DEPARTMENT OF THE INTERIOR
HUBERT WORK, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

WATER-SUPPLY PAPER 503

SURFACE WATER SUPPLY OF THE UNITED STATES

1919 AND 1920

PART III. OHIO RIVER BASIN

NATHAN C. GROVER, Chief Hydraulic Engineer

OLIVER W. HARTWELL, GUY C. STEVENS, WARREN E. HALL, WARREN R. KING and CARL G. PAULSEN, District Engineers

Prepared in cooperation with

THE STATES OF PENNSYLVANIA, WEST VIRGINIA, KENTUCKY ILLINOIS, AND TENNESSEE

WASHINGTON
GOVERNMENT PRINTING OFFICE
1924

CONTENTS.

ILLUSTRATIONS.

SURFACE WATER SUPPLY OF OHIO RIVER BASIN, 1919 AND 1920.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of 14 reports presenting records of measurements of flow made on streams in the United States during the years ending September 30, 1919 and 1920.

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 ending June 30, 1895–1921.

1895	$12,500.00
1896	20,000.00
1897 to 1900, inclusive	50,000.00
1901 to 1902, inclusive	100,000.00
1903 to 1906, inclusive	200,000.00
1907	150,000.00
1908 to 1910, inclusive	100,000.00
1911 to 1917, inclusive	150,000.00
1918	175,000.00
1919	148,244.10
1920	175,000.00
1921	180,000.00

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

Measurements of stream flow have been made at about 4,510 points in the United States and also at many points in Alaska and

the Hawaiian Islands. In July, 1918, 1,180 gaging stations were being maintained by the Survey and the cooperating organizations. Many miscellaneous discharge measurements were made at other points. In connection with this work data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in water-supply papers from time to time.

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 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, acre-feet, and millions of cubic 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 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 inches.

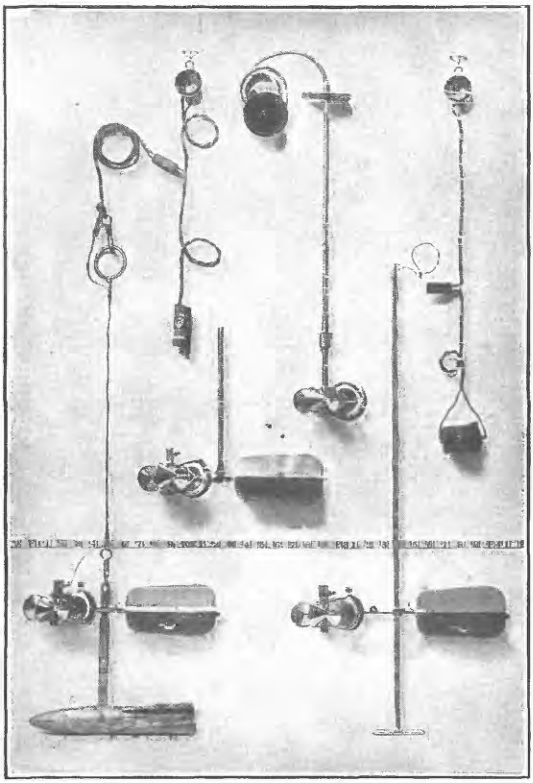
An "acre-foot," equivalent to 43,560 cubic feet, is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

The following terms not in common use are here defined:

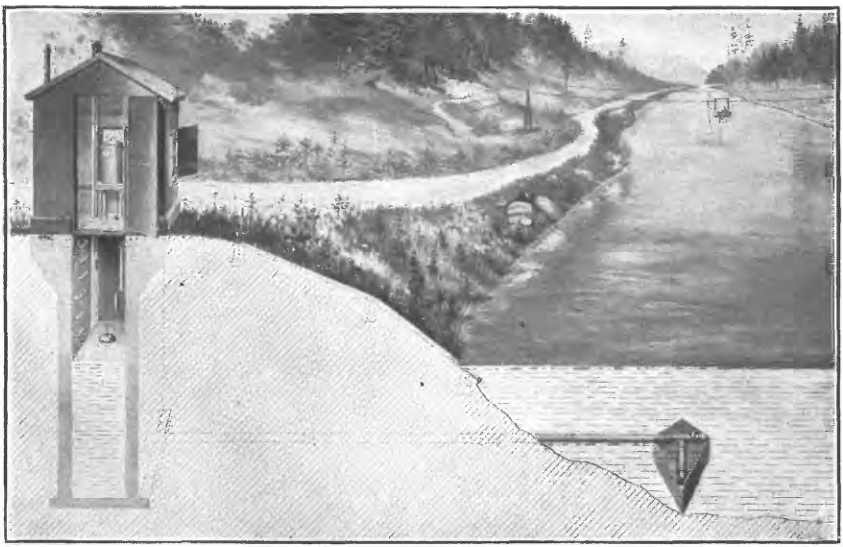
"Stage-discharge relation," an abbreviation for the term "relation of gage height to discharge."

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

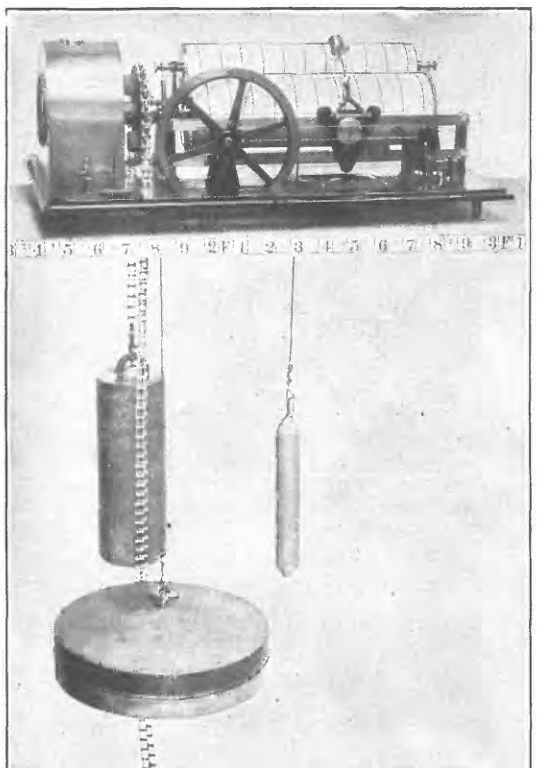
The "point of zero flow" for a gaging station is that point on the gage—the gage height—to which the surface of the stream would fall if there were no flow.



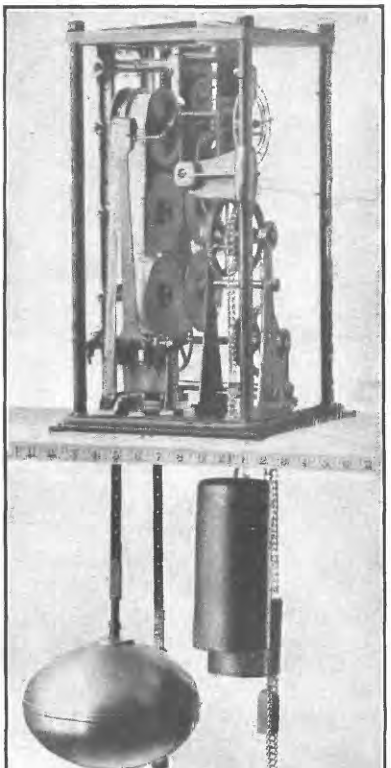
A. PRICE CURRENT METERS.



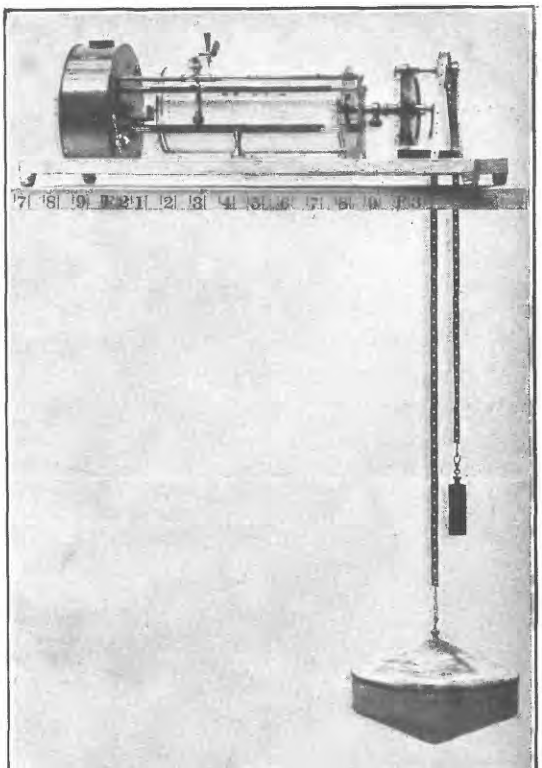
B. TYPICAL GAGING STATION.



A. STEVENS CONTINUOUS.



B. GURLEY PRINTING.



C. FRIEZ.

WATER-STAGE RECORDERS.

EXPLANATION OF DATA.

The data presented in this report cover the two years beginning October 1, 1918, and ending September 30, 1920. 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 by the general methods outlined in standard textbooks on the measurement of river discharge. (See Pls. I, II.)

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

The data presented for each gaging station in the area covered by this report comprise a description of the station, a table giving records 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 height and records 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 permanence 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 use of 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 per second during the month. On this average flow are based computations recorded in the remaining columns, which are defined on page 2.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

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

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

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 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 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 "run-off 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.

PUBLICATIONS.

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 basin 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.

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

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

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

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

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

Boston, Mass., 2500 Customhouse.
Albany, N. Y., 704 Journal Building.
Trenton, N. J., State House.
Asheville, N. C., 33–35 Broadway.
Chattanooga, Tenn., 37 Municipal Building
Columbus, Ohio, Orton Hall, Ohio State University.
Chicago, Ill., 1404 Kimball Building.
Madison, Wis., care of Railroad Commission of Wisconsin.
Ames, Iowa, 103 Engineering Hall, Iowa State College.
Rolla, Mo., Rolla Building, School of Mines and Metallurgy.
Topeka, Kans., 23 Federal Building.
Helena, Mont., 52 National Bank Building.
Denver, Colo., 403 Post Office Building.
Salt Lake City, Utah, 313 Federal Building.
Idaho Falls, Idaho, 228 Federal Building.
Boise, Idaho, 615 Idaho Building.
Tacoma, Wash., 406 Federal Building.
Portland, Oreg., 606 Post Office Building.
San Francisco, Calif., 328 Customhouse.
Los Angeles, Calif., 600 Federal Building.
Tucson, Ariz., 210 Agricultural Building, University of Arizona.
Austin, Tex., State Capitol.
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 records have been obtained at about 5,000 points in the United States, and the data obtained have been published in the reports tabulated on pages 7 and 8.

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	Description, 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.
W 471 to 484	do	1918.
W 501 to 514	do	1919 and 1920.

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

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

The following table gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1920. 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 1920 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, 453, 473, and 503 which contain records for the Ohio River basin for those years.

Numbers of water-supply papers containing results of stream measurements, 1899-1920.

Year.	I North Atlantic slope basins (St. John River to York River).	II South Atlantic 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 basin.	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
1918	471	472	473	474	475	476	477	478	479	480	481	482	483	484
1919-20	501	502	503	504	505	506	507	508	509	510	511	512	513	514

[a] Rating tables and index to Water-Supply Papers 35-39 contained in Water-Supply Paper 39. Tables of monthly discharge for 1899 in Twenty-first Annual Report, Part IV.
[b] James River only.
[c] Gallatin River.
[d] Green and Gunnison rivers and Grand River above junction with Gunnison.
[e] Mohave River only.
[f] Kings and 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.

COOPERATION.

The State of New York cooperated in maintaining the station on Allegheny River at Red House, N. Y.

The work in Pennsylvania was done in cooperation with the State Water Supply Commission, T. J. Lynch, secretary. The United States Engineer Corps also cooperated with the Water Supply Commission in maintaining the stations on Allegheny River at Franklin, Chartiers Creek at Carnegie, and Connoquenessing Creek near Hazen, Pa. The Carnegie Steel Co. cooperated in maintaining the station on Shenango River at Sharon, Pa.

The work in West Virginia was done in cooperation with the State Geological Survey, I. C. White, State geologist. The United States Engineer Corps also cooperated in maintaining six stations in the Monongahela River basin, and furnished base data for twelve additional stations in the State.

The stations on Little Beaver and Yellow creeks in Ohio were maintained in cooperation with United States Engineer Corps, by whom base data were furnished for ten additional stations in that State.

Work on five gaging stations in Kentucky was done in cooperation with the State Geological Survey, J. E. Barton and W. R. Jillson, State geologists. Base data for all other stations in that State were furnished by United States Engineer Corps.

Work in Illinois was carried on in cooperation with the division of waterways of the Department of Public Works.

Work in Tennessee after January 1, 1920, was done in cooperation with the State Geological Survey, Wilbur A. Nelson, State geologist.

In September, 1920, a three-party agreement was entered into by the Chief of Engineers, United States Army, the State geologist of Tennessee, and the Director of the United States Geological Survey, for work in the Tennessee River basin. Maj. Harold C. Fiske, in charge of the United States Engineer office at Chattanooga, Tenn., represented the United States Engineer Corps in the execution of work under this agreement. Most of the office work and computation of records for stations in the Tennessee River basin as published in this report were made after the cooperative agreement was entered into, and employees of the United States Engineer office at Chattanooga assisted in the work.

The Tennessee Power Co. cooperated in maintaining five stations in the Hiwassee and Caney Fork basins and the Embree Iron Co. paid the gage reader on Nolichucky River at Embreeville, Tenn.

The North Carolina Geological and Economic Survey cooperated in maintaining stations on North Toe, Nantahala, Valley, and Nottely rivers.

The Alabama Geological Survey, Eugene Allen Smith, State geologist, rendered financial assistance in connection with the stations on Elk River near Elkmont and on Bear Creek near Red Bay, Ala.

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 M. H. Carson, J. W. Moulton, A. H Davison, Otto Lauterhahn, and B. F. Howe.

Data for stations in Pennsylvania were collected and prepared for publication under direction of O. W. Hartwell, district engineer, assisted by B. J. Peterson and engineers of the State Water Supply Commission as follows: R. A. Boehringer, R. H. Hosmer, R. J. Ferris, H. L. Landis, J. M. Snavely, and B. J. Lichty.

Data for stations in Virginia, West Virginia, and Ohio were collected and prepared for publication under direction of G. C. Stevens, district engineer, assisted by B. J. Peterson, B. L. Bigwood, J. J. Dirzulaitis, V. B. Lamoureux, and J. S. S. Jones.

Data for stations in Illinois were collected and prepared for publication under the direction of W. G. Hoyt, district engineer, assisted by H. C. Beckman, H. J. Dean, and H. E. Grosbach.

Data for stations in Kentucky were collected and prepared for publication under the direction of G. C. Stevens, district engineer, until January 1, 1920, and W. R. King, district engineer, after that date, assisted by J. S. S. Jones, V. B. Lamoureux, and Warren Withee.

Data for stations in Tennessee, North Carolina, Georgia, and Alabama were collected under the direction of C. G. Paulsen, district engineer, until June, 1919, Warren E. Hall, district engineer, after that date, and Warren R. King, district engineer for Tennessee, after January 1, 1920. A. H. Condron and L. J. Hall assisted in collecting the data and Warren Withee, Reginald Waldo, Duncan Charlton, and Effie Mae Tiller assisted in preparing the records for publication.

The records were assembled and reviewed by B. J. Peterson.

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, outlet of Chautauqua Lake, enters Allegheny River in Pennsylvania 30 miles below station.

DRAINAGE AREA.—1,640 square miles.

RECORDS AVAILABLE.—September 4, 1903, to September 30, 1920.

GAGE.—Gurley 7 day graph water-stage recorder on left bank just below highway bridge; installed September 3, 1917. Prior to this date, chain gage attached to the upstream side of bridge near left end. Recorder inspected by W. E. Coe.

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

CHANNEL AND CONTROL.—Coarse gravel; occasionally shifting. Current swift for medium and high stages, slow at low stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 10.12 feet at noon May 23 (discharge, 21,400 second-feet); minimum stage, 3.18 feet at 2 p. m. July 21 (discharge, 312 second-feet).

Maximum stage recorded during year ending September 30, 1920, 11.95 feet at 8 a. m. March 15 (discharge, 31,500 second-feet); minimum stage, 3.10 feet September 26, 27, and 28 (discharge, 260 second-feet).

1903–1920: Maximum stage recorded, 12.7 feet March 26, 1913 (discharge, 40,000 second-feet); minimum stage, 2.7 feet several days in December, 1908 (discharge, about 100 second-feet).

ICE.—Stage-discharge relation 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, a tributary of Allegheny River, and Genesee River, a tributary of Lake Ontario, was formerly used for supplying water to the Erie Canal system through the abandoned Genesee River canal and Genesee River. This reservoir is no longer used for canal purposes and all the water is turned into the Allegheny through Olean Creek.

ACCURACY.—Stage-discharge relation practically permanent between dates of shifting affected by ice during winter of 1919–20. Rating curve well defined between 300 and 900 second-feet and between 6,000 and 15,000 second-feet. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspection of recorder-graph. Records good except for periods when the stage-discharge relation was affected by ice when records were fair.

Discharge measurements of Allegheny River at Red House, N. Y., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Apr. 18	M. H. Carson	6.01	5,570	Jan. 21	Covert and Lauterhahn	[a] 4.17	575
May 17	J. W Moulton	6.46	6,820	Feb. 19	Otto Lauterhahn	[a] 4.50	694
June 18	do	3.77	905	Mar. 29	do	6.42	6,520
Oct. 2	Davison and Howe	3.23	324	June 8	B. F. Howe	3.52	625

