5c.
Discusses the water supply of the streams, springs, wells, cisterns, and artificial ponds.

*121. Waynesburg folio, Pennsylvania.

123. Elders Ridge, Pennsylvania. 5c.

*124. Mount Mitchell, North Carolina-Tennessee.
Describes water powers and the various sources of water used for industrial and domestic supplies.

*144. Amity, Pennsylvania.
Gives a brief discussion of the water supply of the town of Washington.

*146. Rogersville, Pennsylvania.

*147. Pisgah, North Carolina-South Carolina.

*151. Roan Mountain, Tennessee-North Carolina.

*160. Accident-Grantsville, Maryland-Pennsylvania-West Virginia.
Notes possibility of obtaining artesian water.

172. Warren,[1] Pennsylvania-New York. 5c.

*174. Johnstown,[1] Pennsylvania. 5c.
Describes the city water supply at Johnstown and the water resources of the quadrangle in general.

176. Sewickley, Pennsylvania. 5c.

*177. Burgettstown-Carnegie,[2] Pennsylvania.
Contains partial well records.

180. Claysville, Pennsylvania. 5c.

184. Kenova, Kentucky-West Virginia-Ohio. 5c.

187. Ellijay, Georgia-North Carolina-Tennessee. 25c.
Contains brief paragraph on water power.

189. Barnesboro-Patton, Pennsylvania. 25c.

197. Columbus, Ohio. Library edition, 25c.; octavo edition, 50c.
Gives brief description of the water supply of Columbus and analyses of the mineral content of the water of Scioto River.

MISCELLANEOUS REPORTS.

Other Federal bureaus and State and other organizations have from time to time published reports relating to the water resources of the various sections of the country. Notable among those pertaining to the Ohio River basin are the reports of the Chief of Engineers, United States Army; the State geological surveys of Alabama, Illinois, Kentucky, North Carolina, Tennessee, and Virginia; the Illinois Water-Supply Commission and the Rivers and Lakes Commission of Illinois; the New York State Conservation Commission and State Water-Supply Commission; the Water-Supply Commission of Pennsylvania and the Pittsburgh Flood Commission; and the water-power report of the Tenth Census (vol. 17). The following reports deserve special mention.

The Mississippi and Ohio rivers, by Charles H. Ellet. 1853.

Report upon the physics and hydraulics of the Mississippi River, by A. A. Humphreys and H. L. Abbot. 1861.

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

The underground water resources of Alabama, by Eugene A. Smith: Alabama Geol. Survey Mon. 6, 1907.

Preliminary report on a part of the water powers of Georgia, compiled by B. M. Hall: Georgia Geol. Survey Bull. 3 A, 1896.

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

The mineral content of Illinois waters, by Edward Bartow, J. A. Udden, S. W. Parr, and George T. Palmer: Illinois State Geol. Survey Bull. 10, 1909.

Chemical survey of the waters of Illinois, report for the years 1897-1902, by A. W. Palmer, with Geology of Illinois as related to its water supply, by Charles W. Rolfe: University of Illinois publications.

Chemical and biological survey of waters of Illinois, by Edward Bartow: University of Illinois publications 3, 6, 7, 1906–1909.

[1] Issued in two editions. (See p. xviii.) Specify which edition is wanted.
[2] Library edition out of stock.

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Report upon the prevention of overflow of Little Wabash and Skillet Fork rivers, by W. J. McEathron and L. L. Hidinger. Rivers and Lakes Commission, 1911.

Papers on the water power of North Carolina, a preliminary report by George F. Swain: North Carolina Geol. Survey Bull. 8, 1899.

Report of the investigations into the purification of the Ohio River water for the improved water supply of the city of Cincinnati, Ohio; made by the board of trustees, commissioners of waterworks, Cincinnati, 1899.

Progress report on a plan of sewerage for the city of Cincinnati, 1912–13.

The mineral waters of Indiana, their location, origin, and character, by W. S. Blatchley: Indiana Dept. Geology and Nat. Res. Twenty-sixth Ann. Rept., 1901.

Report on the value of the Dix River as a source of water power, by August F. Foerste, and Supplementary report on Dix River, by August F. Foerste: Kentucky Geol. Survey Bull. 21, 1912.

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

Hydrology of the State of New York, by George W. Rafter: New York State Mus. Bull. 85, 1905.

A report to the mayor and city council on flood protection for the city of Columbus, Ohio, 1913.

Report of the filtration commission of the city of Pittsburgh, Pa., 1899.

The water powers of Tennessee, by J. A. Switzer, including a report on Doe River, by A. H. Horton: Tennessee Geol. Survey Bull. 17, 1914.

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

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

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

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

GEOLOGICAL SURVEY HYDROLOGIC REPORTS OF GENERAL INTEREST.