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Allegheny River at Red House, N. Y., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1,460	8,070	1,770	3,750	1,370	3,230	1,870	2,680	2,480	848	528	1,720
2	1,380	6,690	1,660	7,910	1,030	3,660	1,790	2,980	2,090	727	645	1,380
3	1,500	5,560	1,580	6,690	1,070	2,600	1,720	2,980	1,770	635	566	1,660
4	1,690	5,420	1,610	5,030	1,310	2,310	1,720	2,880	1,560	576	454	1,580
5	1,610	5,970	1,520	3,900	1,180	2,440	1,910	3,200	1,400	500	400	1,360
6	1,540	4,640	1,460	3,200	980	2,880	1,940	2,980	1,360	481	1,180	1,160
7	2,640	3,780	1,420	2,980	882	2,800	1,820	2,980	1,360	490	2,020	980
8	3,090	3,200	2,390	3,090	905	2,620	2,220	3,420	1,320	509	1,270	836
9	2,620	2,880	5,030	2,880	790	4,030	4,520	3,420	1,310	454	980	748
10	2,310	2,700	3,780	2,040	859	6,400	7,030	10,400	1,460	427	769	665
11	2,020	2,520	3,090	1,940	870	5,290	11,000	18,800	1,250	645	645	605
12	1,860	2,160	3,200	1,690	824	4,270	14,100	15,400	1,020	738	556	605
13	1,970	1,960	3,090	1,610	1,070	3,900	10,600	11,400	870	528	509	685
14	1,870	1,840	4,400	1,740	1,920	3,090	8,900	8,560	802	427	481	635
15	1,770	1,690	6,840	1,970	1,940	2,680	6,990	8,070	824	427	436	538
16	1,610	1,550	5,970	1,870	1,940	2,860	6,260	5,160	1,020	576	400	490
17	1,440	1,890	4,900	1,660	1,720	5,290	5,830	5,970	918	509	436	454
18	1,310	3,200	4,020	1,560	1,310	7,140	5,290	7,140	980	418	3,110	427
19	1,300	5,030	3,420	1,550	1,190	6,690	4,640	5,700	780	352	4,140	400
20	1,300	5,160	2,880	1,370	930	5,290	4,020	5,650	696	332	3,660	392
21	1,500	4,900	2,580	1,360	859	4,520	3,900	13,200	1,910	325	2,600	445
22	1,500	4,400	2,240	1,320	900	3,900	3,420	18,800	1,580	1,780	1,940	556
23	1,400	3,780	1,740	1,480	950	3,310	2,880	20,800	1,030	2,780	1,560	743
24	1,400	3,200	1,550	2,640	1,000	2,860	3,420	19,800	790	1,600	1,270	727
25	1,300	2,800	1,870	2,700	1,100	2,520	3,540	16,800	675	1,080	1,140	605
26	2,000	2,460	1,550	2,350	1,000	2,270	3,200	12,500	790	848	1,210	518
27	2,740	2,150	2,680	2,150	1,100	2,110	3,310	9,250	1,440	696	1,030	463
28	2,460	1,960	3,310	1,940	1,430	2,330	3,310	6,840	1,770	665	955	445
29	3,200	2,020	2,980	1,840	.....	2,380	3,420	4,900	1,380	645	870	400
30	3,660	2,040	2,980	1,710	.....	2,160	2,980	3,780	1,030	605	813	378
31	8,040	.....	2,460	1,490	.....	2,020	.....	2,880	.....	518	1,220	.....
1919–20.												
1	360	7,440	4,400	500	650	550	3,400	5,290	645	905	615	472
2	346	8,560	3,540	460	600	550	3,200	5,030	645	665	585	436
3	346	7,910	2,880	500	650	550	3,090	4,270	625	526	555	400
4	332	6,840	2,580	550	700	700	2,880	3,780	625	526	490	384
5	332	6,540	2,250	480	800	2,800	2,840	3,200	605	472	436	346
6	376	5,560	2,020	500	850	9,000	2,980	2,640	575	400	400	384
7	605	4,400	2,040	420	850	11,000	3,090	2,270	595	418	384	585
8	685	3,540	2,110	360	850	9,500	2,840	2,020	575	585	384	565
9	545	2,980	2,910	380	800	9,000	2,600	1,840	526	801	436	472
10	499	2,520	5,890	440	800	9,000	2,480	1,660	490	905	427	418
11	595	2,640	4,430	500	800	8,000	2,350	1,640	454	685	661	384
12	965	2,980	3,310	500	800	6,999	2,310	2,200	445	565	790	454
13	1,220	2,680	5,570	500	850	8,420	2,400	1,990	436	481	625	725
14	1,040	2,350	6,540	440	900	18,400	2,400	1,640	481	454	818	768
15	905	2,130	5,290	460	850	30,600	2,640	1,550	472	436	2,080	635
16	845	1,940	4,020	500	750	22,900	3,660	1,440	517	409	1,840	481
17	953	1,800	3,310	500	750	18,800	4,400	1,300	801	384	3,030	392
18	1,440	1,670	2,620	500	750	15,000	4,020	1,190	1,630	368	4,770	360
19	1,300	1,580	2,440	550	700	11,700	3,540	1,140	1,740	590	3,310	311
20	1,160	1,430	2,080	550	700	8,560	3,090	1,120	1,140	1,310	2,200	304
21	1,100	1,300	1,900	600	600	6,690	2,980	1,360	881	917	1,630	290
22	1,750	1,300	1,700	600	600	5,700	3,310	1,500	738	801	1,360	290
23	1,790	1,460	1,600	600	600	5,420	3,090	1,220	635	917	1,160	272
24	1,430	1,740	1,300	600	600	6,260	3,310	1,270	625	2,540	991	260
25	1,210	1,660	1,100	600	550	7,290	3,660	1,190	615	3,570	834	266
26	1,100	1,770	1,200	600	550	8,560	4,020	1,030	585	1,960	725	260
27	1,150	4,620	950	650	550	8,900	4,640	917	517	1,370	655	260
28	1,550	4,770	900	650	550	7,760	5,290	823	445	1,040	499	260
29	3,250	4,140	800	650	550	6,400	4,900	768	418	845	535	311
30	3,090	4,640	750	650	.....	5,000	5,160	685	614	695	535	408
31	3,350	.....	750	650	.....	4,000	.....	635	.....	665	526	.....

NOTE.—Discharge, Dec. 21, 1919, to Mar. 11, 1920, determined from gage heights corrected for ice effect on basis of 2 discharge measurements and study of gage-height graph and weather records. Discharge, Oct. 19–26, 1918, Feb. 22–27, and Dec. 18–20, 1919, Mar. 30, to Apr. 2, 1920, estimated on basis of comparison with records for Cattaraugus Creek at Versailles.

Monthly discharge of Allegheny River at Red House, N. Y., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,640 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	8,040	1,300	2,110	1.29	1.49
November	8,070	1,550	3,520	2.15	2.40
December	6,840	1,420	2,900	1.77	2.04
January	7,910	1,320	2,560	1.56	1.80
February	1,940	790	1,160	.708	.74
March	7,140	2,020	3,540	2.16	2.49
April	14,100	1,720	4,580	2.79	3.11
May	20,800	2,680	8,360	5.10	5.88
June	2,480	675	1,260	.768	.86
July	2,780	325	715	.436	.50
August	4,140	400	1,220	.744	.86
September	1,720	378	753	.459	.51
The year	20,800	325	2,740	1.67	22.68
1919–20.					
October	3,350	332	1,150	.701	.81
November	8,560	1,300	3,500	2.13	2.38
December	6,540	750	2,690	1.64	1.89
January	650	360	530	.323	.37
February	900	550	709	.432	.47
March	30,600	550	8,840	5.39	6.21
April	5,290	2,310	3,350	2.04	2.28
May	5,290	635	1,890	1.15	1.33
June	1,740	418	672	.410	.46
July	3,570	368	878	.535	.62
August	4,770	384	1,110	.677	.78
September	768	260	405	.247	.28
The year	30,600	260	2,150	1.31	17.88

ALLEGHENY RIVER AT FRANKLIN, PA.

LOCATION.—At Eighth Street four-span steel highway bridge, Franklin, Venango County.

DRAINAGE AREA.—6,010 square miles.

RECORDS AVAILABLE.—April 1, 1905, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to upstream side of bridge in first span from left end; read by W. C. Rivers. Elevation of gage zero 958.26 feet, United States Geological Survey datum.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge.

CHANNEL AND CONTROL.—Banks high and not subject to overflow below a stage of 22 feet. Bed composed of gravel and boulders. Control at a riffle, 200 feet long, about 1,000 feet below gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 12.70 feet at 2 p. m. May 11, discharge, 70,100 second-feet); minimum stage, 0.10 foot July 23 and 31 (discharge, 970 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 18.65 feet observed at 10 a. m. March 13 (discharge, 118,000 second-feet); minimum stage, 0.22 foot September 24 (discharge, 1,080 second-feet).

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

ACCURACY.—Stage-discharge relation permanent except as affected by ice December 21, 1919, to March 10, 1920. Rating curve well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Allegheny River at Franklin, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 9	R. A. Boehringer	2.70	8,050	Nov. 12	J. M. Snavely	3.09	9,260
1919.				1920.			
July 30	Ferris and Snavely	.50	1,470	June 9	do	.96	2,400

Daily discharge, in second-feet, of Allegheny River at Franklin, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1.....	4,860	24,000	7,380	10,500	6,280	12,100	8,140	12,900	9,300	4,210	1,260	4,210
2.....	4,210	21,000	7,010	29,400	6,280	17,800	7,760	16,800	7,760	3,430	1,330	4,540
3.....	4,210	18,300	6,280	30,600	5,570	15,300	7,010	17,300	7,010	2,600	1,330	4,540
4.....	5,570	16,300	6,280	22,800	5,570	12,100	6,280	14,300	6,280	2,230	1,260	4,880
5.....	5,920	19,800	6,640	16,300	5,570	10,900	5,920	13,300	5,920	2,010	1,200	4,540
6.....	8,140	18,800	6,640	12,500	5,570	10,900	6,280	14,300	5,570	1,810	1,140	3,580
7.....	9,300	15,300	6,280	11,300	5,220	11,700	7,380	14,800	5,220	1,630	1,080	3,140
8.....	8,520	12,100	6,280	10,900	4,880	10,100	9,300	18,800	4,880	1,470	2,010	2,720
9.....	8,520	10,100	10,100	10,100	4,880	13,800	10,500	19,300	5,920	1,330	2,230	2,470
10.....	7,760	9,300	16,800	8,520	4,880	25,800	16,300	34,900	5,570	1,330	2,010	2,230
11.....	7,010	9,300	14,300	7,760	4,540	25,200	28,800	69,300	5,220	1,200	1,810	2,010
12.....	5,570	8,520	13,300	7,010	4,210	20,400	39,100	62,200	4,880	1,330	1,630	2,010
13.....	5,570	7,760	13,300	6,280	4,210	16,300	33,600	48,200	4,210	1,330	1,910	1,910
14.....	6,280	7,010	16,300	6,280	4,880	13,800	27,000	34,900	3,580	1,330	1,810	1,810
15.....	6,280	6,280	30,000	7,380	7,010	11,700	21,600	27,600	3,280	1,400	1,810	1,810
16.....	5,570	5,570	28,800	7,760	10,100	11,700	18,300	22,800	2,860	1,470	1,810	1,720
17.....	4,880	5,570	22,800	7,760	8,520	21,000	24,000	27,000	2,350	1,400	2,720	1,550
18.....	4,210	7,010	17,300	7,010	7,010	27,600	22,800	32,400	2,230	1,330	4,880	1,470
19.....	3,140	11,700	13,300	7,010	6,280	28,200	19,800	27,600	2,120	1,260	7,010	1,400
20.....	2,860	16,800	11,300	7,010	5,920	22,800	15,300	21,600	2,010	1,200	8,140	1,910
21.....	5,570	16,300	9,300	6,640	5,570	18,300	14,300	26,400	3,890	1,080	7,010	2,010
22.....	8,520	15,300	10,100	6,280	5,570	14,300	13,300	37,700	3,740	1,080	5,570	2,010
23.....	7,760	13,300	15,300	7,010	9,300	12,500	11,700	43,300	4,210	970	4,540	2,120
24.....	6,280	11,700	16,300	12,500	13,300	10,900	11,300	43,300	3,140	2,230	3,890	2,350
25.....	5,570	10,100	18,300	15,300	12,100	10,100	15,300	41,200	2,350	2,600	3,580	2,350
26.....	6,280	9,300	18,300	12,900	12,500	8,520	14,800	33,600	8,140	1,910	2,990	2,230
27.....	9,300	8,520	15,800	10,900	11,300	8,520	13,300	26,400	8,910	1,400	2,990	1,910
28.....	9,700	7,010	13,300	9,300	10,100	8,910	13,800	19,800	7,010	1,200	2,990	1,630
29.....	10,100	7,010	11,300	8,520	.....	8,520	15,300	15,300	6,280	1,080	2,860	1,550
30.....	10,500	7,760	10,100	7,760	.....	8,520	14,300	13,300	5,570	1,080	2,720	1,400
31.....	18,800	.....	9,300	7,010	.....	8,520	.....	10,900	.....	970	3,740	.....
1919-20.												
1.....	1,400	19,800	15,300	3,600	3,200	4,200	11,700	19,800	2,720	2,470	2,720	1,630
2.....	1,400	26,400	12,900	3,400	3,200	4,400	10,100	17,800	2,470	2,470	2,350	1,550
3.....	1,330	24,600	10,500	3,200	3,200	4,600	9,300	15,300	2,720	2,990	2,010	1,470
4.....	1,330	18,800	8,520	3,200	3,200	4,800	8,910	17,800	2,990	2,600	1,810	1,330
5.....	1,400	16,300	7,760	3,200	3,200	6,500	8,520	11,300	2,860	2,120	1,720	1,330
6.....	2,600	14,800	7,010	3,200	3,200	11,000	9,700	10,100	2,720	1,810	1,630	1,260
7.....	3,740	13,300	7,760	3,400	3,200	18,000	9,700	8,520	2,600	2,010	1,550	1,550
8.....	3,280	11,700	8,520	3,600	3,400	19,000	9,300	7,760	2,470	2,990	1,810	2,350
9.....	2,720	10,100	10,500	3,800	3,400	18,000	8,910	7,010	2,120	6,280	1,630	2,120
10.....	2,720	8,520	20,400	3,800	3,600	18,000	8,520	6,640	2,230	7,010	2,120	1,910
11.....	2,860	8,140	21,000	4,000	3,600	27,000	8,520	6,280	2,010	5,570	2,600	1,810
12.....	3,890	9,700	15,800	3,800	3,800	62,200	8,140	6,280	1,910	4,210	2,230	1,720
13.....	4,880	10,100	18,300	3,800	3,800	113,000	9,300	7,010	1,810	3,430	2,860	3,140
14.....	4,540	9,300	29,400	3,800	3,800	87,700	12,100	6,640	2,010	2,990	8,910	2,600
15.....	4,210	7,760	25,200	3,600	3,800	66,900	11,300	5,920	2,120	2,720	4,880	2,600
16.....	3,580	7,010	17,300	3,400	3,800	56,600	12,900	5,220	3,280	2,470	5,570	2,120
17.....	3,580	6,280	12,100	3,400	3,800	60,800	22,200	4,880	10,100	2,350	5,570	1,810
18.....	3,430	5,920	10,900	3,200	3,600	53,100	22,200	4,540	15,300	2,120	10,100	1,550
19.....	3,430	5,570	8,140	3,200	3,600	41,900	16,800	4,210	11,700	2,350	11,700	1,400
20.....	3,580	5,570	6,640	3,200	3,200	37,700	13,300	4,210	8,910	5,920	8,140	1,260
21.....	3,280	4,880	6,500	3,200	3,200	30,000	13,300	6,280	7,380	5,220	5,920	1,200
22.....	3,740	4,880	5,500	3,200	3,200	25,200	14,300	5,570	5,920	5,220	5,220	1,140
23.....	4,880	4,880	5,000	3,200	3,200	21,600	13,800	5,920	5,220	9,700	4,210	1,140
24.....	5,570	6,280	4,600	3,200	3,400	21,000	14,300	5,570	5,570	10,100	3,430	1,080
25.....	4,880	7,010	4,200	3,200	3,600	22,200	13,300	5,920	5,220	8,140	2,990	1,140
26.....	4,210	7,010	4,200	3,200	3,800	24,000	12,100	5,220	4,210	8,520	2,600	1,140
27.....	3,740	14,300	4,000	3,200	3,800	24,600	11,300	4,540	3,280	6,280	2,350	1,200
28.....	9,300	17,800	3,800	3,200	4,200	22,800	17,800	4,210	2,860	4,540	2,120	1,550
29.....	12,900	14,800	3,800	3,200	4,200	18,800	24,000	3,580	2,470	3,580	1,910	1,470
30.....	10,900	15,800	3,600	3,200	.....	15,800	22,800	3,140	2,606	2,990	1,810	1,400
31.....	10,500	.....	3,600	3,200	.....	13,300	.....	2,860	.....	2,600	1,810	.....

NOTE.—Discharge, Dec. 21, 1919, to Mar. 10, 1920, estimated, because of ice, from weather records and study of gage-height graph.

Monthly discharge of Allegheny River at Franklin, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 6,010 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	18,800	2,860	6,990	1.16	1.34
November	24,000	5,570	11,900	1.98	2.21
December	30,000	6,280	13,200	2.20	2.54
January	30,600	6,280	10,900	1.81	2.09
February	13,300	4,210	7,040	1.17	1.22
March	28,200	8,520	14,700	2.44	2.81
April	39,100	5,920	15,800	2.63	2.94
May	69,300	10,900	27,800	4.62	5.33
June	9,300	2,010	4,980	.829	.92
July	4,210	970	1,640	.273	.32
August	8,140	1,080	2,940	.489	.56
September	4,880	1,400	2,470	.411	.46
The year	69,300	970	10,100	1.68	22.74
1919–20.					
October	12,900	1,330	4,320	.719	.83
November	26,400	4,880	11,200	1.86	2.08
December	29,400	3,600	10,400	1.73	1.99
January	4,000	3,200	3,390	.564	.65
February	4,200	3,200	3,520	.586	.63
March	113,000	4,200	30,800	5.12	5.90
April	24,000	8,140	12,900	2.11	2.35
May	19,800	2,860	7,420	1.23	1.42
June	15,300	1,810	4,330	.720	.80
July	10,100	1,810	4,320	.719	.83
August	11,700	1,550	3,750	.624	.72
September	3,140	1,080	1,630	.271	.30
The year	113,000	1,080	8,200	1.36	18.5

ALLEGHENY RIVER AT KITTANNING, PA.

LOCATION.—At Market Street, five-span steel highway bridge, Kittanning, Armstrong County.

DRAINAGE AREA.—9,010 square miles.

RECORDS AVAILABLE.—August 18, 1904, to September 30, 1920. Records October 1, 1913, to September 30, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to upstream side of bridge; read by S. C. Carr. Elevation of gage zero 764.45 feet, United States Geological Survey datum.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Bed composed of gravel. Control is at a riffle about 500 feet below gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 17.9 feet at 5 p. m. May 11 (discharge, 106,000 second-feet); minimum stage, 1.86 feet at 8 a. m. July 25 (discharge, 1,400 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 26.4 feet at 6 p. m. March 13 (discharge, 209,000 second-feet); minimum stage, 1.8 feet several days in September (discharge, 1,340 second-feet).

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

ACCURACY.—Stage-discharge relation permanent except as affected by ice December 21, 1919, to March 13, 1920. Rating curve well defined between 800 and 250,000 second-feet. Gage read to tenths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Allegheny River at Kittanning, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Oct. 13	R. A. Boehringer	4.82	8,220	Jan. 11	B. A. Knight	[a]8.38	5,820
				Feb. 9	J. M. Snavely	[a]6.03	5,250
1919.				May 13	do	4.90	8,610
July 25	Ferris and Snavely	2.27	2,140				

[a] Measurement made through complete ice cover.

Daily discharge, in second-feet, of Allegheny River at Kittanning, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19												
1	5,840	37,200	10,100	15,800	9,200	16,800	10,100	19,000	14,300	5,580	1,600	6,380
2	5,340	34,400	10,100	40,000	7,980	21,400	9,200	24,500	11,900	4,620	1,840	6,380
3	4,850	29,000	8,780	53,000	6,960	24,500	8,380	28,400	10,100	3,940	1,920	5,840
4	5,080	25,200	7,980	42,900	6,660	20,200	7,980	25,200	8,780	3,270	1,760	5,340
5	6,660	22,600	8,380	29,700	6,660	16,800	7,980	20,800	7,600	3,060	1,920	5,340
6	10,100	26,400	8,380	22,600	6,960	16,800	8,780	19,600	6,960	2,640	2,640	4,850
7	20,800	23,900	8,380	17,800	6,100	17,800	9,200	20,200	6,380	2,350	2,640	4,390
8	16,800	18,400	7,980	17,300	5,340	16,200	9,200	23,900	5,840	2,260	2,160	3,940
9	13,800	15,800	9,200	16,200	4,390	17,800	11,400	33,000	6,100	1,920	1,840	3,060
10	11,900	12,800	14,800	13,300	4,850	37,200	14,800	53,000	7,600	1,920	3,490	2,850
11	10,100	11,900	20,200	11,000	4,390	40,700	27,800	98,600	5,840	1,920	2,850	2,640
12	8,380	11,000	18,400	9,640	3,940	35,100	45,700	98,600	5,580	1,920	2,080	2,640
13	7,600	10,100	17,800	7,600	4,390	29,000	48,600	76,200	4,850	2,080	2,080	2,350
14	7,600	9,200	21,400	6,960	5,580	23,300	40,700	57,600	4,620	2,260	2,000	2,260
15	7,980	8,380	34,400	9,640	7,260	20,200	31,700	42,900	4,850	2,640	1,920	2,080
16	7,600	7,600	44,300	11,900	11,000	17,300	27,100	37,900	4,850	4,620	1,760	1,920
17	6,380	6,960	37,900	11,000	12,800	29,000	30,400	37,900	4,390	3,490	1,920	1,920
18	5,840	11,000	29,700	11,400	10,100	40,000	34,400	54,500	4,850	3,060	3,270	1,760
19	5,340	19,000	22,600	10,500	7,600	44,300	30,400	47,900	4,850	2,640	5,840	1,600
20	5,340	27,100	18,400	11,000	6,660	38,600	26,400	40,000	4,160	2,260	6,960	1,760
21	5,340	28,400	15,800	10,100	6,380	31,000	22,000	47,100	3,940	2,080	7,980	1,920
22	7,600	25,200	14,800	9,200	6,380	25,200	19,000	56,100	4,850	1,840	7,600	2,440
23	10,500	22,600	25,200	9,200	9,200	21,400	17,300	67,400	4,390	1,680	6,380	2,850
24	8,780	19,000	28,400	13,800	16,800	17,300	16,200	63,200	4,850	1,600	5,340	3,270
25	7,600	16,800	28,400	29,000	18,400	14,800	15,800	64,000	3,940	1,840	7,600	3,490
26	7,260	14,300	31,700	23,900	19,600	13,300	20,200	54,500	3,490	3,940	6,960	3,060
27	11,900	11,900	27,800	18,400	19,000	12,400	19,000	43,600	13,800	2,850	4,850	2,850
28	13,300	11,000	23,300	15,300	16,800	12,400	17,300	33,700	10,500	2,440	4,390	2,440
29	13,800	10,100	19,000	12,800	.....	12,800	17,800	26,400	8,380	2,080	3,940	2,000
30	15,300	10,100	16,200	11,900	.....	12,400	19,000	20,800	6,660	1,680	4,390	1,760
31	26,400	.....	14,300	10,100	.....	11,000	.....	16,800	.....	1,600	5,340	.....
1919–20												
1	1,760	29,700	27,100	5,500	4,800	4,800	17,300	34,400	4,160	4,390	3,940	2,640
2	1,600	50,800	23,900	5,500	4,800	5,500	14,800	31,700	3,940	4,390	3,940	2,440
3	1,460	50,800	19,000	5,000	4,800	6,000	13,300	27,800	3,720	4,390	3,490	2,000
4	1,460	40,700	14,800	5,000	4,800	6,500	11,900	23,300	3,940	4,620	3,060	1,920
5	1,460	31,000	12,400	5,000	5,000	8,000	11,900	19,000	4,160	3,940	2,440	1,840
6	2,160	25,800	11,000	5,000	5,000	15,000	11,900	16,200	4,160	3,270	2,080	1,760
7	3,060	22,000	11,900	5,500	5,000	28,000	13,800	13,800	3,940	3,060	2,000	1,600
8	5,340	19,000	13,800	5,500	5,000	46,000	13,800	11,900	3,940	3,270	2,260	1,840
9	4,850	16,200	14,800	5,500	5,500	55,000	12,800	10,100	3,490	4,160	3,490	2,350
10	4,850	13,800	22,600	6,000	5,500	55,000	11,900	9,200	3,490	7,600	3,060	2,640
11	5,840	11,900	32,400	6,000	5,500	60,000	11,000	8,380	3,490	8,380	3,490	3,490
12	11,000	12,400	28,400	6,000	6,000	70,000	11,000	8,380	3,060	6,960	4,160	3,060
13	11,900	14,300	25,800	5,500	6,000	100,000	11,000	8,780	2,850	5,840	3,490	2,640
14	10,100	13,800	40,000	5,500	6,000	158,000	12,400	9,200	2,640	4,850	3,940	2,850
15	9,200	12,400	40,000	5,500	6,000	107,000	14,800	8,780	3,060	4,160	8,380	3,060
16	9,200	10,100	33,000	5,000	5,500	82,400	14,800	7,600	3,720	3,940	6,100	3,490
17	18,400	9,200	23,300	5,000	5,500	89,800	30,400	6,660	20,200	3,490	9,640	3,060
18	14,800	7,980	16,800	5,000	5,500	86,100	42,900	6,380	59,200	3,270	10,100	2,640
19	11,400	7,600	14,300	4,800	5,000	68,200	34,400	5,840	37,900	3,060	13,300	2,260
20	8,780	7,260	10,500	4,800	4,800	62,400	27,800	5,840	26,400	3,060	13,800	1,840
21	7,260	6,660	9,000	4,800	5,500	51,500	29,000	8,380	17,800	5,580	9,200	1,600
22	6,960	6,380	8,500	4,800	5,500	41,400	31,700	9,200	13,800	5,340	6,960	1,460
23	7,260	6,100	7,500	4,800	6,000	35,800	28,400	8,380	11,400	5,580	6,380	1,460
24	7,600	6,100	7,000	4,800	5,500	32,400	25,800	9,200	9,200	10,100	5,340	1,340
25	7,980	7,260	6,500	4,800	5,500	31,700	23,900	7,600	8,380	11,900	4,390	1,340
26	6,960	11,000	6,500	4,800	5,500	33,700	21,400	7,600	7,600	8,380	3,940	1,340
27	7,980	25,200	6,000	4,800	5,000	34,400	19,000	6,960	6,380	8,380	3,490	1,340
28	9,200	32,400	6,000	4,800	4,800	34,400	21,400	6,380	5,340	6,380	3,060	1,760
29	23,300	29,000	6,000	4,800	4,800	29,000	31,700	5,340	4,620	5,080	3,060	3,060
30	23,300	27,800	5,500	4,800	.....	24,500	34,400	5,080	4,160	4,160	2,640	3,490
31	19,600	.....	5,500	4,800	.....	20,800	.....	4,390	.....	3,720	2,640	.....

NOTE.—Discharge Dec. 21, 1919, to Mar. 13, 1920, estimated because of ice, from discharge measurements, weather records, and study of gage-height graph.

Monthly discharge of Allegheny River at Kittanning, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 9,010 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	26,400	4,850	9,710	1.08	1.24
November	37,200	6,960	17,900	1.99	2.22
December	44,300	7,980	19,500	2.16	2.49
January	53,000	6,960	17,200	1.91	2.20
February	19,600	3,940	8,980	.997	1.04
March	44,300	11,000	22,800	2.53	2.92
April	48,600	7,980	20,800	2.31	2.58
May	98,600	16,800	43,700	4.85	5.59
June	14,300	3,490	6,640	.737	.82
July	5,580	1,600	2,650	.294	.34
August	7,980	1,600	3,780	.420	.48
September	6,380	1,600	3,180	.353	.39
The year	98,600	1,600	14,800	1.64	22.31
1919–20.					
October	23,300	1,460	8,580	.952	1.10
November	50,800	6,100	18,800	2.09	2.33
December	40,000	5,500	16,400	1.82	2.10
January	6,000	4,800	5,140	.570	.66
February	6,000	4,800	5,310	.589	.64
March	158,000	4,800	47,800	5.31	6.12
April	42,900	11,000	20,400	2.26	2.52
May	34,400	4,390	11,300	1.25	1.44
June	59,200	2,640	9,670	1.07	1.19
July	11,900	3,060	5,310	.589	.68
August	13,800	2,000	5,070	.563	.65
September	3,490	1,340	2,250	.250	.28
The year	158,000	1,340	13,100	1.45	19.71

BROKENSTRAW CREEK AT YOUNGSVILLE, PA.

LOCATION.—At single-span steel highway bridge at Youngsville, Warren County.

DRAINAGE AREA.—290 square miles.

RECORDS AVAILABLE.—October 22, 1909, to September 30, 1920. Records prior to October 1, 1919, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to downstream side of bridge; read by H. H. Higgins and William L. York. Elevation of gage zero 1,188.92 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Banks are high and not subject to overflow. Bed is composed of silt, clay, and gravel. Control is at the first of a series of riffles extending from 300 to 500 feet below gage; may shift occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1920, 9.81 feet at 5 p. m. March 12 (discharge, about 10,000 second-feet); minimum stage, −0.18 foot at 5.15 p. m. September 20 (discharge, 56 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year except as affected by ice January 1 to February 13. Rating curve well defined between 50 and 5,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Brokenstraw Creek at Youngsville, Pa., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 1	J. M. Snavely	3.02	1,630	Apr. 13	J. M. Snavely	2.15	915
Jan. 17	do	[a] 1.50	28.2	June 7	do	.27	142
Feb. 17	do	[b] .63	253	Sept. 29	R. J. Ferris	— .07	66.0
Apr. 13	do	2.13	881				

[a] Measurement made through complete ice cover; results unreliable because of excessive amount of slush ice at measuring section.
[b] Measurement made through incomplete ice cover.

Daily discharge, in second-feet, of Brokenstraw Creek at Youngsville, Pa., for the year ending Sept. 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug	Sept.
1	135	1,510	595	240	170	231	398	1,370	282	130	130	125
2	135	1,740	418	220	180	248	378	1,440	265	120	115	115
3	135	1,510	338	200	180	282	358	1,370	300	120	110	105
4	138	800	282	200	170	522	338	1,300	300	105	105	90
5	248	620	230	200	170	1,230	378	1,370	179	86	105	88
6	230	545	300	220	150	1,510	418	1,230	84	84	95	100
7	212	570	398	240	140	1,300	398	1,100	152	212	95	112
8	206	545	358	240	150	1,100	398	980	170	378	86	125
9	200	479	620	240	150	1,230	398	860	152	860	90	118
10	188	378	1,440	240	170	2,060	378	645	125	595	200	110
11	191	438	1,040	200	170	6,310	545	545	107	398	206	110
12	282	920	800	200	170	8,800	745	378	105	282	200	115
13	265	745	1,660	200	170	9,200	1,040	282	164	218	146	102
14	209	398	1,740	180	182	8,300	1,160	265	158	218	745	115
15	185	319	1,230	170	173	7,600	1,100	230	146	248	458	90
16	164	300	695	170	227	6,310	1,040	206	265	230	319	82
17	152	265	500	170	265	4,560	980	178	458	176	500	78
18	140	230	500	170	248	3,630	980	172	695	176	1,230	63
19	135	218	458	150	224	2,900	1,040	230	458	980	980	60
20	130	206	438	150	227	2,510	1,230	300	300	920	418	58
21	125	188	378	140	197	1,820	1,100	282	265	522	282	65
22	230	206	338	140	188	1,440	1,040	248	230	338	282	60
23	265	300	282	140	167	1,040	1,160	300	224	695	265	60
24	224	398	319	140	167	920	1,230	378	265	1,040	212	60
25	179	378	338	140	197	800	1,230	358	212	458	185	67
26	170	695	282	140	221	800	1,230	338	170	319	167	62
27	186	745	265	140	248	920	1,230	300	146	248	149	70
28	645	645	248	140	282	860	1,230	300	130	200	135	86
29	595	620	282	150	282	800	1,230	319	115	164	140	72
30	378	800	282	150	.....	645	1,300	300	176	135	146	92
31	398	.....	248	150	.....	479	.....	265	.....	138	125	.....

NOTE.—Discharge Jan. 1 to Feb. 13 estimated, because of ice, from discharge measurements, weather records, and study of gage-height graph. Discharge June 5–6 estimated, because of no gage-height record.

Monthly discharge of Brokenstraw Creek at Youngsville, Pa., for the year ending Sept. 30, 1920.

[Drainage area, 290 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
October	645	125	228	0.786	0.91
November	1,740	188	590	2.03	2.26
December	1,740	230	558	1.92	2.21
January	240	140	180	.621	.72
February	282	140	194	.669	.72
March	9,200	231	2,590	8.93	10.30
April	1,300	338	856	2.95	3.29
May	1,440	172	575	1.98	2.28
June	695	115	227	.782	.87
July	1,040	84	348	1.20	1.38
August	1,230	86	272	.938	1.08
September	125	58	88.5	.305	.34
The year	9,200	58	562	1.94	26.36

TIONESTA CREEK AT BUTLER BRIDGE, PA.

LOCATION.—At three-span steel highway bridge, known as Butler Bridge, 2 miles above Nebraska, Forest County.

DRAINAGE AREA.—420 square miles.

RECORDS AVAILABLE.—July 26, 1912, to September 30, 1920. Records prior to October 1, 1919, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to downstream side of bridge; read by Mrs. P. S. Moore. The Sanborn water-stage recorder, installed on downstream end of first pier from left end of bridge, was not operated after April 18, 1920.

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

CHANNEL AND CONTROL.—Right bank high and not subject to overflow; left is overflowed at a stage of about 12.6 feet. Bed is composed of gravel and boulders. Control is at a riffle composed of gravel, at the upstream end of an island about 500 feet below gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum open-water stage recorded during year ending September 30, 1920, 10.3 feet at 8 a. m. March 13 (discharge, 8,340 second-feet); a stage of 16.5 feet, determined from levels, was reached at 12.30 p. m. March 12, but the water was held back by an ice jam; minimum stage, 3.10 feet at 1 p. m. September 26 (discharge, 42 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year except as affected by ice December 18 to March 12. Rating curve well defined below 1,000 second-feet and fairly well defined between 1,000 and 5,000 second-feet. Gage read to quarter-tenths once daily; water-stage recorder graph was unsatisfactory and not used. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Tionesta Creek at Butler Bridge, Pa., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 16	J. M. Snavely	[a] 5.29	191	June 8	R. J. Ferris	3.64	176
Feb. 20	do	[a] 6.02	243	Sept. 30	O. W. Hartwell	3.49	141

[a] Measurement made through complete ice cover.

Daily discharge, in second-feet, of Tionesta Creek at Butler Bridge, Pa., for the year ending Sept. 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	80	3,320	1,180	220	220	260	555	1,340	208	160	285	80
2	98	2,760	945	220	260	260	490	1,040	208	160	175	60
3	117	1,970	820	190	360	380	433	860	208	145	145	60
4	117	1,390	780	190	400	500	380	780	245	130	145	60
5	119	1,280	520	180	400	400	520	700	225	103	130	70
6	330	1,180	590	160	400	360	625	555	208	103	130	76
7	285	860	740	160	400	360	520	433	208	145	116	355
8	245	740	660	160	400	380	490	433	166	380	103	175
9	190	590	1,180	160	400	460	433	1,080	166	520	130	160
10	225	520	1,500	160	400	600	380	1,080	160	285	145	160
11	265	590	1,180	160	400	3,200	380	860	145	225	245	160
12	460	780	1,080	160	400	6,500	380	490	136	190	245	160
13	285	660	1,180	160	400	7,700	405	285	145	190	145	145
14	233	590	2,620	180	380	4,580	380	265	166	190	225	130
15	190	490	1,500	190	360	3,880	380	225	160	190	145	130
16	225	460	1,180	220	320	4,440	780	181	460	190	225	125
17	355	405	1,340	220	300	4,300	1,440	175	1,970	145	245	103
18	305	405	1,000	220	280	3,040	780	175	2,230	145	1,180	103
19	265	380	800	220	260	2,760	990	285	990	190	520	85
20	233	355	800	220	240	2,360	860	285	740	145	297	85
21	197	305	650	190	260	1,610	900	285	1,440	145	197	92
22	405	305	650	190	300	1,390	860	330	700	130	285	80
23	433	355	500	190	300	1,340	820	285	460	900	175	70
24	245	433	500	190	360	1,440	780	380	900	820	116	64
25	245	380	460	190	380	1,610	740	433	900	900	103	60
26	265	433	400	190	380	1,730	740	355	287	208	103	42
27	273	1,390	380	190	300	1,610	740	285	245	190	103	60
28	1,230	1,340	320	190	300	1,230	1,130	245	190	166	92	160
29	1,970	1,970	300	190	300	945	1,440	225	175	145	80	125
30	1,040	1,500	280	220	.....	700	1,440	208	160	130	80	160
31	1,040	.....	260	220	.....	590	.....	208	.....	175	80	.....

NOTE.—Discharge Dec. 18 to Mar. 12 estimated, because of ice, from discharge measurements, weather records, and study of gage-height graph.

Monthly discharge of Tionesta Creek at Butler Bridge, Pa., for the year ending Sept. 30, 1920.

[Drainage area, 420 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,970	80	386	0.919	1.05
November	3,320	305	938	2.23	2.49
December	2,620	260	848	2.02	2.33
January	220	160	190	.452	.52
February	400	220	340	.809	.87
March	7,700	260	1,970	4.69	5.41
April	1,440	380	706	1.68	1.87
May	1,340	175	476	1.13	1.30
June	2,230	136	487	1.16	1.29
July	900	103	253	.602	.69
August	1,180	80	206	.490	.56
September	355	42	113	.269	.31
The year	7,700	42	577	1.37	18.69

OIL CREEK NEAR ROUSEVILLE, PA.

LOCATION.—At two-span steel highway bridge half a mile below Rouseville, Venango County.

DRAINAGE AREA.—330 square miles.

RECORDS AVAILABLE.—October 20, 1909, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to downstream side of bridge; read by Mrs. Lenna Copeland.

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

CHANNEL AND CONTROL.—Left bank high and not subject to overflow; right bank is overflowed at a stage of about 9.2 feet. Bed composed of gravel and boulders. Control at the first of a series of riffles extending from 250 to 450 feet below gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 5.63 feet at 9 a. m. May 11 (discharge, 7,930 second-feet); minimum stage 0.7 foot August 9–12, September 18, and 19 (discharge, 54 second-feet).

Maximum stage recorded during the year ending September 30, 1920, determined by levels from high-water mark and hydrograph, 7.1 feet at 2 a. m. March 13 (discharge, 12,000 second-feet); minimum stage, 0.8 foot several days in October and September (discharge, 70 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year except as affected by ice January 16 to February 1, 1920. Rating curve well defined between 50 and 10,000 second-feet. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Oil Creek near Rouseville, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Oct. 11	R. A. Boehringer.....	1.24	202	Jan. 14	J. M. Snavely.....	[c] 1.21	180
				Feb. 21	.....do.....	[c] 1.16	192
1919.				Apr. 14	.....do.....	1.87	586
July 29	Peterson and Landis...	[a] .78	66	June 9	R. J. Ferris.....	1.01	124
30	.....do.....	[b] .82	70				

[a] Wading measurement 500 feet above gage.
[b] Wading measurement 3,000 feet below gage.
[c] Measurement made through incomplete ice cover.

Daily discharge, in second-feet, of Oil Creek near Rouseville, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	137	1,060	305	1,110	245	1,110	265	750	235	157	104	168
2	137	650	305	3,370	164	605	240	2,140	235	124	80	118
3	255	520	305	1,480	164	480	265	1,110	193	124	70	185
4	281	1,320	370	650	245	420	293	750	193	110	70	168
5	209	650	305	520	245	480	495	700	193	124	70	118
6	920	480	305	420	301	480	370	560	174	96	70	90
7	605	420	305	420	164	329	323	1,180	157	96	70	90
8	335	370	305	420	164	329	605	1,400	174	96	70	70
9	255	370	305	420	164	2,040	750	1,480	193	96	54	70
10	209	420	420	370	164	2,210	2,390	5,330	157	96	54	70
11	171	370	520	370	130	1,400	2,770	7,200	157	96	54	70
12	189	311	700	305	164	980	2,580	2,970	124	96	54	90
13	370	311	605	335	164	750	1,550	1,710	124	96	70	70
14	281	255	1,480	335	221	605	1,110	1,110	157	96	70	70
15	255	209	2,970	335	420	520	805	980	124	96	90	70
16	255	209	1,630	370	405	860	980	1,060	96	124	90	70
17	209	230	980	305	270	2,390	2,040	3,370	96	84	150	70
18	154	480	650	305	245	2,580	1,320	2,210	96	74	275	54
19	106	920	520	305	182	1,480	1,060	1,400	96	74	480	62
20	171	980	420	250	164	980	805	1,110	370	74	205	168
21	1,180	805	370	250	182	750	750	1,320	213	74	150	150
22	480	605	700	250	245	560	560	1,060	110	140	118	150
23	311	520	1,250	305	1,630	480	480	980	96	96	90	150
24	230	420	860	1,400	805	420	805	1,400	96	74	90	118
25	209	370	1,710	650	750	329	700	1,250	96	74	90	90
26	805	311	1,250	520	750	299	700	860	2,140	74	90	90
27	750	255	750	420	560	405	860	650	1,180	74	90	70
28	480	255	605	370	420	520	920	520	420	74	90	70
29	520	370	605	305	.....	420	980	420	160	82	90	70
30	480	370	405	250	.....	370	650	370	174	70	90	70
31	2,140	.....	370	205	.....	299	.....	323	.....	90	275	.....
1919–20.												
1	70	2,390	650	205	150	154	335	1,250	118	134	124	112
2	70	1,870	420	168	157	150	275	805	115	118	101	101
3	70	1,180	335	185	185	171	275	650	225	118	90	90
4	70	650	230	205	225	281	250	560	154	107	90	82
5	80	650	230	221	225	2,390	480	480	134	96	82	80
6	700	560	275	205	225	2,580	480	405	131	90	80	90
7	250	405	370	217	217	2,140	405	335	121	185	86	90
8	168	335	370	185	205	1,480	405	305	118	335	90	82
9	131	287	920	178	193	980	335	275	118	329	118	86
10	137	235	2,210	178	185	980	335	270	107	225	157	99
11	168	335	860	185	189	4,200	335	265	101	185	217	96
12	405	560	750	181	205	8,430	335	329	90	157	134	99
13	250	405	2,210	178	230	9,540	750	275	112	144	96	112
14	178	275	2,140	164	287	3,370	650	245	157	121	1,320	90
15	157	235	2,210	150	225	1,710	480	217	118	118	560	86
16	154	225	805	130	205	2,770	1,250	185	287	115	560	78
17	154	193	520	130	205	3,990	1,870	167	1,320	104	980	72
18	150	185	405	120	209	1,980	1,250	167	1,710	104	1,710	70
19	137	189	335	120	185	1,480	805	150	560	168	560	70
20	118	182	335	120	185	2,140	650	150	405	150	323	70
21	111	168	370	120	167	1,400	750	154	335	131	265	74
22	235	193	275	120	185	1,320	980	150	305	178	370	70
23	221	250	250	120	201	1,110	750	150	275	920	275	70
24	185	335	265	120	205	980	1,180	150	520	420	217	72
25	150	287	265	120	185	860	750	150	305	245	178	74
26	134	480	235	120	167	750	560	150	217	178	154	112
27	185	1,980	250	120	157	700	650	146	178	150	144	90
28	1,550	860	225	120	150	560	2,110	137	154	131	118	150
29	1,400	605	217	120	157	480	1,980	131	157	118	118	112
30	520	1,180	250	120	.....	405	1,250	118	150	101	118	118
31	700	.....	225	130	.....	370	.....	118	.....	118	118	.....