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

WATER-SUPPLY PAPERS.

*1. Pumping water for irrigation, H. M. Wilson. 1896. 57 pp., 9 pls.

Describes pumps and motive powers, windmills, water wheels, and various kinds of engines; also storage reservoirs to retain pumped water until needed for irrigation.

*3. Sewage irrigation, by G. W. Bafter. 1897. 100 pp., 4 pls. (See Water-Supply Paper 22.) 10c.

Discusses methods of sewage disposal by intermittent filtration and by irrigation; describes utilization of sewage in Germany, England, and France, and sewage purification in the United States.

*8. Windmills for irrigation, by E. C. Murphy. 1897. 49 pp., 8 pls. 10c.

Gives results of experimental tests of windmills during the summer of 1896 in the vicinity of Garden, Kans.; describes instruments and methods and draws conclusions.

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

Discusses efficiency of pumps and water lifts of various types.

*20. Experiments with windmills, by T. O. Perry. 1899. 97 pp., 12 pls. 15c.

Includes tables and descriptions of wind wheels, compares wheels of several types, and discusses results.

*22. Sewage irrigation, Part II, by G. W. Rafter. 1899. 100 pp., 7 pls. 15c.

Gives résumé of Water-Supply Paper 3; discusses pollution of certain streams, experiments on purification of factory wastes in Massachusetts, value of commercial fertilizers, and describes American sewage-disposal plants by States; contains bibliography of publications relating to sewage utilization and disposal.

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

*42. The windmill: Its efficiency and economic use, Part II, by E. C. Murphy. 1901. 75 pp. (73–147), 2 pls. (15–16). 10c.

Nos. 41 and 42 give details of results of experimental tests with windmills of various types.

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

*56. Methods of stream measurement. 1901. 51 pp., 12 pls. 15c.

Describes the methods used by the Survey in 1901–2. (See also Nos. 64, 94, and 95.)

*64. Accuracy of stream measurements, by E. C. Murphy. 1902. 99 pp., 4 pls. (See No. 95.) 10c.

Describes methods of measuring velocity of water and of measuring and computing stream flow and compares results obtained with the different instruments and methods; describes also experiments and results at the Cornell University hydraulic laboratory. A second, enlarged edition published as Water-Supply Paper 95.

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

Discusses origin, depth, and amount of ground waters; permeability of rocks and porosity of soils; causes, rates, and laws of motions of ground water; surface and deep zones of flow, and recovery of waters by open wells and artesian and deep wells; treats of the shape and position of the water table; gives simple methods of measuring yields of flowing wells; describes artesian wells at Savannah, Ga.

72. Sewage pollution in the metropolitan area near New York City and its effect on inland water resources, by M. O. Leighton. 1902. 75 pp., 8 pls. 10c.

Defines "normal" and "polluted" waters and discusses the damages resulting from pollution.

*80. The relation of rainfall to run-off, by G. W. Rafter. 1903. 104 pp. 10c.

Treats of measurements of rainfall and laws and measurements of stream flow; gives rainfall, run-off, and evaporation formulas; discusses effects of forests on rainfall and run-off.

87. Irrigation in India (second edition), by H. M. Wilson. 1903. 238 pp., 27 pls. 25c.

First edition was published in Part II of the Twelfth Annual Report.

93. Proceedings of first conference of engineers of Reclamation Service, with accompanying papers, compiled by F. H. Newell, chief engineer. 1904. 361 pp. 25c. [Requests for this report should be addressed to the United States Reclamation Service.]

Contains, the following papers of more or less general interest:
Limits of an irrigation project, by D. W. Ross.
Relation of Federal and State laws to irrigation, by Morris Bien.
Electrical transmission of power for pumping, by H. A. Storrs.
Correct design and stability of high masonary dams, by George Y. Wisner.
Irrigation surveys and the use of the plane table, by J. B. Lippincott.
The use of alkaline waters for irrigation, by Thomas H. Means.

*94. Hydrographic manual of the United States Geological Survey, prepared by E. C. Murphy, J. C. Hoyt, and G. B. Hollister. 1904. 76 pp., 3 pls. 10c.

Gives instruction for field and office work relating to measurements of stream flow by current meters. (See also No. 95.)

*95. Accuracy of stream measurements (second, enlarged edition), by E. C. Murphy. 1904. 169 pp., 6 pls.

Describes methods of measuring and computing stream flow and compares results derived from different instruments and methods. (See also No. 94.)

*103. A review of the laws forbidding pollution of inland waters in the United States, by E. B. Goodell. 1904. 120 pp. (See No. 152.)

Explains the legal principles under which antipollution statutes become operative, quotes court decisions to show authority for various deductions, and classifies according to scope the statutes enacted in the different States.