NOTE.—Discharge estimated Jan. 14–15, 1919, from gage-height graph. Discharge Jan. 16, 1920, to Feb. 1, 1920, estimated, because of ice, from discharge measurements, weather records, and study of gage-height graph.

Monthly discharge of Oil Creek near Rouseville, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 330 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	2,140	106	422	1.28	1.48
November	1,320	209	494	1.50	1.67
December	2,970	305	728	2.21	2.55
January	3,370	205	559	1.69	1.95
February	1,630	130	347	1.05	1.09
March	2,580	299	835	2.53	2.92
April	2,770	240	944	2.86	3.19
May	7,200	323	1,540	4.67	5.38
June	2,140	96	268	.812	.91
July	157	70	95	.288	.33
August	480	54	113	.342	.39
September	185	54	99	.300	.34
The year	7,200	54	539	1.63	22.20
1919–20.					
October	1,550	70	290	.879	1.01
November	2,390	182	589	1.78	1.99
December	2,210	217	626	1.90	2.19
January	221	120	153	.464	.53
February	287	150	195	.591	.64
March	9,540	150	1,930	5.85	6.74
April	2,110	250	764	2.32	2.59
May	1,250	118	292	.885	1.02
June	1,710	90	293	.888	.99
July	920	90	187	.567	.65
August	1,710	80	308	.933	1.08
September	150	70	89.3	.271	.30
The year	9,540	70	479	1.45	19.73

FRENCH CREEK AT KIMMEYTOWN, PA.

LOCATION.—At single-span steel highway bridge at Kimmeytown, Erie County, 4 miles upstream from mouth of South Branch of French Creek and 5 miles north of Union City.

DRAINAGE AREA.—207 square miles.

RECORDS AVAILABLE.—May 16, 1910, to September 30, 1920. Records prior to October 1, 1919, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to downstream side of bridge; read by Mrs. J. L. Carter. Elevation of gage zero 1,235.7 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. Right bank subject to overflow above a stage of 8.2 feet; left bank not subject to overflow. Control for low water is the first of a series of riffles extending from 10 to 60 feet below gage; probably shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum open-water stage recorded during the year ending September 30, 1920, 6.94 feet observed at 8.50 a. m. March 17 (discharge, 3,600 second-feet); a stage of 15.2 feet, estimated from hydrograph, was reached on March 12, when water was held back by an ice jam; minimum stage, 0.70 foot at 9 a. m. September 22, and 11.40 a. m. September 26 (discharge, 27 second-feet).

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

ACCURACY.—Stage-discharge relation probably permanent through the year except as affected by ice December 17 to March 13. Rating curve fairly well defined to 5,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records fair.

Discharge measurements of French Creek at Kimmeytown, Pa., during the year ending Sept. 30, 1920.

[Made by R. J. Ferris.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 10	0.98	60.4
Sept. 29	.79	34.6

Daily discharge, in second-feet, of French Creek at Kimmeytown, Pa., for the year ending Sept. 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	39	1,000	396	240	80	140	265	470	57	67	41	41
2	37	850	296	180	90	140	222	361	64	57	41	41
3	37	508	250	150	100	160	208	280	100	54	41	38
4	37	328	222	140	110	200	172	208	97	51	32	39
5	106	414	280	130	120	300	208	172	75	42	29	38
6	117	470	296	130	120	600	196	156	83	36	36	39
7	83	585	236	130	120	900	196	135	83	48	36	50
8	67	451	250	130	120	800	183	121	83	147	31	41
9	65	344	196	130	120	800	183	119	73	361	36	44
10	69	265	1,180	130	120	800	208	104	56	183	57	90
11	111	546	625	120	130	1,000	296	97	54	110	56	54
12	172	546	546	120	130	2,800	470	156	54	98	50	46
13	127	361	1,180	120	140	3,400	850	150	111	111	59	53
14	88	236	900	120	140	1,700	625	117	81	113	85	47
15	83	208	432	120	140	1,420	470	110	61	104	92	36
16	83	183	236	110	120	2,430	1,120	100	80	88	70	41
17	83	154	200	110	110	3,100	800	95	280	59	236	36
18	81	160	180	100	110	1,120	470	83	432	183	250	36
19	70	150	170	100	120	900	280	83	236	755	127	31
20	61	131	160	100	140	755	208	110	222	414	81	29
21	67	127	150	100	140	546	265	850	100	208	64	29
22	250	183	140	90	140	665	296	451	90	135	70	27
23	196	312	140	90	140	850	344	222	95	196	67	29
24	133	280	140	80	140	900	508	172	95	145	57	31
25	113	222	140	80	140	850	361	135	70	119	54	35
26	97	265	150	75	140	850	236	117	64	95	54	28
27	119	625	160	70	140	800	361	102	57	70	54	34
28	265	470	180	70	140	470	1,420	92	57	61	54	41
29	265	328	240	70	140	432	950	86	53	47	54	42
30	172	585	280	70	.....	378	546	67	50	50	59	41
31	296	.....	300	75	.....	312	.....	64	.....	48	53	.....

NOTE.—Discharge Dec. 17 to Mar. 13 estimated, because of ice, from weather records and study of gage-height graph.

Monthly discharge of French Creek at Kimmeytown, Pa., for the year ending Sept. 30, 1920.

[Drainage area, 207 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
October	296	37	116	0.560	0.65
November	1,000	127	376	1.82	2.03
December	1,180	140	331	1.60	1.84
January	240	70	112	.541	.62
February	140	80	126	.609	.66
March	3,400	140	984	4.75	5.48
April	1,420	172	431	2.08	2.32
May	850	64	180	.870	1.00
June	432	50	104	.502	.56
July	755	36	137	.662	.76
August	250	29	68.6	.331	.38
September	90	27	40.2	.194	.22
The year	3,400	27	251	1.21	16.52

FRENCH CREEK AT CARLTON, PA.

LOCATION.—At two-span steel highway bridge at Carlton, Mercer County.

DRAINAGE AREA.—1,000 square miles.

RECORDS AVAILABLE.—April 29, 1908, to September 30, 1920. Records prior to October 1, 1919, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGES.—Chain gage attached to downstream side of bridge; read by R. Z. Parrish. Elevation of gage zero 1,033.60 feet, United States Geological Survey datum. Sanborn water-stage recorder installed on the upstream end of pier was damaged by ice on March 14, 1920, and not used thereafter.

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

CHANNEL AND CONTROL.—Right bank high and not subject to overflow; left of medium height and overflow begins at a stage of about 10 feet. Bed composed of sand, gravel, and boulders. Control is at a riffle at the measuring section; practically permanent.

EXTREMES OF DISCHARGE.—Maximum open-water stage recorded during the year ending September 30, 1920, 13.50 feet at 5 p. m. March 14 (discharge, 25,000 second-feet); a stage of 13.70 feet was observed at 8 p. m. March 13, when stage-discharge relation was affected by ice; minimum stage, 0.35 foot several days in September (discharge, 128 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year, except as affected by ice December 18 to March 13. Rating curve fairly well defined below 3,000 second-feet and well defined between 3,000 and 13,000 second-feet. Gage read to half-tenths twice daily; during high stages more frequently. Daily discharge ascertained by applying daily mean gage height to rating table. Records fair.

Discharge measurements of French Creek at Carlton, Pa., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Nov. 5	J. M. Snavely	3.01	1,540
Feb. 19	....do	[a]3.65	873
June 11	R. J. Ferris	.71	332

[a] Measurement made through complete ice cover.

Daily discharge, in second-feet, of French Creek at Carlton, Pa., for the year ending Sept. 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	155	2,760	2,550	650	800	850	1,220	2,760	188	233	375	212
2	146	3,900	1,880	600	900	1,000	1,060	2,150	188	233	302	205
3	140	3,200	1,380	600	900	1,100	955	1,790	272	198	240	198
4	155	2,350	1,060	600	900	1,500	885	1,460	375	188	240	198
5	222	1,790	990	650	900	2,000	780	1,140	425	188	240	198
6	530	1,790	990	650	900	3,800	850	955	302	170	222	205
7	590	1,700	1,140	700	900	5,500	815	815	233	272	240	188
8	502	1,700	1,380	750	900	5,500	885	680	233	780	240	170
9	365	1,460	1,790	900	900	5,500	850	620	302	990	240	170
10	316	1,300	3,310	950	900	5,500	850	530	260	1,620	272	233
11	302	1,380	3,310	1,000	900	6,500	990	530	222	1,140	302	248
12	590	1,620	2,450	1,000	900	8,000	1,060	590	177	745	425	289
13	780	1,620	3,420	900	900	14,000	1,790	650	170	530	530	229
14	710	1,300	4,550	850	900	24,100	2,650	620	272	560	1,300	205
15	530	990	3,420	850	900	17,700	2,250	590	365	502	1,220	195
16	400	920	1,700	800	900	11,100	2,550	475	475	475	990	181
17	350	850	1,140	800	900	9,650	4,030	425	1,790	400	850	155
18	316	815	1,100	750	900	8,910	3,660	375	2,760	375	1,060	155
19	280	710	1,000	750	900	6,330	2,550	365	2,250	990	1,460	149
20	280	710	950	750	900	4,970	1,880	425	1,620	2,450	920	140
21	272	650	900	750	900	4,160	2,150	425	1,060	1,700	590	133
22	350	650	900	750	900	3,540	2,870	1,140	850	1,460	475	128
23	745	780	850	750	1,000	3,310	2,650	955	745	2,980	365	128
24	850	1,060	850	750	900	3,090	2,870	620	850	2,450	425	128
25	650	1,060	800	750	800	2,870	2,550	530	920	1,620	302	140
26	475	1,140	800	750	750	2,550	1,970	450	590	1,300	280	128
27	375	2,550	750	750	750	2,350	1,620	375	450	850	248	140
28	1,700	2,760	700	750	800	2,060	3,200	316	325	620	240	205
29	2,060	1,970	700	750	800	1,700	4,030	272	272	502	233	240
30	1,620	2,650	700	750	.....	1,460	3,200	233	248	400	222	240
31	1,540	.....	700	750	.....	1,380	.....	205	.....	365	222	.....

NOTE.—Discharge Dec. 18 to Mar. 14 estimated, because of ice, from one discharge measurement, weather records, and study of gage-height graph.

Monthly discharge of French Creek at Carlton, Pa., for the year ending Sept. 30, 1920.

[Drainage area, 1,000 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,060	140	590	0.590	0.68
November	3,900	650	1,600	1.60	1.78
December	4,550	700	1,550	1.55	1.79
January	1,000	600	766	.766	.88
February	1,000	750	879	.879	.95
March	24,100	850	5,550	5.55	6.40
April	4,030	780	1,990	1.99	2.22
May	2,760	205	757	.757	.87
June	2,760	170	640	.640	.71
July	2,980	170	880	.880	1.01
August	1,460	222	493	.493	.57
September	289	128	184	.184	.21
The year	24,100	128	1,330	1.33	18.07

CUSSEWAGO CREEK NEAR MEADVILLE, PA.

LOCATION.—At single-span steel highway bridge near Jones farm, 4½ miles northwest of Meadville, Crawford County.

DRAINAGE AREA.—88 square miles.

RECORDS AVAILABLE.—May 3, 1910, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to downstream side of bridge; read by Thomas McCay. Elevation of gage zero 1,071.77 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Banks subject to overflow; right is overflowed at a stage of about 8.6 feet and left at a stage of about 9.1 feet. Bed composed of sand, gravel, and boulders. Low-water control is a gravel bar 5 feet below gage; practically permanent. Control for medium and high stages is at old dam about 4 miles below the gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 10.72 feet at 7 a. m. May 11 (discharge, 1,210 second-feet); minimum stage, 0.4 foot July 30 (discharge, 1.5 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 13.59 feet observed at 6 p. m. March 12, stage-discharge relation affected by ice, discharge not determined; minimum discharge, 3 second-feet October 3 and September 18–26.

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

ACCURACY.—Stage-discharge relation fairly permanent, except as affected by ice. Rating curve fairly well defined. Gage read to tenths twice daily previous to November 6, 1919; to hundredths twice daily since that date. Daily discharge ascertained by applying daily mean gage height to rating table. Records fair.

Discharge measurements of Cussewago Creek near Meadville, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Oct. 8	R. A. Boehringer.....	3.70	112	June 11	J. M. Snavely.....	1.42	19.1
1919.							
July 26	Peterson and Landis...	.53	1.6				
Nov. 6	J. M. Snavely.....	3.76	108				

Daily discharge, in second-feet, of Cussewago Creek near Meadville, Pa., for the year ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.
1918–19.												
1	30	272	84	164	43	192	31	132	24	8	4	14
2	22	264	62	398	41	248	25	241	20	6	3	24
3	39	272	54	501	39	138	24	206	17	5	2	26
4	108	241	72	501	35	90	35	120	15	5	3	13
5	84	304	114	272	41	84	78	157	13	5	3	8
6	64	353	120	157	33	78	96	157	12	4	4	6
7	72	227	120	102	25	67	70	220	11	4	13	5
8	108	114	157	60	20	43	57	375	11	4	9	5
9	96	84	288	50	18	206	126	439	14	4	6	4
10	50	84	304	43	18	398	213	641	13	3	4	4
11	35	78	185	43	18	484	342	1130	11	4	3	4
12	33	62	185	41	18	332	375	861	9	5	2	5
13	132	50	185	45	22	157	272	663	8	4	2	4
14	185	43	256	60	47	114	150	411	8	3	3	4
15	114	39	411	96	120	78	102	192	6	6	3	4
16	64	31	453	108	150	132	150	213	6	5	5	3
17	45	33	439	96	96	304	322	439	13	5	19	3
18	33	248	185	120	72	398	386	538	14	5	25	3
19	26	411	108	138	50	398	264	620	9	4	24	3
20	39	439	84	132	54	256	144	353	8	4	22	4
21	199	453	72	120	52	120	114	313	6	3	19	4
22	272	411	114	132	50	84	114	296	5	3	9	10
23	164	304	272	171	288	67	78	220	5	3	6	19
24	72	206	272	342	411	52	150	248	4	2	6	13
25	47	120	288	411	411	45	304	264	5	2	6	9
26	54	84	364	241	241	41	227	171	120	2	6	7
27	84	67	256	132	157	41	144	96	72	2	7	6
28	108	60	96	90	138	64	132	64	28	2	7	5
29	199	62	84	72	.....	60	150	45	15	2	6	4
30	234	78	70	62	.....	47	150	35	10	2	7	4
31	227	.....	64	45	.....	39	.....	28	.....	2	8	.....

Daily discharge, in second-feet, of Cussewago Creek near Meadville, Pa., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	4	233	241	40	38	48	42	149	6	8	12	5
2	4	365	125	40	36	48	41	131	8	7	11	4
3	3	328	74	38	38	48	38	79	41	6	9	4
4	4	179	59	36	40	50	35	59	89	6	8	4
5	5	113	51	32	50	60	34	46	35	6	7	4
6	8	113	47	28	65	110	41	38	19	5	7	4
7	19	119	64	28	75	240	44	34	19	7	6	4
8	18	84	125	28	75	400	47	29	18	10	6	4
9	13	59	173	30	75	460	47	24	23	26	6	4
10	11	46	295	34	75	500	55	22	23	84	11	5
11	13	55	285	38	75	550	74	23	16	46	28	5
12	19	101	219	44	80	600	79	32	12	28	23	5
13	30	89	241	48	80	850	185	35	11	22	23	5
14	28	55	393	50	85	900	295	28	16	18	74	5
15	18	44	393	50	85	705	191	23	18	15	179	4
16	16	36	219	48	80	592	185	19	26	23	101	4
17	13	32	160	46	70	592	365	17	119	20	42	4
18	12	29	110	42	60	629	422	16	316	15	29	3
19	12	29	70	40	55	437	275	16	365	41	32	3
20	10	29	55	40	50	249	131	19	155	233	28	3
21	12	29	50	44	48	241	143	24	55	305	17	3
22	22	35	48	48	48	233	328	22	38	137	13	3
23	40	51	44	55	48	226	365	18	30	113	11	3
24	34	69	42	55	50	173	249	16	34	316	10	3
25	18	64	40	55	55	125	205	17	74	422	8	3
26	19	74	40	55	50	101	119	16	35	233	7	3
27	23	226	40	50	50	79	107	13	23	55	6	4
28	89	285	40	48	48	69	257	11	16	29	6	7
29	161	167	40	44	48	59	295	9	13	20	5	5
30	113	212	40	40	.....	64	185	8	10	16	6	5
31	79	.....	40	40	.....	64	.....	7	.....	14	5	.....

NOTE.—Discharge Jan. 8–13, Feb. 1–2, 5–12, 1919, and Dec. 17, 1919, to Mar. 14, 1920, estimated because of ice, from study of weather records and gage-height graph.

Monthly discharge of Cussewago Creek near Meadville, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 88 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918-19.					
October	272	22	98	1.11	1.28
November	453	31	183	2.08	2.32
December	453	54	188	2.14	2.47
January	501	41	159	1.81	2.09
February	411	18	97	1.10	1.15
March	484	39	157	1.78	2.05
April	386	24	161	1.83	2.04
May	1,130	28	319	3.62	4.17
June	120	4	17	.193	.22
July	8	2	4	.045	.05
August	35	2	8	.091	.10
September	26	3	8	.091	.10
The year	1,130	2	117	1.33	18.04
1919-20.					
October	161	3	28.1	.319	.37
November	365	29	112	1.27	1.42
December	393	40	125	1.42	1.64
January	55	28	42.4	.482	.56
February	85	36	59.7	.678	.73
March	900	48	307	3.49	4.02
April	422	34	163	1.85	2.06
May	149	7	32.3	.367	.42
June	365	6	55.4	.630	.70
July	422	5	73.8	.839	.97
August	179	5	23.8	.270	.31
September	7	3	4.07	.046	.05
The year	900	3	85.6	.973	13.25

CLARION RIVER NEAR CLARION, PA.

LOCATION.—At single-span steel highway bridge known as Toby Bridge, 1 mile north of Clarion, Clarion County.

DRAINAGE AREA.—930 square miles.

RECORDS AVAILABLE.—November 17, 1884, to September 30, 1920. Records prior to October 1, 1919, are contained in the annual reports of the Water Supply Commission of Pennsylvania and publications of the United States Weather Bureau.

GAGES.—Chain gage attached to downstream side of bridge; read by L. B. Gifford. The Sanborn water-stage recorder, on downstream left wing-wall approach, was damaged by ice and the record not used after March 12, 1920. Zero elevation of both gages 1,052.00 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Bed composed of gravel, boulders, and ledge. Control is at the first of a series of riffles about 800 feet below gage; permanent.

EXTREMES OF DISCHARGE.—Maximum open-water stage recorded during the year ending September 30, 1920, 13.01 feet at 8.20 a. m. March 13 (discharge, 28,600 second-feet; a stage of 17.0 feet, from water-stage recorder, was reached at 6 p. m. March 11, but the water was held back by an ice jam; minimum stage, estimated from hydrograph, −0.25 foot, at midnight September 25–26 (discharge, 140 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year except as affected by ice December 20 to March 11. Rating curve well defined between 100 and 30,000 second-feet. Gage read to hundredths once daily at irregular times. Daily mean gage heights, October 1 to March 12, were computed from water-stage recorder graph in connection with chain gage observations; March 13 to September 30, from hydrographs. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Clarion River near Clarion, Pa., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 11	R. J. Ferris	2.47	1,540	May 14	R. J. Ferris	1.83	960
Jan. 20	J. M. Snavely	[a]3.32	329	June 8	do	.78	426
Feb. 22	do	[a]3.26	414				

[a] Measurement made through complete ice cover.

Daily discharge, in second-feet, of Clarion River near Clarion, Pa., for the year ending Sept. 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.
1	206	8,090	3,570	650	340	380	1,730	3,260	488	560	231	195
2	206	9,880	2,560	600	340	420	1,530	2,970	465	535	258	184
3	218	9,100	2,180	500	360	440	1,340	2,830	465	560	286	184
4	258	5,710	1,950	440	400	480	1,430	2,300	465	510	231	174
5	367	4,450	1,530	420	460	550	1,730	2,180	488	465	218	206
6	367	3,410	1,430	460	480	600	1,630	1,840	465	405	206	244
7	1,040	2,830	1,530	500	550	1,000	1,340	1,430	425	385	184	231
8	1,040	2,430	1,950	550	600	2,200	1,340	1,430	445	425	184	195
9	665	2,180	1,840	600	650	4,800	1,340	1,340	385	585	195	184
10	638	1,730	2,970	600	650	9,000	1,250	1,160	349	665	218	184
11	1,340	1,630	2,830	600	650	11,000	1,250	1,040	332	665	218	174
12	1,950	2,060	2,180	600	650	8,590	1,160	1,080	301	510	218	184
13	1,950	1,840	2,560	550	650	25,300	1,120	1,040	301	385	258	206
14	1,530	1,530	4,260	480	600	11,200	1,120	1,000	301	349	272	218
15	1,250	1,340	4,260	460	600	5,710	1,160	960	332	349	385	272
16	1,160	1,160	2,690	440	600	4,450	1,430	818	1,160	316	488	218
17	1,530	1,160	2,560	400	600	10,100	3,570	722	4,650	301	560	184
18	2,690	1,080	2,430	360	550	9,360	3,730	665	10,900	286	785	165
19	1,840	1,040	1,430	340	500	6,620	3,110	665	5,060	258	1,000	165
20	1,430	920	1,100	320	480	5,710	2,970	694	2,830	258	610	165
21	1,250	1,000	950	300	440	4,450	2,830	850	2,300	316	465	156
22	1,250	785	800	300	400	3,570	3,570	850	1,950	316	425	148
23	1,730	818	700	300	360	3,730	2,830	850	1,530	535	349	148
24	1,250	850	650	280	340	4,450	2,970	850	1,250	1,160	332	148
25	1,080	885	600	280	340	4,080	3,110	818	1,080	1,340	316	140
26	1,430	1,040	600	300	340	4,260	2,430	785	920	665	286	148
27	1,160	4,080	600	300	360	4,650	2,180	638	694	316	258	184
28	2,830	3,900	650	320	360	3,570	2,830	638	665	272	231	385
29	5,710	2,970	650	320	380	2,560	3,730	585	560	258	231	367
30	3,570	3,410	700	320	.....	2,430	3,110	560	585	231	218	665
31	3,260	.....	700	340	.....	2,060	.....	510	.....	244	206	.....

NOTE.—Discharge Dec. 20 to Mar. 11 estimated, because of ice, from two discharge measurements and study of weather records and gage-height graph.

Monthly discharge of Clarion River near Clarion, Pa., for the year ending Sept. 30, 1920.

[Drainage area, 930 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
October	5,710	206	1,490	1.60	1.84
November	9,880	785	2,780	2.99	3.34
December	4,260	600	1,790	1.92	2.21
January	650	280	427	.459	.53
February	650	340	484	.520	.56
March	25,300	380	5,090	5.47	6.31
April	3,730	1,120	2,160	2.32	2.59
May	3,260	510	1,210	1.30	1.50
June	10,900	301	1,400	1.50	1.67
July	1,340	231	465	.500	.58
August	1,000	184	333	.358	.41
September	665	140	214	.230	.26
The year	25,300	140	1,490	1.60	21.80

RED BANK CREEK AT ST. CHARLES, PA.

LOCATION.—At single-span steel railroad bridge at St. Charles, Clarion County.

DRAINAGE AREA.—540 square miles.

RECORDS AVAILABLE.—October 19, 1909, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to upstream side of bridge; read by Forest Bish. Elevation of gage zero 976.24 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Bed composed of rocks and fairly regular. Control is at the first of a series of riffles, where the bed is composed of large boulders and ledge, about 200 feet below gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 8.20 feet at 5 p. m. May 10 (discharge, 10,200 second-feet); minimum stage, 0.74 foot at 4.30 p. m. October 1 (discharge, 19 second-feet).

Maximum open-water stage recorded during the year ending September 30, 1920, determined from levels and hydrograph, 10.3 feet at midnight March 12–13 (discharge, about 15,500 second-feet); a stage of 14.0 feet, determined from levels and hydrograph, was reached at 1.30 p. m. March 12, but the water was held back by an ice jam; minimum stage, 0.90 foot at 7 a. m. August 28 (discharge, 37 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year except as affected by ice. Rating curve well defined below 1,000 second feet and fairly well defined between 1,000 and 10,000 second-feet. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Red Bank Creek at St. Charles, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Oct. 11	R. A. Boehringer.....	2.20	481	Jan. 12	B. A. Knight.....	[b] 2.78	332
				May 14	J. M. Snavely.....	2.28	575
1919.							
July 31	Peterson and Landis...	[a] .92	38				

[a] Measurement made by wading 1,000 feet below gage.
[b] Measurement made through complete ice cover.

Daily discharge, in second-feet, of Red Bank Creek at St. Charles, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	22	1,440	466	1,790	548	1,330	441	466	548	242	76	826
2	33	1,140	416	6,270	520	1,330	416	1,330	466	207	105	635
3	30	970	416	3,250	368	1,330	392	970	441	135	110	466
4	26	895	416	1,920	300	1,230	368	895	416	90	76	466
5	36	793	416	1,140	240	1,140	392	728	368	95	95	322
6	2,330	793	392	900	140	1,050	368	635	301	95	110	207
7	2,330	696	345	650	130	970	345	576	224	90	242	151
8	2,330	606	345	600	110	970	368	1,550	242	76	224	151
9	2,050	576	368	500	95	2,480	322	4,670	301	66	163	148
10	1,790	520	322	500	85	2,780	261	8,850	261	70	122	175
11	1,440	441	368	500	85	2,190	548	6,690	224	70	42	191
12	1,330	392	441	493	95	1,920	441	4,290	175	92	46	175
13	1,230	368	520	441	135	1,330	441	2,480	148	92	40	172
14	1,140	368	826	441	392	970	441	1,790	130	66	191	151
15	970	345	2,480	392	606	793	466	1,330	1,230	84	122	130
16	895	322	1,920	392	576	1,330	576	1,330	520	322	108	84
17	793	666	1,440	441	466	3,580	932	3,090	520	261	98	64
18	696	2,190	970	441	345	3,250	932	3,930	826	172	207	62
19	548	2,630	970	493	322	2,630	793	3,580	666	118	191	74
20	493	2,480	860	441	301	2,190	666	3,250	493	118	207	77
21	466	2,330	696	416	345	1,670	666	7,530	441	76	191	38
22	520	1,920	1,230	392	392	1,440	576	5,450	322	70	151	224
23	493	1,140	1,440	441	895	1,440	548	3,580	301	66	207	175
24	466	895	2,190	1,550	793	860	548	2,930	242	54	207	169
25	466	793	2,630	1,330	793	666	576	2,330	207	50	322	163
26	493	666	1,790	1,050	1,330	548	520	2,050	175	50	466	172
27	576	576	1,330	970	1,140	576	493	1,330	392	50	368	148
28	728	548	970	760	932	493	493	970	322	50	345	145
29	1,330	606	895	606	.....	493	493	826	322	50	261	125
30	1,670	576	760	576	.....	548	441	666	261	27	280	130
31	1,550	.....	793	606	.....	493	.....	606	.....	68	826	.....

Daily discharge, in second-feet, of Red Bank Creek at St. Charles, Pa., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	90	1,550	2,050	200	400	360	635	895	520	322	120	110
2	75	2,050	1,330	200	420	360	606	895	466	322	125	115
3	68	3,580	1,140	200	420	420	576	895	441	345	135	122
4	70	3,930	895	200	440	600	635	826	261	280	120	120
5	70	2,330	520	200	440	1,900	635	793	242	280	118	98
6	207	2,330	576	200	460	1,600	635	696	242	207	98	98
7	191	2,190	520	260	460	1,400	635	696	242	207	98	77
8	169	1,790	520	280	460	1,500	635	606	242	140	98	122
9	207	1,550	970	320	460	1,700	635	576	242	140	105	151
10	242	1,330	1,550	320	460	2,200	635	466	207	169	125	148
11	826	1,230	1,330	340	460	5,050	576	466	242	175	145	148
12	4,480	696	1,330	340	460	11,500	576	466	207	151	148	145
13	3,580	635	2,190	340	460	14,300	576	466	224	148	132	175
14	1,920	576	2,330	320	460	11,800	606	416	261	148	125	175
15	1,670	576	1,920	320	460	10,000	1,330	416	322	125	175	172
16	2,190	548	826	320	460	7,110	3,250	441	416	122	520	151
17	5,250	466	600	320	460	4,670	2,190	466	6,270	125	860	140
18	3,410	466	360	320	460	4,480	1,920	466	8,630	120	760	160
19	1,670	416	320	320	420	4,670	1,550	441	3,930	130	696	175
20	1,330	368	280	320	360	3,580	1,550	416	3,250	132	606	191
21	970	392	260	320	360	3,250	1,550	466	2,930	130	520	175
22	970	345	260	320	340	2,930	1,790	466	2,190	125	493	175
23	970	345	260	320	360	2,050	1,920	493	1,550	120	322	148
24	970	322	240	320	360	2,050	1,790	576	1,140	120	175	145
25	895	322	240	320	420	1,790	1,920	576	760	100	95	148
26	860	606	240	320	440	1,550	1,920	520	576	98	72	151
27	1,440	4,860	220	320	420	1,440	1,790	520	576	98	74	160
28	1,790	3,750	220	320	360	1,440	1,550	466	520	110	44	175
29	1,550	2,780	200	340	360	970	1,330	493	466	130	95	191
30	1,440	2,330	200	360	.....	895	895	466	368	122	108	151
31	1,440	.....	200	360	.....	696	.....	368	.....	130	122	.....

NOTE.—Discharge Jan. 6–11, Feb. 4–12, 1919, and Dec. 17, 1919, to Mar. 10, 1920, estimated because of ice from discharge measurements and study of weather record and gage-height graph.

Monthly discharge of Red Bank Creek at St. Charles, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 540 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	2,330	22	944	1.75	2.02
November	2,630	322	956	1.77	1.98
December	2,630	322	949	1.76	2.03
January	6,270	392	990	1.83	2.11
February	1,330	85	446	.826	.86
March	3,580	493	1,420	2.63	3.03
April	932	261	509	.943	1.05
May	8,850	466	2,600	4.81	5.55
June	1,230	175	383	.710	.79
July	322	27	102	.189	.22
August	826	40	200	.370	.43
September	826	38	207	.383	.43
The year	8,850	22	815	1.51	20.50
1919–20.					
October	5,250	68	1,320	2.44	2.81
November	4,860	322	1,490	2.76	3.08
December	2,330	200	777	1.44	1.66
January	360	200	299	.554	.64
February	460	360	424	.785	.85
March	14,300	360	3,490	6.46	7.45
April	3,250	576	1,230	2.28	2.54
May	895	368	555	1.03	1.19
June	8,630	207	1,260	2.33	2.60
July	345	98	164	.304	.35
August	860	44	240	.444	.51
September	191	77	147	.272	.30
The year	14,300	44	952	1.76	23.98

CROOKED CREEK AT HILEMAN FARM, PA.

LOCATION.—At single-span steel highway bridge at Hileman farm, 3½ miles south of Ford City, Armstrong County.

DRAINAGE AREA.—279 square miles.

RECORDS AVAILABLE.—October 16, 1909, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain attached to upstream side of bridge; read by D. G. Hileman.

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

CHANNEL AND CONTROL.—Left bank high and not subject to overflow; right low and overflow begins at a stage of about 8 feet. Bed composed of gravel and rock. Control is at a riffle about 300 feet below gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during the year ending September 30, 1919, 7.5 feet, estimated from hydrograph at 7 p. m. May 10 (discharge, 6,040 second-feet); minimum stage 1.05 feet, several times in July (discharge, 8 second-feet).

Maximum open-water stage during the year ending September 30, 1920, estimated from hydrograph, 10.0 feet at midnight June 17–18 (discharge, 10,000 second-feet); a stage of 14.8 feet, determined from levels, was reached at 8 p. m. March 12, but the water was held back by an ice jam; minimum stage, 1.09 feet at 7.15 p. m. September 5 (discharge, 15 second-feet).

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

ACCURACY.—Stage-discharge relation permanent, except as affected by ice. Rating curve well defined below 500 second-feet and fairly well defined between 500 and 5,500 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good, except for periods of ice effect, for which they are fair.

Discharge measurements of Crooked Creek at Hileman farm, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 14	R. A. Boehringer.....	1.64	64	Nov. 14	J. M. Snavely.....	2.19	218
1919.				1920.			
July 28	J. M. Snavely.....	1.17	25	May 13	R. J. Ferris.....	2.10	190

Daily discharge, in second-feet, of Crooked Creek at Hileman farm, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	52	1,700	360	1,520	570	850	160	570	225	59	35	970
2	46	890	250	4,510	510	745	150	930	168	52	27	1,050
3	52	570	205	2,510	390	675	135	710	150	35	35	1,170
4	46	450	168	1,340	390	510	150	540	135	35	46	890
5	46	330	168	710	275	510	168	390	120	24	40	510
6	67	275	135	440	205	480	150	360	85	35	1,250	250
7	275	205	135	340	180	510	135	390	95	24	540	390
8	150	205	135	280	170	510	135	540	85	18	250	330
9	85	168	135	260	140	2,090	108	2,510	85	15	168	108
10	67	135	135	220	120	1,890	95	5,250	75	15	52	85
11	52	135	480	260	100	1,100	95	3,190	108	27	75	150
12	59	135	330	260	100	800	168	1,890	67	67	59	135
13	67	108	1,170	240	108	600	225	1,170	59	20	390	95
14	59	108	1,520	220	168	450	265	850	52	52	205	135
15	46	108	2,400	220	330	400	225	640	67	250	135	168
16	52	85	2,510	220	330	320	265	675	46	570	95	85
17	52	85	1,250	220	275	650	360	1,890	59	275	1,610	59
18	40	1,340	710	220	250	1,100	420	2,290	135	135	1,170	52
19	40	1,890	510	220	217	890	330	1,340	85	75	1,170	52
20	46	2,090	390	260	205	675	275	1,170	59	67	1,250	85
21	225	1,610	360	260	302	570	240	1,340	57	59	510	52
22	185	1,340	1,010	260	450	420	225	1,340	52	52	540	85
23	120	675	1,520	260	815	330	168	1,170	59	35	675	67
24	59	510	1,520	1,700	970	275	250	1,340	40	46	450	135
25	75	390	1,340	1,430	745	275	225	1,340	40	31	1,890	67
26	390	275	1,170	1,250	1,340	225	205	1,170	35	40	1,340	52
27	890	205	930	1,170	1,170	225	150	850	510	31	675	40
28	640	390	675	1,050	930	275	150	675	275	40	480	46
29	605	450	570	970	.....	225	108	450	135	27	360	46
30	605	420	450	850	.....	185	168	390	59	31	420	52
31	2,730	.....	510	710	.....	157	.....	275	.....	40	780	.....
1919–20.												
1	27	1,340	710	110	200	180	147	1,010	55	510	85	22
2	46	4,370	570	110	200	180	135	710	47	126	61	20
3	31	3,690	480	110	220	220	129	510	79	123	50	18
4	35	2,950	456	110	220	340	126	450	77	108	38	16
5	31	2,090	420	110	220	1,000	260	390	93	93	31	15
6	40	1,520	420	120	220	3,200	221	286	154	83	26	18
7	31	1,340	815	120	220	4,800	217	225	112	77	22	20
8	24	1,340	1,010	140	220	3,600	190	189	70	81	20	18
9	46	745	1,250	150	220	2,200	157	157	67	85	18	16
10	59	510	1,340	170	260	1,800	147	138	52	70	24	141
11	95	302	856	170	260	2,200	135	126	47	61	20	213
12	640	510	710	170	260	6,000	126	148	42	112	24	260
13	890	275	1,520	170	260	4,800	150	185	58	100	95	230
14	390	174	2,950	170	260	2,290	141	171	50	73	61	372
15	480	154	1,520	170	260	1,430	120	141	43	52	77	245
16	1,250	135	890	170	260	1,170	174	107	360	40	59	205
17	3,070	120	700	170	220	2,730	1,340	93	5,250	34	70	147
18	1,700	112	400	170	220	1,340	540	81	6,040	32	77	89
19	745	108	220	170	200	1,090	850	77	2,190	58	69	47
20	570	102	140	170	180	1,010	930	221	1,090	36	61	36
21	450	95	120	170	180	930	3,430	1,010	850	31	52	32
22	710	93	120	170	200	850	2,510	675	710	31	47	29
23	675	93	120	170	200	745	1,610	420	1,430	33	45	26
24	480	89	120	170	220	1,340	1,170	292	1,010	38	43	24
25	390	150	120	170	220	510	780	230	605	32	36	22
26	250	2,190	120	170	220	420	540	168	450	26	29	21
27	185	4,650	120	170	200	360	540	132	221	19	24	18
28	225	2,400	120	180	180	302	970	100	108	18	23	24
29	640	1,340	110	180	180	213	850	85	73	18	16	26
30	570	1,340	110	180	.....	189	745	73	98	16	21	45
31	605	.....	110	180	.....	157	.....	61	.....	15	.....	.....

NOTE.—Discharge Jan. 6–23, Feb. 7–12, 1919, and Dec. 17, 1919, to Mar. 12, 1920, estimated because of ice from study of weather records and gage-height graph. Discharge estimated Mar. 11–18, 1919, because of no gage-height record.

Monthly discharge of Crooked Creek at Hileman farm for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 279 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	2,730	40	256	0.918	1.06
November	2,090	85	576	2.06	2.30
December	2,510	135	747	2.68	3.09
January	4,510	220	786	2.82	3.25
February	1,340	100	420	1.51	1.57
March	2,090	157	610	2.19	2.52
April	420	95	197	.706	.79
May	5,250	275	1,210	4.34	5.00
June	510	35	108	.387	.43
July	570	15	73.6	.264	.30
August	1,890	27	539	1.93	2.22
September	1,170	40	247	.885	.99
The year	5,250	15	484	1.73	23.51
1919–20.					
October	3,070	24	496	1.78	2.05
November	4,650	89	1,140	4.09	4.56
December	2,950	110	602	2.16	2.49
January	180	110	157	.563	.65
February	260	180	220	.789	.85
March	6,600	157	1,540	5.52	6.36
April	3,430	120	646	2.32	2.59
May	1,010	61	279	1.00	1.15
June	6,040	42	718	2.57	2.87
July	510	15	72.0	.258	.30
August	95	16	43.5	.156	.18
September	372	15	80.5	.289	.32
The year	6,040	15	499	1.79	24.37

KISKIMINITAS RIVER AT AVONMORE, PA.

LOCATION.—At four-span steel highway bridge at Avonmore, Westmoreland County.

DRAINAGE AREA.—1,720 square miles.

RECORDS AVAILABLE.—May 29, 1907, to September 30, 1920. Records October 1, 1914, to September 30, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to downstream side of bridge; read by J. H. Shupe. Elevation of gage zero 805.64 feet, United States Geological Survey datum.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Right bank high and not subject to overflow; left bank subject to overflow at high stages. Bed composed of gravel. Control is at the first of a series of riffles about 500 feet below gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 15.47 feet at 4.45 p. m. January 2 (discharge, 22,200 second-feet); minimum stage, 2.49 feet July 8–10 (discharge, 325 second-feet).

Maximum stage during the year ending September 30, 1920, estimated from hydrograph, 20.3 feet at 2 a. m. November 27 (discharge, 37,700 second-feet); minimum stage, 2.55 feet at 8.45 a. m. October 1 (discharge, 352 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year except as affected by ice December 17, 1919, to March 5, 1920. Rating curve fairly well defined below 30,000 second-feet. Gage read to half-tenths twice daily; during high stages more frequently. Daily discharge ascertained by applying daily mean gage height to rating table. Records fair.

Discharge measurements of Kiskiminitas River at Avonmore, Pa., during the years ending Sept. 30, 1919 and 1920.