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

Contains the following reports of general interest. The scope of each paper is indicated by its title.

Description of underflow meter used in measuring the velocity and direction of underground water, by Charles S. Slichter.

The California or "stovepipe" method of well construction, by Charles S. Slichter.

Approximate methods of measuring the yield of flowing wells, by Charles S. Slichter.

Corrections necessary in accurate determination of flow from vertical well casings, from notes furnished by A. N. Talbot.

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

113. The disposal of strawboard and oil-well wastes, by R. L. Sackett and Isaiah Bowman. 1905. 52 pp., 4 pls. 5c.

The first paper discusses the pollution of streams by sewage and by trade wastes, describes the manufacture of strawboard and gives results of various experiments in disposing of the waste. The second paper describes briefly the topography, drainage, and geology of the region about Marion, Ind., the contamination of rock wells and of streams by waste-oil and brine.

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

Contains report on "Occurrence of underground waters," by M. L. Fuller, discussing sources, amount, and temperature of waters, permeability and storage capacity of rocks, water-bearing formations, recovery of water by springs, wells, and pumps, essential conditions of artesian flows, and general conditions affecting ground waters in eastern United States.

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

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

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

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

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

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

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

Scope indicated by title.

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

Contains brief reports of general interest as follows:

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

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

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

146. Proceedings of second conference of engineers of the Reclamation Service with accompanying papers, compiled by F. H. Newell, chief engineer. 1905. 267 pp. 15c. [Requests for this report should be addressed to the United States Reclamation Service.]

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

Proposed State code of water laws, by Morris Bien.

Power engineering applied to irrigation problems, by O. H. Ensign.

Estimates on tunneling in irrigation projects, by A. L. Fellows.

Collection of stream-gaging data, by N. C. Grover.

Diamond-drill methods by G. A. Hammond.

Mean-velocity and area curves, by F. W. Hanna.

Importance of general hydrographic data concerning basins of streams gaged, by R. E. Horton.

Effect of aquatic vegetation on stream flow, by R. E. Horton.

Sanitary regulations governing construction camps, by M. O. Leighton.

Necessity of draining irrigated land, by Thomas H. Means.

Alkali soils, by Thomas H. Means.

Cost of stream-gaging work, by E. C. Murphy.

Equipment of a cable gaging station, by E. C. Murphy.

Silting of reservoirs, by W. M. Reed.

Farm-unit classification, by D. W. Ross.

Cost of power for pumping irrigating water, by H. A. Storrs.

Records of flow of current-meter gaging stations during the frozen season, by F. H. Tillinghast.

147. Destructive floods in United States in 1894, by E. C. Murphy and others. 206 pp., 18 pls. 15c.

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

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

Scope indicated by title.

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

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

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

*155. Fluctuations of the water level in wells, with special reference to Long Island, N. Y., by A. C. Veatch. 1906. 83 pp., 9 pls. 25c.
Includes general discussion of fluctuations due to rainfall and evaporation, barometric changes, temperature changes, changes in rivers, changes in lake level, tidal changes, effects of settlement, irrigation, dams, ground-water developments, and to indeterminate causes.

*160. Underground-water papers; M. L. Fuller, geologist in charge. 1906. 104 pp., 1 pl.
Gives account of work in 1905, lists of publications relating to ground waters, and contains the following brief reports of general interest:
Significance of the term "artesian," by Myron L. Fuller.
Representation of wells and springs on maps, by Myron L. Fuller.
Total amount of free water in the earth's crust, by Myron L. Fuller.
Use of fluorescein in the study of underground water, by R. B. Dole.
Problems of water contamination, by Isaiah Bowman.
Instances of improvement of water in wells, by Myron L. Fuller.

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

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

*179. Prevention of stream pollution by distillery refuse, based on investigations at Lynchburg, Ohio, by Herman Stabler. 1906. 34 pp., 1 pl. 10c.
Describes grain distillation, treatment of slop, sources, character, and effects of effluents on streams; discusses filtration, precipitation, fermentation, and evaporation methods of disposal of wastes without pollution.

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

*185. Investigations on the purification of Boston sewage, * * * with a history of the sewage problem, by C.-E. A. Winslow and E. B. Phelps. 1906. 163 pp. 25c.
Discusses composition, disposal, purification, and treatment of sewages and tendencies in sewage-disposal practice in England, Germany, and the United States; describes character of crude sewage at Boston, removal of suspended matter, treatment in septic tanks, and purification in intermittent sand filtration and coarse material; gives bibliography.

*186. Stream pollution by acid-iron wastes: a report based on investigations made at Shelby, Ohio, by Herman Stabler. 1906. 36 pp., 1 pl.
Gives history of pollution by acid-iron wastes at Shelby, Ohio, and resulting litigation; discusses effect of acid-iron liquors on sewage purification processes, recovery of copperas from acid-iron wastes, and other processes for removal of pickling liquor.