[Made by J. M. Snavely.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1919.	*Feet.*	*Sec.-ft.*	1920.	*Feet.*	*Sec.-ft.*
July 26	3.00	682	May 11	4.34	1,630

Daily discharge, in second-feet, of Kiskiminitas River at Avonmore, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	540	7,950	1,320	6,260	1,860	6,410	1,590	1,680	2,360	570	480	4,880
2	510	5,010	1,160	21,900	1,410	6,860	1,320	2,360	1,960	510	452	2,460
3	510	3,620	1,090	12,400	1,410	5,140	1,320	2,580	1,590	452	425	1,860
4	480	2,800	1,160	8,120	1,500	3,860	1,320	2,050	1,410	425	375	1,410
5	480	2,360	1,160	4,880	1,680	3,620	1,410	1,860	1,160	400	425	1,160
6	1,590	1,860	1,090	4,360	1,410	3,990	1,320	1,680	1,090	400	945	1,090
7	3,260	1,590	1,320	3,860	1,160	3,500	1,160	1,680	1,020	352	2,680	875
8	1,680	1,410	1,320	3,620	1,240	2,920	1,090	3,500	945	325	1,680	735
9	1,160	1,320	2,150	3,030	1,090	3,860	1,020	5,010	1,090	325	1,020	700
10	1,020	1,240	3,500	2,460	945	5,400	1,020	15,400	1,020	330	735	665
11	875	1,090	5,400	2,250	1,680	4,360	1,020	14,300	945	480	540	805
12	770	945	6,860	1,960	1,020	3,740	1,770	9,170	735	770	480	665
13	770	875	5,960	1,680	1,240	3,140	1,770	6,710	632	480	1,320	665
14	735	840	7,780	1,860	1,160	2,920	1,410	5,400	700	452	1,090	600
15	665	805	9,550	2,680	1,770	2,460	1,320	4,240	735	2,800	875	480
16	600	735	7,160	2,360	1,960	2,250	1,500	4,750	1,090	7,620	805	480
17	540	770	5,400	2,050	1,410	3,260	1,860	6,110	1,770	3,860	7,310	480
18	510	3,380	4,360	2,360	1,240	4,620	2,150	7,950	1,160	1,960	3,380	480
19	452	5,540	3,500	3,140	1,160	5,010	1,960	5,820	1,020	1,410	1,960	425
20	480	6,110	2,920	2,920	1,090	3,990	1,680	5,960	805	1,020	1,680	480
21	840	6,560	2,460	2,460	1,240	3,380	1,680	8,120	2,050	945	1,500	540
22	1,090	5,140	3,140	2,250	1,860	2,920	1,680	9,740	1,020	875	2,250	480
23	875	3,860	10,100	2,250	3,500	2,460	1,500	8,460	735	840	2,680	840
24	735	3,030	6,560	6,110	3,620	2,150	1,860	7,160	570	945	1,860	875
25	700	2,460	5,960	5,140	3,140	1,960	2,250	7,780	665	735	3,380	632
26	1,320	2,150	5,680	4,120	6,260	1,770	1,960	5,960	1,160	600	2,920	510
27	2,050	1,860	4,490	3,500	5,270	1,770	1,770	4,750	2,800	480	1,770	425
28	1,680	1,590	3,740	2,920	4,360	2,250	1,590	3,740	1,860	425	1,500	352
29	1,860	1,680	3,380	2,580	.....	2,050	1,590	3,030	1,020	945	1,160	352
30	2,250	1,590	2,800	2,360	.....	1,680	1,500	2,460	700	665	1,860	330
31	17,900	.....	2,580	2,050	.....	1,680	.....	2,050	.....	570	5,960	.....
1919-20.												
1	425	9,740	5,010	750	2,400	2,600	2,460	5,960	945	2,580	1,160	1,860
2	480	17,700	3,860	750	3,000	2,400	2,250	5,680	875	1,680	1,860	1,160
3	540	11,800	3,260	750	3,000	2,200	2,360	4,620	910	3,260	1,320	840
4	452	7,780	2,460	650	3,200	2,400	2,050	3,860	1,020	2,800	945	735
5	400	6,260	2,250	600	3,800	12,000	3,500	3,260	1,410	1,860	735	665
6	480	4,750	2,250	600	3,200	15,200	4,620	2,680	2,250	1,500	600	632
7	1,960	3,860	6,860	650	2,600	8,120	3,740	2,460	1,860	1,320	1,590	632
8	1,320	3,140	8,120	950	2,200	5,680	3,620	2,150	1,410	1,860	1,960	805
9	875	2,580	7,010	1,700	1,400	5,140	3,380	1,960	1,680	1,680	1,160	910
10	875	2,250	11,100	8,500	1,600	5,400	3,030	1,770	1,320	1,320	1,680	1,320
11	1,680	2,050	7,160	9,500	1,600	11,300	3,140	1,590	1,160	1,160	2,800	3,140
12	2,580	2,460	5,540	7,000	1,500	19,500	3,140	1,680	1,090	1,320	1,770	2,680
13	2,800	2,460	6,560	5,000	1,700	29,800	3,140	1,860	1,410	1,160	2,920	2,250
14	2,250	2,360	12,200	3,600	1,600	14,700	4,240	3,860	2,050	1,020	2,800	1,680
15	3,380	1,960	7,950	2,600	1,500	9,170	3,260	2,800	1,860	945	1,860	1,320
16	4,360	1,770	5,010	1,900	1,400	9,740	3,740	2,250	9,170	1,240	1,860	1,090
17	7,460	1,590	3,800	1,400	1,300	19,500	8,460	1,860	25,200	1,090	2,680	1,020
18	5,680	1,500	3,000	1,300	1,300	15,200	9,740	1,680	30,100	945	1,960	875
19	3,860	1,410	2,000	1,300	1,300	9,360	7,010	1,680	12,600	735	1,590	735
20	2,800	1,320	1,300	1,700	1,300	11,100	5,820	1,860	7,160	875	1,320	600
21	2,150	1,160	1,200	2,400	1,300	8,460	9,930	1,860	5,680	805	1,160	600
22	2,050	1,160	1,100	3,800	1,400	7,160	9,930	3,030	4,620	700	1,160	600
23	2,250	1,160	1,100	4,200	1,500	5,960	7,160	2,150	4,120	700	1,090	600
24	1,860	1,320	1,000	4,800	1,600	5,960	5,960	1,860	4,120	875	1,090	540
25	1,860	1,410	900	4,400	2,600	5,820	5,010	1,770	3,030	600	910	480
26	1,590	10,900	900	3,800	4,200	5,680	4,120	1,590	2,580	540	805	480
27	2,800	29,500	900	4,200	3,600	5,540	3,860	1,500	2,150	540	665	452
28	7,310	13,300	900	3,600	3,000	4,490	6,410	1,320	1,860	540	665	1,160
29	6,260	8,120	800	3,000	2,800	3,380	5,820	1,160	1,500	540	665	1,860
30	4,750	6,260	800	1,800	.....	3,140	4,880	1,090	1,680	570	665	1,320
31	4,240	.....	800	2,000	.....	2,680	.....	1,020	.....	1,160	1,500	.....

NOTE.—Discharge Dec. 17, 1919, to Mar. 5, 1920, estimated, because of ice, from weather records and study of gage-height graph.

Monthly discharge of Kiskiminitas River at Avonmore, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,720 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918-19.					
October	17,900	452	1,580	0.919	1.06
November	7,950	770	2,670	1.55	1.73
December	10,100	1,090	4,030	2.34	2.70
January	21,900	1,680	4,190	2.44	2.81
February	6,260	945	2,020	1.17	1.22
March	6,860	1,680	3,400	1.98	2.28
April	2,250	1,020	1,550	.901	1.00
May	15,400	1,680	5,530	3.22	3.71
June	2,800	570	1,190	.692	.77
July	3,860	325	1,060	.616	.71
August	7,310	375	1,790	1.04	1.20
September	4,880	330	891	.518	.58
The year	21,900	325	2,510	1.46	19.77
1919-20.					
October	7,460	400	2,640	1.53	1.76
November	29,500	1,160	5,430	3.16	3.53
December	12,200	800	3,780	2.20	2.54
January	9,500	600	2,880	1.67	1.92
February	4,200	1,300	2,170	1.26	1.36
March	29,800	2,200	8,670	5.04	5.81
April	9,930	2,050	4,860	2.82	3.15
May	5,960	1,020	2,380	1.38	1.59
June	30,100	875	4,560	2.53	2.82
July	3,260	540	1,220	.709	.82
August	2,920	600	1,450	.843	.97
September	3,140	452	1,100	.640	.71
The year	30,100	400	3,430	1.99	26.98

STONY CREEK AT JOHNSTOWN, PA.

LOCATION.—At Poplar Street single-span steel highway bridge, Johnstown, Cambria County, 1½ miles above confluence of Stony Creek and Little Conemaugh River.

DRAINAGE AREA.—468 square miles.

RECORDS AVAILABLE.—July 2, 1913, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to downstream side of bridge; read by Herbert Reitz. Elevation of gage zero 1,154.0 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Control for low water is at a riffle, where the bed is composed of gravel and small boulders, about 100 feet below gage; practically permanent. Control for high stages is at a riffle, where the bed is composed of gravel and large boulders, about 1,300 feet below gage; probably permanent

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 8.15 feet at 8 a. m. May 10 (discharge, 6,380 second-feet); minimum stage, 0.92 foot September 30 (discharge, 38 second-feet).

Maximum stage during the year ending September 30, 1920, estimated from hydrograph, 11.2 feet at 1 p. m. March 12 (discharge, 11,600 second-feet); minimum stage, 1.10 feet at 6 p. m. October 4 and morning and afternoon October 5 (discharge, 70 second-feet).

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

DIVERSIONS.—A dam 1 mile above the mouth of Quemahoning Creek creates a reservoir having a capacity of 1,740,000,000 cubic feet, from which water is carried through a conduit to the plant of the Cambria Steel Co. at Johnstown where it is returned to the stream below the gaging station.

ACCURACY.—Stage-discharge relation probably permanent throughout the year, except as affected by ice for short periods during winter of 1919–20. Rating curve fairly well defined below 1,000 second-feet and well defined from 1,000 to 8,000 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

COOPERATION.—A record of the quantity of water diverted from the Quemahoning reservoir is furnished by the Cambria Steel Co., Johnstown.

Discharge measurements of Stony Creek at Johnstown, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
July 18	J. M. Snavely	1.62	225	Feb. 3	J. M. Snavely	2.74	721
				Mar. 3	do	2.47	597
1920.				May 27	do	1.94	328
Jan. 5	B. A. Knight	[a] 1.71	243				

[a] Measurement made through incomplete ice cover.

Daily discharge, in second-feet, of Stony Creek at Johnstown, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	60	575	280	3,060	390	2,460	345	480	780	108	100	199
2	66	390	252	4,590	322	1,930	300	675	600	100	82	144
3	60	322	213	2,660	260	1,240	252	502	502	108	70	120
4	50	220	213	1,610	525	1,030	252	480	368	95	70	105
5	50	213	260	1,240	435	1,030	322	458	300	100	115	90
6	390	192	322	1,030	345	1,100	345	390	260	95	240	75
7	260	168	480	1,100	300	1,170	300	550	260	95	202	70
8	168	157	550	900	252	1,100	252	780	368	95	168	82
9	126	135	625	780	213	1,030	213	2,660	368	95	108	95
10	100	135	1,380	675	192	1,170	213	5,650	300	178	95	80
11	90	125	1,930	550	157	1,030	260	3,830	252	150	66	75
12	82	120	1,850	458	220	900	345	2,560	228	120	82	70
13	82	120	1,930	390	220	780	280	1,850	192	108	144	82
14	75	120	2,100	480	260	675	260	1,450	150	390	185	82
15	70	120	1,850	502	368	675	300	1,310	185	900	280	95
16	60	120	1,450	435	300	1,030	322	1,310	368	840	260	108
17	60	435	1,100	368	345	900	575	2,560	525	435	480	95
18	60	675	840	1,100	260	1,690	725	2,100	390	220	412	90
19	60	575	675	995	260	1,170	502	1,530	280	168	300	75
20	120	725	725	780	252	900	390	1,610	280	206	202	82
21	135	840	675	675	220	780	390	3,270	220	185	252	75
22	90	625	1,310	502	345	675	368	2,860	185	150	252	95
23	95	480	1,450	575	625	625	458	3,270	168	300	202	100
24	70	390	2,100	1,530	675	550	575	2,460	144	202	300	75
25	95	345	1,930	1,170	780	480	435	1,850	150	168	300	70
26	120	300	1,310	840	1,850	480	458	1,450	260	144	280	70
27	108	300	1,100	675	1,240	575	435	1,100	300	150	220	60
28	115	280	840	625	1,030	502	390	900	150	168	164	50
29	108	280	900	525	.....	435	390	752	100	147	126	42
30	252	280	1,450	480	.....	390	345	700	95	126	213	38
31	960	.....	1,770	435	.....	390	.....	625	.....	100	236	.....

Daily discharge, in second-feet, of Stony Creek at Johnstown, Pa., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20												
1	120	3,270	1,170	220	345	435	900	2,280	178	322	525	300
2	126	5,240	1,030	220	575	525	625	2,010	185	435	480	252
3	100	2,960	725	220	725	550	575	1,850	345	840	502	220
4	75	2,010	550	220	1,450	650	780	1,930	675	675	435	185
5	70	1,530	525	240	960	1,600	840	2,010	550	435	480	157
6	502	1,100	675	260	1,450	3,600	1,310	1,930	390	435	502	150
7	412	1,030	2,860	300	780	2,280	1,380	1,850	300	435	1,170	135
8	228	900	1,850	400	575	2,100	1,170	1,770	280	322	840	120
9	178	675	4,070	1,200	480	1,770	1,100	1,770	268	268	900	135
10	164	600	2,760	2,600	525	2,660	1,030	1,610	268	213	1,030	220
11	345	525	2,280	2,460	550	3,490	1,030	1,610	292	178	900	345
12	292	675	1,610	1,930	525	8,910	1,100	2,280	345	168	1,450	675
13	390	625	2,370	1,530	500	6,860	1,030	1,450	322	157	1,170	458
14	345	550	2,370	1,170	460	4,200	1,030	1,100	345	168	1,030	390
15	390	502	1,610	900	420	2,860	1,030	900	625	280	900	345
16	780	435	1,170	575	420	3,380	1,100	725	2,100	202	780	345
17	960	390	960	458	420	4,720	1,030	625	6,860	168	675	368
18	675	390	780	502	400	3,710	1,240	525	7,020	150	550	458
19	550	368	650	675	400	3,600	1,310	480	3,600	144	780	480
20	550	322	550	900	420	6,380	1,380	458	2,660	120	725	480
21	575	268	500	1,380	440	5,240	1,310	600	1,850	115	675	458
22	675	228	440	1,610	500	2,960	1,240	725	1,610	100	575	435
23	780	252	400	1,450	525	1,770	1,100	625	1,380	95	502	435
24	900	157	400	1,310	525	1,610	1,100	502	1,100	108	412	458
25	900	202	340	840	502	1,770	1,100	458	810	108	345	480
26	1,030	3,950	320	600	435	1,850	1,850	435	625	100	220	480
27	1,170	5,370	300	500	435	1,690	1,530	345	525	95	150	525
28	1,450	3,830	280	420	390	1,610	1,310	292	412	82	126	480
29	1,930	2,660	260	340	345	1,610	1,170	260	322	90	120	502
30	2,370	1,770	240	300	.....	1,450	1,170	228	322	100	168	675
31	2,760	.....	220	280	.....	1,240	.....	213	.....	575	675	.....

NOTE.—Discharge does not include the water diverted from the Quemahoning reservoir. Discharge Dec. 19, 1919, to Jan. 10, Jan. 26–31, Feb. 13–22, and Mar. 4–6, 1920, estimated, because of ice, from discharge measurement, weather records, and study of gage-height graph.

Monthly discharge of Stony Creek at Johnstown, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 468 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	960	50	137	0.417	0.48
November	810	120	326	.797	.89
December	2,100	213	1,090	2.50	2.88
January	4,590	368	1,020	2.46	2.84
February	1,850	157	451	1.23	1.28
March	2,460	451	932	2.20	2.54
April	725	213	366	1.03	1.15
May	5,650	390	1,680	3.76	4.34
June	780	95	291	.818	.91
July	900	95	208	.568	.65
August	480	66	200	.594	.68
September	199	38	86	.353	.39
The year	5,650	38	570	1.40	19.03
1919–20.					
October	2,760	70	703	1.55	1.79
November	5,370	157	1,430	3.14	3.50
December	4,070	220	1,110	2.63	3.03
January	2,600	220	839	2.10	2.42
February	1,450	345	569	1.51	1.63
March	8,910	435	2,810	6.28	7.24
April	1,850	575	1,130	2.72	3.04
May	2,280	213	1,090	2.61	3.01
June	7,020	178	1,220	2.86	3.19
July	810	82	248	.761	.88
August	1,450	120	638	1.60	1.84
September	675	120	372	1.04	1.16
The year	8,910	70	1,010	2.40	32.73

NOTE.—Maximum, minimum, and mean discharge does not include the water diverted from the Quemahoning reservoir. Run-off in second-feet per square mile and depth in inches includes the quantity of water diverted from the reservoir.

BLACKLICK CREEK AT BLACKLICK, PA.

LOCATION.—At three-span steel highway bridge a quarter of a mile north of Pennsylvania Railroad station at Blacklick, Indiana County.

DRAINAGE AREA.—386 square miles.

RECORDS AVAILABLE.—August 16, 1904, to December 31, 1905, and January 8, 1907, to September 30, 1920. Records October 1, 1913, to September 30, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to upstream side of bridge; read by Miss Carrie Kelley.

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

CHANNEL AND CONTROL.—Right bank high and not subject to overflow; left is overflowed at a stage of about 12.0 feet. Bed composed of sand, gravel, and boulders. Control is at a riffle about 200 feet below gage; may shift occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 7.90 feet at 7 a. m. October 31 (discharge, 7,370 second-feet); minimum stage, 2.20 feet July 9 (discharge, 42 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 10.5 feet at 6 p. m. June 17 (discharge, about 13,700 second-feet); minimum stage, 2.20 feet several times in July, August, and September (discharge, 42 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year except as affected by ice for short periods during winter of 1919–20. Rating curve fairly well defined below 10,000 second-feet. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Blacklick Creek at Blacklick, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
July 18	J. M. Snavely	3.14	429	Feb. 4	J. M. Snavely	[a] 3.66	707
				Mar. 4	do	4.06	1,080
1920.				May 27	R. J. Ferris	2.75	234
Jan. 6	B. A. Knight	[a] 2.68	168				

[a] Measurement made through incomplete ice cover.

Daily discharge, in second-feet, of Blacklick Creek at Blacklick, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	160	2,380	290	2,840	290	2,230	245	390	315	125	63	950
2	153	1,520	222	5,690	245	1,160	209	625	268	108	63	625
3	142	1,070	268	2,520	268	1,030	222	472	268	63	63	500
4	153	798	268	1,420	340	835	268	418	180	52	59	340
5	118	760	268	910	315	760	281	365	172	52	108	281
6	950	592	290	835	142	798	200	315	214	57	1,240	236
7	625	560	222	835	200	658	209	592	150	52	625	200
8	365	445	315	725	245	500	200	990	125	52	340	180
9	290	445	340	560	108	910	160	3,880	142	42	200	160
10	260	340	340	390	160	1,160	160	6,320	180	63	160	153
11	230	290	625	500	90	872	222	3,510	136	125	125	168
12	200	245	625	290	160	690	530	1,960	108	100	90	125
13	245	254	1,520	315	142	625	340	1,330	76	160	530	132
14	222	200	1,620	365	245	560	290	1,070	90	418	290	108
15	180	200	1,960	500	445	560	300	872	76	1,960	192	90
16	153	168	1,420	500	268	445	340	872	232	1,620	160	90
17	142	245	1,070	500	245	910	365	2,380	200	690	2,840	90
18	125	1,420	872	592	180	1,520	340	1,730	125	390	990	68
19	125	1,730	625	625	108	1,030	290	1,160	76	330	835	63
20	142	2,090	592	472	108	872	268	990	365	254	592	160
21	500	1,730	500	472	245	725	300	2,380	222	209	390	160
22	365	1,240	1,240	500	290	592	254	2,230	142	200	445	108
23	290	1,030	2,090	540	1,070	445	209	1,520	76	390	365	118
24	268	690	1,420	1,300	690	418	340	1,420	71	268	290	390
25	245	625	1,520	1,000	798	365	365	1,520	90	132	725	222
26	872	560	1,160	760	1,620	365	330	1,160	365	108	472	160
27	910	418	950	670	1,070	390	268	910	1,160	90	445	90
28	690	445	690	560	950	530	290	725	472	125	365	85
29	1,030	445	625	560	.....	315	268	560	245	168	290	68
30	1,420	365	530	445	.....	315	245	472	180	76	872	63
31	6,110	.....	592	418	.....	290	.....	365	.....	76	1,520	.....
1919–20.												
1	125	3,160	950	160	315	315	390	1,520	118	445	340	250
2	108	4,660	725	140	340	340	365	1,070	118	445	153	160
3	90	2,520	560	140	500	340	340	910	118	365	90	90
4	68	1,620	365	140	690	1,330	340	725	118	365	63	94
5	63	1,330	445	140	625	6,530	300	592	236	268	63	59
6	315	1,030	530	160	592	3,880	560	500	250	245	63	44
7	690	798	1,960	160	560	1,840	592	445	161	472	108	90
8	200	658	1,420	240	500	1,330	530	390	132	445	63	63
9	180	560	1,520	850	472	990	500	365	132	315	142	68
10	445	445	1,840	2,520	500	1,160	500	315	118	222	340	560
11	530	560	1,160	1,520	500	2,520	472	315	63	268	290	725
12	990	625	1,070	1,160	500	5,900	418	340	78	192	164	390
13	690	592	1,840	910	625	6,320	725	418	180	200	128	472
14	690	445	2,380	592	600	2,520	500	445	204	160	125	281
15	1,030	390	1,520	500	550	1,730	390	300	212	168	125	227
16	1,330	390	1,160	390	500	2,090	625	272	2,520	132	222	184
17	2,380	365	910	445	500	3,690	1,520	250	9,990	97	204	160
18	1,420	340	690	418	440	2,230	2,090	227	6,740	118	164	125
19	990	290	550	990	440	1,840	1,520	268	1,730	125	204	97
20	725	300	500	1,620	400	2,840	1,330	281	1,330	90	146	90
21	592	290	440	950	400	1,840	4,060	530	1,160	94	125	68
22	910	240	400	872	445	1,520	2,680	472	760	85	125	66
23	658	290	360	760	658	1,240	1,960	340	835	63	104	63
24	530	280	340	1,070	760	1,240	1,520	286	760	66	90	63
25	445	365	320	910	560	1,240	1,160	218	500	63	74	68
26	445	2,840	260	725	445	1,160	872	204	418	46	68	42
27	658	5,690	240	625	390	1,030	910	176	418	42	52	63
28	1,960	2,520	240	560	390	760	1,420	160	254	42	52	500
29	1,240	1,520	220	472	365	625	1,160	132	266	44	63	168
30	950	1,330	200	445	.....	530	990	142	390	42	46	340
31	1,520	.....	180	390	.....	472	.....	125	.....	160	500	.....

NOTE.—Discharge Oct. 10–11, 1918, interpolated; Jan. 23–27, 1919, estimated by comparison with records for Stony Creek at Johnstown; Dec. 19, 1919, to Jan. 9, 1920, and Feb. 14–21, 1920, estimated, because of ice from discharge measurements and study of weather records and gage-height graph.

Monthly discharge of Blacklick Creek at Blacklick, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 386 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	6,110	118	570	1.48	1.71
November	2,380	168	777	2.01	2.24
December	2,090	222	809	2.10	2.42
January	5,690	290	923	2.39	2.76
February	1,620	90	394	1.02	1.06
March	2,230	290	738	1.91	2.20
April	530	160	277	.718	.80
May	6,320	315	1,400	3.63	4.18
June	1,160	71	217	.562	.63
July	1,960	42	276	.715	.82
August	2,840	59	508	1.32	1.52
September	950	63	206	.534	.60
The year	6,320	42	595	1.54	20.94
1919–20.					
October	2,380	63	731	1.89	2.18
November	5,690	240	1,210	3.13	3.49
December	2,380	180	816	2.11	2.43
January	2,520	140	677	1.75	2.02
February	760	315	502	1.30	1.40
March	6,530	315	1,980	5.13	5.91
April	4,060	300	1,020	2.67	2.98
May	1,520	125	411	1.06	1.22
June	9,990	63	1,010	2.62	2.92
July	472	42	189	.490	.56
August	500	46	145	.376	.43
September	725	42	189	.490	.55
The year	9,990	42	741	1.92	26.09

LOYALHANNA CREEK AT NEW ALEXANDRIA, PA.

LOCATION.—At single-span wooden-covered highway bridge at New Alexandria, Westmoreland County.

DRAINAGE AREA.—264 square miles.

RECORDS AVAILABLE.—August 17, 1913, to August 31, 1918, and August 7, 1919, to September 30, 1920. Records prior to October 1, 1919, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to upstream side of bridge; read by E. E. Hoffman. Elevation of gage zero 917.26 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Bed composed of gravel and boulders. Control for low stages is at a gravel riffle about 50 feet below gage; practically permanent. Medium and high-stage control is at a riffle, about 1,300 feet below gage, composed of gravel and boulders; probably permanent.

EXTREMES OF DISCHARGE.—maximum stage recorded during the year ending September 30, 1920, 8.70 feet at 3 p. m. June 17 (discharge, 5,520 second-feet); minimum stage, 1.49 feet at 8 a. m. October 5 (discharge, 46 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year, except as affected by ice. Rating curve well defined below 1,000 second-feet and fairly well defined between 1,000 and 4,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records fair.

Discharge measurements of Loyalhanna Creek at New Alexandria, Pa., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 7	B. A. Knight	[a] 3.03	225	Apr. 19	J. M. Snavely	3.65	947
Mar. 5	J. M. Snavely	6.60	3,230	May 24	do	2.51	340

[a] Measurement made through complete ice cover.

Daily discharge, in second-feet, of Loyalhanna Creek at New Alexandria, Pa., for the year ending Sept. 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	51	1,570	685	250	208	190	253	795	166	276	1,220	160
2	65	3,150	550	222	296	220	284	685	142	211	452	122
3	58	1,780	452	190	525	280	250	575	172	362	292	101
4	53	1,030	284	160	1,360	700	250	475	228	316	211	92
5	51	795	340	160	550	3,200	408	385	340	300	166	90
6	280	575	430	190	480	2,880	430	362	575	166	154	87
7	276	475	2,700	260	380	850	430	308	430	246	154	87
8	142	430	1,430	600	300	630	408	284	385	211	133	83
9	130	385	1,640	1,200	280	525	362	242	500	184	120	115
10	154	300	1,780	1,900	260	685	332	222	316	151	225	475
11	139	304	1,030	1,030	220	970	324	175	242	190	232	575
12	328	312	850	740	220	1,940	316	236	204	340	246	362
13	340	332	1,360	500	220	2,790	385	312	336	218	268	260
14	292	260	2,260	360	200	1,430	362	340	292	154	232	197
15	685	232	1,290	260	200	1,290	332	288	197	218	175	169
16	850	218	910	240	190	2,340	500	250	630	225	385	154
17	1,500	194	795	240	190	1,500	850	204	4,280	154	316	125
18	795	190	575	240	180	1,030	1,150	211	3,060	120	225	110
19	575	197	630	260	160	1,090	910	280	1,500	136	184	105
20	430	166	452	300	160	1,780	850	284	910	122	169	72
21	336	160	452	340	140	1,150	1,030	550	740	108	160	87
22	316	178	430	600	140	910	970	475	550	96	197	87
23	292	178	362	910	140	795	850	332	550	246	225	74
24	276	225	362	2,020	160	685	740	362	475	232	166	83
25	239	685	324	1,030	160	630	575	316	525	154	139	79
26	276	4,390	264	575	180	575	475	253	385	125	122	76
27	1,290	4,060	332	550	180	550	550	232	284	103	118	94
28	2,260	1,860	280	525	190	475	1,150	211	225	83	122	550
29	970	1,150	232	304	190	385	795	187	211	85	108	225
30	795	970	239	362	.....	324	685	172	232	72	110	253
31	795	.....	280	385	.....	292	.....	148	.....	408	272	.....

NOTE.—Discharge Jan. 3-10, 13-22, and Feb. 6 to Mar. 5 estimated, because of ice, from discharge measurements, weather records, and study of gage-height graph.

Monthly discharge of Loyalhanna Creek at New Alexandria, Pa., for the year ending Sept. 30, 1920.

[Drainage area, 264 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,260	51	485	1.84	2.12
November	4,390	160	892	3.38	3.77
December	2,700	232	774	2.93	3.38
January	2,020	160	545	2.06	2.38
February	1,360	140	278	1.05	1.13
March	3,200	190	1,070	4.05	4.67
April	1,150	250	574	2.17	2.42
May	795	148	327	1.24	1.43
June	4,280	142	636	2.41	2.69
July	408	72	194	.735	.85
August	1,220	108	235	.890	1.03
September	575	72	172	.652	.73
The year	4,390	51	516	1.95	26.60

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 Railway. Stalnaker Run enters river on right 1,000 feet below station.

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

RECORDS AVAILABLE.—April 20, 1915, to September 30, 1920.

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

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Channel straight for 100 feet above bridge; curves slightly to right below bridge. Bed composed of small boulders. Banks sandy. Right bank high; left bank low; large overflow through meadows at high stages. 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 ending September 30, 1919, 12.1 feet at 4.30 p. m. January 1; minimum stage 0.68 foot September 21.

Maximum stage recorded for year ending September 30, 1920, 12.04 feet at 5 p. m., December 7; minimum stage, 0.65 foot at 8 a. m. September 27.

1915–1919: Maximum stage recorded, 15.9 feet March 13, 1918, minimum stage recorded, 0.6 foot September 6, 1917. Highest known flood reached a stage represented by gage height about 16 feet.

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

ACCURACY.—Gage heights affected by ice during short periods in January and February. Gage read to hundredths twice daily. Rating curve not developed on account of insufficient data.

Discharge measurements of Tygart River near Dailey, W. Va., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 17..	Peterson and Bigwood	2.55	384
June 21..	B. L. Bigwood	1.30	57

NOTE.—No discharge measurements were made during year ending Sept. 30, 1919.

Daily gage height, in feet, of Tygart River near Dailey, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	1.05	3.50	2.34	10.65	1.75	3.58	2.26	1.86	1.52	1.46	1.44	1.28
2	1.01	2.69	2.19	11.20	1.50	3.02	2.08	2.68	1.66	1.32	1.81	1.19
3	.97	2.20	2.08	5.48	1.50	2.58	1.98	2.55	1.56	1.19	1.60	1.10
4	.93	2.12	1.96	4.00	1.66	2.32	1.93	2.32	1.40	1.10	1.33	1.02
5	.92	1.96	1.79	4.00	1.64	2.10	1.91	2.13	1.30	1.04	1.28	1.00
6	.92	1.80	1.72	4.00	1.58	3.68	1.90	1.96	1.30	1.00	1.48	.92
7	.91	1.64	1.64	3.71	1.52	3.18	1.82	1.90	1.28	1.00	1.47	.87
8	.91	1.56	2.08	2.80	1.46	2.86	1.76	2.17	1.30	.95	1.42	.85
9	.88	1.50	2.72	2.22	1.40	2.92	1.69	3.42	1.26	.91	1.40	.85
10	.88	1.42	6.56	2.00	1.40	3.15	1.64	7.42	1.18	.90	1.28	.82
11	.88	1.36	5.75	2.12	1.40	2.80	1.82	4.55	1.10	1.60	1.10	.84
12	1.00	1.32	4.92	2.23	1.41	2.50	3.13	3.40	1.30	1.28	1.00	1.15
13	1.26	1.29	3.72	2.28	1.42	2.28	2.71	2.86	1.31	1.75	1.00	1.16
14	1.26	1.20	2.86	2.30	1.51	2.12	2.34	2.57	1.28	2.18	1.00	.96
15	1.14	1.19	5.96	2.33	1.79	1.98	2.18	2.42	1.70	2.32	1.00	.93
16	1.05	1.17	3.94	2.36	1.60	1.88	2.10	2.25	1.85	7.82	1.00	.88
17	.99	1.14	3.10	2.60	1.51	1.84	2.80	2.70	1.52	4.88	1.00	.79
18	.95	1.31	2.58	4.24	1.62	2.00	2.66	3.34	1.70	2.52	1.42	.75
19	.94	2.01	2.28	4.91	1.50	2.32	2.44	2.90	1.35	2.52	1.55	.73
20	.92	2.55	1.98	3.38	1.40	2.22	2.28	2.46	1.22	4.25	1.30	.71
21	1.00	3.08	1.96	2.86	2.10	2.12	2.16	2.82	1.20	3.48	1.24	.68
22	1.21	2.54	2.05	2.60	2.26	1.92	1.98	3.14	1.12	2.82	1.87	.72
23	1.28	2.30	4.30	2.56	2.61	1.88	1.86	3.32	.98	3.85	1.86	1.72
24	1.20	1.93	4.01	5.28	3.10	1.80	2.08	2.88	1.00	2.42	1.50	1.82
25	1.22	1.80	3.48	3.64	2.90	1.72	2.18	3.35	1.48	1.92	1.29	1.46
26	2.25	1.69	3.26	3.10	3.96	1.64	2.08	3.26	2.90	1.63	1.22	1.26
27	1.87	1.58	2.73	2.65	3.26	1.88	1.96	2.73	3.39	1.42	1.19	1.10
28	1.70	1.76	2.44	2.28	2.90	4.30	1.85	2.38	2.78	1.35	1.16	1.04
29	1.58	3.44	2.30	2.08	.....	3.22	1.84	2.00	2.15	1.27	1.14	.99
30	3.65	2.70	2.08	1.98	.....	2.78	1.78	1.72	1.68	1.19	1.10	.92
31	5.60	.....	2.45	1.92	.....	2.44	.....	1.54	.....	1.11	1.05	.....
1919-20.												
1	.84	2.09	2.20	3.95	1.89	2.35	1.75	5.42	1.54	.96	1.20	1.17
2	.83	7.44	1.99	3.40	1.85	2.15	1.77	3.52	1.42	.96	1.80	1.06
3	.82	4.15	1.88	3.40	1.74	2.03	2.30	2.52	1.32	1.72	1.25	1.08
4	.80	2.96	1.74	3.40	2.67	2.02	2.30	2.42	1.26	3.89	1.04	.09
5	.80	2.42	1.68	3.50	3.11	4.31	2.65	2.15	2.29	2.96	1.00	.94
6	.92	2.08	1.68	4.20	2.62	4.09	2.85	1.98	2.28	1.90	1.38	.92
7	1.32	1.92	10.55	4.90	2.34	2.95	3.40	1.88	2.00	1.62	1.72	.92
8	1.26	1.78	6.28	5.75	2.22	2.60	3.42	1.78	1.70	1.56	1.36	.91
9	1.02	1.64	4.15	7.95	1.87	2.42	3.40	1.69	1.59	1.34	1.18	.90
10	.99	1.53	3.91	4.88	3.23	2.24	3.25	1.62	1.47	1.22	1.18	1.02
11	.95	1.48	3.50	3.64	4.00	2.18	3.00	1.52	1.37	1.26	1.95	1.10
12	2.00	1.48	3.05	3.10	3.20	3.28	2.82	1.80	1.31	2.08	1.89	1.15
13	2.95	1.42	2.80	2.72	2.72	7.42	3.00	5.98	1.28	1.74	1.92	1.18
14	2.48	1.34	7.24	2.30	2.42	5.22	2.71	5.72	1.28	1.55	1.52	1.02
15	4.08	1.26	4.30	2.30	2.40	3.82	2.40	3.70	1.30	1.44	1.44	.94
16	3.30	1.26	3.18	2.30	2.35	4.48	2.31	2.90	1.36	1.72	1.71	.89
17	2.91	1.23	2.88	2.30	2.32	6.41	2.38	2.26	1.51	1.45	1.66	.85
18	2.72	1.20	2.70	2.30	2.22	4.14	2.48	2.24	1.46	1.30	1.73	.82
19	2.20	1.18	2.48	2.30	2.05	7.18	2.37	2.19	1.31	1.52	2.82	.80
20	1.99	1.12	2.40	2.60	2.00	7.80	2.80	2.14	1.22	1.48	3.28	.78
21	1.88	1.11	2.40	5.01	2.05	4.48	8.68	2.16	1.37	1.34	3.10	.74
22	2.18	1.22	2.40	7.70	5.85	3.70	5.08	2.26	1.42	1.20	3.12	.70
23	3.30	1.39	2.40	9.64	5.52	3.32	3.68	2.26	1.38	1.08	3.20	.68
24	4.06	1.34	2.40	7.61	4.85	2.91	3.00	2.23	1.30	1.41	2.56	.66
25	3.31	1.35	2.40	5.82	3.76	2.65	2.55	2.67	1.22	3.56	2.10	.66
26	2.58	6.45	2.40	3.80	3.10	2.42	2.38	2.98	1.16	2.66	1.85	.66
27	2.26	5.26	2.40	3.11	2.50	2.25	2.38	2.44	1.03	2.34	1.66	.66
28	2.06	3.56	2.40	2.68	2.50	2.08	2.29	2.06	1.00	1.90	1.52	.70
29	1.88	2.85	2.40	2.34	2.50	2.00	2.18	1.89	.98	1.51	1.40	1.51
30	1.76	2.54	2.65	2.18	.....	1.88	2.15	1.80	.97	1.36	1.30	1.30
31	1.58	.....	4.20	2.04	.....	1.76	.....	1.66	.....	1.26	1.24	.....

TYGART RIVER AT BELINGTON, W. VA.

LOCATION.—At highway bridge at Belington, Barbour County, a quarter of a mile above mouth of Mill Creek.

DRAINAGE AREA.—390 square miles.

RECORDS AVAILABLE.—June 5, 1907, to September 30, 1920.

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 bridge or by wading.

CHANNEL AND CONTROL.—Channel straight above and below bridge. Bed composed of firm, coarse gravel. Banks high. Control slightly shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, not determined, but probably occurred sometime on January 2, maximum mean daily discharge estimated (11,000 second-feet) January 2; minimum stage recorded, 1.87 feet at 7 a. m. September 21 (discharge, 10 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 16.38 feet 7.30 a. m. January 23 (discharge, 13,400 second-feet); minimum stage, 1.85 feet at 7 a. m. September 24 (discharge, 10 second-feet).

1907–1920: Maximum stage recorded, 21.48 feet March 13, 1917 (discharge, 20,100 second-feet); minimum stage, 1.70 feet October 2, 1914 (discharge, 3 second-feet).

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

ACCURACY.—Stage-discharge relation permanent during the years ending September 30, 1919 and 1920, except as affected by ice. Rating curve fairly well defined between 50 and 150 second-feet and well defined between 150 and 7,000 second-feet; extended beyond those limits. Gage read to hundredths once daily. Owing to indistinct figures at footmarks on gage scale some of the gage readings were in error by multiples of half a foot. Records for these days were interpreted by comparison with records for other stations on this stream. Daily discharge ascertained by applying daily gage height to rating table. Records good except those for low and high stages which are fair.

Discharge measurements of Tygart River at Belington, W. Va., during the year ending Sept. 30, 1920.

Gage.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 15	Peterson and Bigwood.	6.25	1,980	June 17	B. L. Bigwood.....	3.00	186
15	.....do.....	5.99	1,830	17	.....do.....	3.04	197

NOTE.—No discharge measurements were made during year ending Sept. 30, 1919.