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

*189. The prevention of stream pollution by strawboard waste, by E. B. Phelps. 1906. 29 pp., 2 pls.
Describes manufacture of strawboard, present and proposed methods of disposal of waste liquors, laboratory investigations of precipitation and sedimentation, and field studies of amounts and character of water used, raw material and finished product, and mechanical filtration.

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

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

Scope indicated by title.

*226. The pollution of streams by sulphite-pulp waste, a study of possible remedies, by E. B. Phelps. 1908. 37 pp., 1 pl. 10c.

Describes manufacture of sulphite pulp, the waste liquors, and the experimental work leading to suggestions as to methods of preventing stream pollution.

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

Scope indicated by title.

*234. Papers on the conservation of water resources. 1909. 96 pp., 2 pls. 15c.

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

*235. The purification of some textile and other factory wastes, by Herman Stabler and G. H. Pratt. 1909. 76 pp. 10c.

Discusses waste waters from wool scouring, bleaching and dyeing cotton yarn, bleaching cotton piece goods, and manufacture of oleomargarine, fertilizer, and glue.

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

Describes collection of samples, method of examination, preparation of solutions, accuracy of estimates, and expression of analytical results.

238. The public utility of water powers and their governmental regulation, by René Tavernier and M. O. Leighton. 1910. 161 pp. 15c.

Discusses hydraulic power and irrigation, French, Italian, and Swiss legislation relative to the development of water powers, and laws proposed in the French Parliament; reviews work of bureau of hydraulics and agricultural improvements of the French department of agriculture, and gives résumé of Federal and State water-power legislation in the United States.

*255. Underground waters for farm use, by M. L. Fuller. 1910. 58 pp., 17 pls. 15c.

Discusses rocks as sources of water supply and the relative safety of supplies from different materials; springs, and their protection; open or dug and deep wells, their location, yield, relative cost, protection, and safety; advantages and disadvantages of cisterns and combination wells and cisterns.

*257. Well-drilling methods, by Isaiah Bowman. 1911. 139 pp., 4 pls. 15c.

Discusses amount, distribution, and disposal of rainfall, water-bearing rocks, amount of ground water, artesian conditions, and oil and gas bearing formations; gives history of well drilling in Asia, Europe, and the United States; describes in detail the various methods and the machinery used; discusses loss of tools and geologic difficulties; contamination of well water and methods of prevention; tests of capacity and measurement of depth; and costs of sinking wells.

*258. Underground-water papers, 1910, by M. L. Fuller, F. G. Clapp, G. C. Matson, Samuel Sanford, and H. C. Wolff. 1911. 135 pp., 2 pls. 15c.

Contains the following papers (scope indicated by titles) of general interest:
Drainage by wells, by M. L. Fuller.
Freezing of wells and related phenomena, by M. L. Fuller.
Pollution of underground waters in limestone, by G. C. Matson.
Protection of shallow wells in sandy deposits, by M. L. Fuller.
Magnetic wells, by M. L. Fuller.

274. Some stream waters of the western United States, with chapters on sediment carried by the Rio Grande and the industrial application of water analyses, by Herman Stabler. 1911. 188 pp. 15c.

Describes collection of samples, plan of analytical work, and methods of analyses; discusses soap-consuming power of waters, water-softening, boiler waters, and waters for irrigation.

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

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

*337. The effects of ice on stream flow, by William Glenn Hoyt. 1913. 71 pp., 7 pls. 15c.

Discusses methods of measuring water flow of streams.

*345. Contributions to the hydrology of the United States, 1914. N. C. Grover, chief hydraulic engineer. 1915. 225 pp., 17 pls. 30c. Contains:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ANNUAL REPORTS.

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

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

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

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

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

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

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

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

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

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

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

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

PROFESSIONAL PAPERS.

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

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

A highly technical report.

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

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

BULLETINS.

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

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

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

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

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

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

695. The data of geochemistry (fourth edition), by F. W. Clarke. 1920. 832 pp. 45c.

Earlier editions were published as Bulletins 330, 491, and 616. Contains a discussion of the statement and interpretation of water analyses and a chapter on "Mineral wells and springs" (pp. 175–211). Discusses the definition and classification of mineral waters, changes in the composition of water, deposits of calcareous, ocherous, and siliceous materials made by water, vadose and juvenile waters, and thermal springs in relation to volcanism. Describes the different kinds of ground water and gives typical analyses. Includes a brief bibliography of papers containing water analyses.

INDEX BY AREAS AND SUBJECTS.

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

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

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

INDEX OF STREAMS.

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