Daily discharge, in second-feet, of Tygart River at Belington, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	54	2,870	644	6,600	342	1,020	694	321	213	178	139	70
2	59	1,440	498	11,000	321	959	498	475	498	161	230	69
3	32	694	430	6,900	282	694	452	850	282	123	246	85
4	48	363	363	2,380	246	745	430	620	230	87	161	69
5	42	385	342	1,370	282	595	407	546	142	83	117	49
6	54	282	302	1,370	246	1,130	475	452	125	100	92	38
7	58	282	407	797	189	1,630	385	407	125	66	178	27
8	42	195	363	745	264	1,130	342	694	139	38	230	16
9	47	207	498	595	207	1,020	302	797	134	43	154	32
10	37	88	4,840	644	139	959	282	3,710	112	1,440	112	24
11	34	132	5,500	498	180	1,440	342	2,070	134	1,250	76	28
12	33	117	4,310	430	180	797	850	1,310	90	498	37	94
13	30	106	2,460	407	282	644	694	1,250	167	498	70	82
14	33	88	1,130	430	230	595	546	850	321	1,020	24	36
15	92	108	2,000	546	342	342	498	745	342	797	66	49
16	66	106	2,460	904	321	342	452	620	321	5,390	76	34
17	65	114	1,370	1,310	321	452	522	522	321	6,410	57	24
18	60	119	904	1,310	407	644	797	570	302	1,780	62	26
19	19	498	694	1,920	321	595	694	620	342	1,020	149	17
20	18	1,070	522	1,920	321	644	745	694	230	694	149	13
21	48	1,850	342	1,190	452	522	570	904	100	2,620	88	10
22	73	1,190	264	694	904	498	452	1,020	92	1,310	66	24
23	132	694	1,250	644	1,020	407	407	959	88	850	246	39
24	125	595	1,500	2,460	1,130	321	452	904	85	904	213	321
25	106	385	1,700	2,380	959	342	904	797	76	342	151	230
26	430	302	1,250	2,070	1,020	302	694	694	198	302	94	137
27	96	246	1,020	1,600	1,780	363	644	904	1,500	203	85	90
28	90	213	797	694	1,190	1,370	430	694	1,190	94	87	55
29	73	546	620	522	.....	1,310	407	522	694	137	96	37
30	694	959	321	452	.....	959	363	385	363	92	82	42
31	2,380	.....	475	342	.....	904	.....	282	.....	100	75	.....
1919-20.												
1	45	407	694		201	650	264	4,310	210	48	123	154
2	34	430	522		230	500	230	3,710	183	47	130	92
3	48	4,110	321		161	460	302	2,000	146	35	88	73
4	46	1,500	186		302	510	342	904	144	87	72	57
5	22	850	156	380	797	2,170	385	694	302	904	26	53
6	43	620	302			1,730	620	498	522	407	47	53
7	24	452	10,000		420	1,170	850	385	644	452	264	53
8	27	385	11,100	850		920	1,190	385	407	498	230	36
9	49	321	2,380	4,010	246	670	1,020	302	302	452	156	31
10	69	246	1,370	6,760	745	660	1,130	264	246	213	119	57
11	42	204	1,190	2,230	2,380	650	1,020	246	189	117	498	88
12	51	213	1,190	1,250	1,500	1,220	797	385	156	159	282	75
13	407	201	959	570	1,070	5,020	797	1,780	142	186	230	66
14	546	195	5,060		797	3,270	904	3,520	112	189	385	94
15	2,540	159	2,150			2,130	694	2,230	85	156	302	73
16	1,630	151	1,130	460		2,710	595	1,250	159	189	321	46
17	1,920	134	904		340	5,970	694	694	170	159	363	35
18	1,250	128	498			2,310	644	694	246	144	246	36
19	694	123				7,510	694	546	230	106	170	37
20	264	92		1,440		8,340	850	498	189	92	1,070	30
21	154	90		2,230	570	3,290	6,760	595	132	83	797	26
22	342	123		7,590	1,920	1,910	5,610	620	130	108	1,190	24
23	1,130	146		13,400	4,010	1,410	1,780	595	186	106	1,440	15
24	2,380	134		8,550	3,320	1,040	1,440	498	213	88	904	10
25	1,850	159	345	3,810	2,380	850	1,250	452	230	522	546	18
26	1,020	1,440		2,460	1,440	694	797	430	213	1,130	385	17
27	797	4,730		1,250	850	595	694	595	178	498	282	15
28	1,250	2,380		1,020	694	546	570	475	98	282	213	21
29	620	1,130		644	644	363	959	385	62	207	195	213
30	452	904		407	.....	302	745	321	53	142	183	170
31	363	.....		385	.....	282	.....	342	.....	128	159	.....

NOTE.—Stage-discharge relation affected by ice Dec. 19, 1919, to Jan. 7, 1920, Jan. 14–19, Feb. 6–8, and Feb. 15–20, 1920; discharge estimated from study of weather records and comparison with records of flow at Dailey and Fetterman. Gage readings in error (see "Accuracy" paragraph) for following periods and discharge estimated by comparison with records of flow for other stations in this basin and a study of weather records: Oct. 24, 26, 29, Dec. 4, 12, 16, 17, 23, 24, 26, 27, 29, 1918; Jan. 1–3, 14, 15, Feb. 1, 11, 15–17, 26, Mar. 30, 31, Apr. 6, 7, 10, 12–14, 21, May 11, 28, June 7–9, 13–18, July 1, 2, Aug. 1–3, 19, 20, 23, 24, 28, 29, Sept. 12, 13, 24, Oct. 5–7, 21, Nov. 18, Dec. 4, 5, 11, 14, 15, 1919; Jan. 11, 12, 23, 30, 31, Feb. 1–3, 9, 27, Mar. 1–24, 29, April 3, 6, 17–19, May 28, July 3, 14, 15, and Aug. 9, 1920.

Monthly discharge of Tygart River at Belington, W. Va., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 390 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	2,380	18	167	0.428	0.49
November	2,870	88	541	1.39	1.55
December	5,500	264	1,280	3.28	3.78
January	11,000	342	1,780	4.57	5.27
February	1,780	139	496	1.27	1.32
March	1,630	302	764	1.96	2.26
April	904	282	524	1.34	1.50
May	3,710	282	845	2.17	2.50
June	1,500	76	299	.767	.86
July	6,410	38	924	2.37	2.73
August	246	24	120	.308	.36
September	321	10	62.2	.159	.18
The year	11,000	10	654	1.68	22.80
1919–20.					
October	2,540	22	649	1.66	1.91
November	4,730	90	739	1.89	2.11
December	11,100	156	1,440	3.69	4.25
January	13,400	.....	2,070	5.31	6.12
February	4,010	161	950	2.44	2.63
March	8,340	282	1,930	4.95	5.71
April	6,760	230	1,150	2.95	3.29
May	4,310	246	987	2.53	2.92
June	644	53	209	.536	.60
July	1,130	35	256	.656	.76
August	1,440	26	368	.944	1.09
September	213	10	58.9	.151	.17
The year	13,400	10	905	2.32	31.56

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, 1920.

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 or by wading.

CHANNEL AND CONTROL.—Channel straight above and below bridge. Bed hard and firm. Banks high. Control practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 22.72 feet at 7 a. m. January 2 (discharge, 41,800 second-feet); minimum stage 3.19 feet at 7 a. m. September 22 (discharge, 64 second-feet).

Maximum stage recorded during year ending September 30, 1920, 17.17 feet at 5 p. m. January 23 (discharge, 28,100 second-feet); minimum stage, 3.18 feet September 26–27 (discharge, 62 second-feet).

1907–1920: Maximum stage recorded, 29.1 feet July 25, 1912 (discharge, 57,600 second-feet): minimum stage, 2.30 feet October 27–28, and November 4–10, 1912 (discharge, 12 second-feet).

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

ACCURACY.—Stage-discharge relation practically permanent; slightly affected by ice January 11 and 12, December 20–31, 1919, January 1–4, 14–20, and February 7–9, 1920. Rating curve well defined between 80 and 23,000 second-feet; poorly defined below 80 second-feet and extended above 23,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table except for periods affected by ice. Records good.

Discharge measurements of Tygart River at Fetterman, W. Va., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 7	Peterson and Bigwood	4.83	1,500
June 15	B. L. Bigwood	4.03	454

NOTE.—No discharge measurements were made during the year ending Sept. 30, 1919.

Daily discharge, in second-feet, of Tygart River at Fetterman, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	273	8,140	1,850	22,900	865	3,720	2,270	1,100	760	975	250	354
2	244	4,860	1,610	38,100	810	4,670	1,690	1,380	710	620	279	328
3	216	2,790	1,230	24,100	665	3,720	1,450	1,850	865	479	341	354
4	191	1,930	1,160	9,120	578	2,970	1,300	1,770	620	348	578	291
5	148	1,450	1,030	4,480	865	2,610	1,160	1,530	479	285	503	250
6	191	1,100	1,030	3,530	810	4,290	1,100	1,300	402	228	410	211
7	148	920	920	2,970	760	5,050	1,030	1,160	334	200	578	173
8	191	810	1,030	2,610	665	4,100	920	1,380	297	206	810	148
9	148	710	3,720	2,440	620	3,720	865	1,100	309	178	620	141
10	148	620	11,900	2,440	578	3,340	810	6,000	334	186	471	134
11	148	519	18,800	2,300	527	2,970	810	11,900	380	975	354	222
12	148	440	13,900	2,160	527	2,610	1,230	7,160	463	2,970	328	182
13	130	402	7,360	2,020	620	2,100	1,450	4,480	328	1,530	527	127
14	148	402	4,860	2,100	810	1,770	1,690	3,150	402	3,340	448	111
15	191	354	6,780	3,910	1,300	1,610	1,450	2,440	920	3,150	354	90
16	255	363	7,160	4,480	1,690	1,300	1,380	2,020	578	12,600	285	88
17	425	315	4,480	3,530	1,530	1,100	2,020	1,850	1,160	18,300	279	134
18	244	810	3,150	4,860	1,300	760	2,440	2,100	1,300	7,560	267	117
19	148	1,610	2,270	7,940	920	1,610	2,270	2,440	760	2,970	354	96
20	191	4,860	1,690	6,190	1,160	1,770	1,850	2,270	527	3,530	309	75
21	233	6,190	1,450	4,480	1,450	1,610	1,690	5,240	402	7,560	348	68
22	303	4,670	2,020	3,150	2,790	1,450	1,530	5,240	354	5,240	471	96
23	303	2,610	3,910	2,790	3,720	1,300	1,300	3,910	315	2,610	487	291
24	334	1,930	5,240	4,860	3,720	1,160	1,450	3,340	354	2,020	920	503
25	440	1,530	5,430	6,780	3,340	1,030	2,270	3,340	511	1,380	710	760
26	420	1,160	5,240	4,480	4,480	920	2,020	4,100	2,440	920	448	665
27	367	920	3,720	2,610	5,430	865	1,610	3,340	6,380	620	374	448
28	479	975	2,610	2,270	3,910	1,610	975	2,100	4,100	503	279	328
29	620	975	2,100	1,690	.....	3,530	1,100	1,850	2,270	395	250	267
30	1,160	1,380	1,690	1,160	.....	2,610	1,100	1,690	1,380	328	222	211
31	6,580	.....	4,100	1,030	.....	2,610	.....	975	.....	279	279	.....
1919-20.												
1	173	8,920	2,440		1,230	1,690	810	8,920	710	255	578	360
2	138	23,100	1,850	2,000	1,100	1,610	865	9,310	620	285	620	297
3	114	13,900	1,450		975	1,610	810	4,670	519	920	448	250
4	105	6,580	1,160		1,160	2,270	865	2,970	535	3,340	432	206
5	99	3,340	1,100	665	1,530	5,430	1,450	1,690	3,340	2,440	341	173
6		2,270	1,770	487	1,770	9,500	1,930	1,770	6,380	1,450	261	152
7		1,610	17,800	328	1,380	5,430	2,790	1,380	3,150	1,160	410	144
8	175		21,700	810	975	3,150	3,340	1,160	2,020	1,230	578	124
9		1,110	9,900	11,900	760	2,440	2,970	1,030	1,300	975	710	117
10			5,240	18,300	2,270	2,270	2,790	920	975	760	578	620
11	250	760	4,480	8,140	6,380	2,100	2,440	760	760	710	578	578
12	367	665	3,720	4,100	5,430	2,020	2,270	810	620	1,030	665	710
13	920	620	3,720	2,790	3,530	5,810	2,790	3,530	535	975	810	367
14	3,340	710	19,500		2,790	11,500	2,610	8,340	495	920	810	303
15	9,900	665	13,200		2,610	7,750	2,270	5,240	463	710	865	255
16	9,310	620	6,190	1,530	1,850	6,000	2,020	3,530	578	865	920	233
17	9,700	578	3,530		1,690	10,300	2,440	2,440	760	665	865	168
18	6,780	519	2,440		2,100	10,100	4,860	1,770	810	665	760	141
19	3,530	479	2,100		2,270	10,100	4,480	1,610	760	511	665	114
20	2,020	455			1,690	23,100	3,910	1,610	665	360	710	99
21	1,380	425		5,430	1,610	13,000	18,600	2,270	620	341	1,530	99
22	2,100	402		13,600	5,620	6,780	16,900	1,850	760	309	1,930	85
23	3,910	402		25,600	10,900	5,050	7,360	1,610	1,450	297	1,690	85
24	5,810	463		25,600	9,120	3,340	4,670	1,380	1,300	448	2,270	72
25	5,620	1,230	1,220	15,400	7,750	2,970	3,150	1,300	1,030	7,160	1,530	72
26	3,720	8,530		8,720	5,240	2,270	2,610	1,930	760	6,780	1,030	62
27	3,720	15,900		5,050	2,970	2,020	2,440	2,100	578	3,150	760	62
28	5,430	9,310		3,720	2,270	1,610	3,340	1,450	455	1,530	578	
29	3,150	5,050		2,440	2,100	1,380	3,340	1,160	367	920	535	360
30	2,020	3,530		2,020	.....	1,230	3,150	920	303	665	448	
31	2,270	.....		1,530	.....	920	.....	810	.....	527	374	.....

NOTE.—Stage-discharge relation affected by ice Jan. 11, 12, Dec. 20–31, 1919, Jan. 1–4, 14–20, and Feb. 7–9, 1920. Gage reading in error Oct. 6–10, Nov. 8–10, 1919, and Sept. 28–30, 1920; discharge estimated by comparison with records for other stations in the basin and a study of weather records.

Monthly discharge of Tygart River at Fetterman, W. Va., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,340 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918-19.					
October	6,580	130	489	0.365	0.42
November	8,140	303	1,860	1.39	1.55
December	18,800	920	4,300	3.21	3.70
January	38,100	1,030	6,050	4.51	5.20
February	5,430	527	1,660	1.24	1.29
March	5,050	760	2,400	1.79	2.06
April	2,440	810	1,470	1.10	1.23
May	11,900	975	3,020	2.25	2.59
June	6,380	297	1,010	7.54	.84
July	18,300	178	2,660	1.99	2.29
August	920	222	424	.316	.36
September	760	68	242	.181	.20
The year	38,100	68	2,150	1.60	21.73
1919-20.					
October	9,900	99	2,800	2.09	2.41
November	23,100	402	3,810	2.84	3.17
December	21,700	.....	4,450	3.32	3.83
January	25,600	328	5,660	4.22	4.86
February	10,900	.....	3,140	2.34	2.52
March	23,100	920	5,310	3.96	4.56
April	18,600	810	3,810	2.84	3.17
May	9,310	760	2,590	1.93	2.22
June	6,380	303	1,120	.836	.93
July	7,160	255	1,370	1.02	1.18
August	2,270	261	815	.608	.70
September	620	62	234	.175	.20
The year	25,600	62	2,930	2.19	29.75

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.—October 1, 1914, to September 30, 1920. Upper and lower gages at Lock 15 have been read under direction of United States Engineer Corps since May 1, 1904.

GAGE.—Upper vertical staff gage in two sections 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, was used until January 29, 1918, when it was carried away by ice. Read by Charles R. Hall, lockmaster.

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

CHANNEL AND CONTROL.—One channel at all stages; straight half a mile above and below bridge. Control for 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 year ending September 30, 1919, 21.2 feet at 8 a. m. January 2 (discharge, 92,200 second-feet); minimum stage, 7.10 feet at 6 p. m. September 21 (discharge, 137 second-feet).

Maximum stage recorded during year ending September 30, 1920, 16.8 feet at 11 p. m. on January 23 (discharge, 51,600 second-feet) minimum stage 7.02 feet at 6 p. m. September 27 (discharge, 114 second-feet).

1915–1920: Maximum stage recorded, 21.2 feet at 8 a. m. January 2, 1919 (discharge, 92,200 second-feet); minimum stage, 6.10 feet July 31, 1916, due to opening valves. Minimum stage under normal conditions, 7.00 feet September 26, 1917 (discharge, 47 second-feet).

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 and on lower side of 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 21, 1919, to January 1, 1920. Rating curve well defined to 62,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table, and adding amount of water used for lockage. Rating table makes allowance based on measurements for leakage through upper gates, as under normal conditions upper gates are closed; gage reader records number of lockages and length of time upper gates are open. Daily discharge corrected for effect of lockage and change in leakage when upper gates at lock are open. Records good.

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

May 10, 1920: Gage height, 8.04 feet; discharge, 1,290 second-feet.

Daily discharge, in second-feet, of Monongahela River at Lock 15, Hoult, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	302	12,500	2,600	32,300	1,580	6,250	2,730	1,570	1,110	1,180	350	442
2	310	7,400	2,120	80,800	1,280	6,640	2,230	2,870	946	914	352	474
3	276	4,190	1,780	40,800	1,110	5,170	1,890	2,730	870	673	341	430
4	246	2,740	1,470	16,600	668	4,020	1,680	2,610	866	600	563	453
5	200	1,940	1,370	2,820	1,370	3,570	1,570	2,230	658	421	577	450
6	221	1,580	1,280	5,520	1,370	7,000	1,370	2,000	540	472	594	372
7	225	1,290	1,180	4,830	1,180	8,260	1,370	1,780	430	420	672	369
8	261	1,040	1,370	4,500	1,040	7,000	1,220	2,120	411	343	916	284
9	228	906	1,570	4,500	844	7,400	1,110	3,870	528	287	855	250
10	210	718	14,500	3,140	895	7,820	946	8,260	450	305	599	278
11	206	614	27,300	2,600	682	5,880	900	10,100	450	4,830	451	352
12	190	620	24,000	2,600	762	4,180	1,470	10,100	592	5,520	588	291
13	196	522	12,500	2,600	844	3,420	1,780	6,250	497	2,860	820	249
14	198	382	8,290	2,730	1,080	2,860	2,120	4,340	520	5,520	726	232
15	215	400	13,500	5,520	1,890	2,470	1,780	3,420	1,280	7,000	588	197
16	239	402	12,500	8,260	3,570	2,000	1,780	2,730	4,830	13,500	474	179
17	314	401	7,400	5,880	3,140	1,780	4,020	2,470	3,570	21,400	410	179
18	271	950	4,850	5,520	2,860	1,780	3,870	2,740	2,230	11,200	433	169
19	246	3,380	3,340	9,630	2,230	2,120	3,280	3,000	1,470	4,180	518	169
20	235	7,450	2,640	8,260	2,020	2,350	2,760	3,580	916	8,260	550	158
21	246	9,630	2,230	5,520	1,900	2,000	2,420	11,000	1,040	9,630	560	153
22	320	7,400	2,000	4,020	3,730	2,000	2,000	10,600	882	8,260	1,780	218
23	342	4,500	6,620	3,420	5,520	1,780	1,790	6,620	616	4,350	1,900	1,680
24	357	3,000	7,820	10,600	5,170	1,570	1,900	5,170	672	3,030	1,680	760
25	446	2,350	8,710	12,000	4,340	1,470	3,000	5,180	716	2,020	1,180	560
26	436	1,820	8,710	7,000	5,170	1,280	2,730	7,000	4,500	1,370	777	930
27	400	1,280	5,880	4,830	7,000	1,280	2,230	5,170	15,000	1,110	595	658
28	356	1,140	4,500	4,020	5,880	2,350	1,780	3,420	7,820	716	500	513
29	538	2,000	3,280	2,860	.....	4,830	1,570	2,480	3,750	616	410	430
30	769	2,730	2,960	2,230	.....	3,720	1,370	1,780	2,230	516	363	350
31	10,600	.....	2,610	1,900	.....	3,570	.....	1,370	.....	370	405	.....

Daily discharge, in second-feet, of Monongahela River at Lock 15, Hoult, W. Va., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	314	16,600	4,500	2,470	2,120	2,470	1,010	11,000	853	454	740	366
2	260	35,300	3,280	5,880	1,780	2,470	1,030	13,500	740	892	804	324
3	248	24,000	2,730	4,830	1,570	3,000	1,130	7,400	626	4,830	696	351
4	221	10,100	2,230	3,000	2,860	3,430	1,180	5,000	640	7,400	564	288
5	206	5,520	1,780	2,120	7,000	7,820	1,780	3,280	5,880	4,830	471	281
6	190	3,570	1,780	1,800	5,520	14,500	2,860	2,490	12,000	2,730	390	274
7	190	2,470	29,400	2,000	4,340	8,710	4,180	2,000	5,880	2,600	508	306
8	204	2,000	33,800	2,600	3,140	4,830	5,520	1,690	3,140	3,870	746	306
9	218	1,680	20,200	18,400	2,730	3,870	4,660	1,570	2,000	2,730	1,100	272
10	209	1,370	10,600	29,400	4,020	3,420	3,870	1,280	1,470	1,780	1,010	2,730
11	271	1,180	7,820	12,500	11,500	3,140	3,420	1,100	1,170	1,370	886	1,780
12	850	1,150	6,250	6,620	9,170	3,280	3,280	1,010	949	2,350	787	1,020
13	1,300	1,150	7,010	4,520	6,250	7,400	3,420	4,660	743	2,000	956	860
14	2,730	1,110	34,500	3,140	5,520	19,000	4,180	11,000	650	1,680	1,140	640
15	13,500	1,060	22,000	2,230	4,340	11,500	3,420	7,820	951	1,470	1,020	464
16	15,600	898	10,600	1,890	3,170	9,630	3,000	4,830	1,050	1,890	1,000	404
17	16,600	850	6,250	3,720	2,600	17,800	3,140	3,420	1,120	1,280	956	324
18	11,500	736	4,180	4,020	3,420	15,600	7,400	2,600	1,190	1,130	899	288
19	5,520	700	3,000	3,420	3,870	13,500	7,830	2,120	1,090	2,120	1,190	242
20	3,140	658	2,600	3,280	3,280	37,600	6,260	2,010	956	940	1,040	242
21	2,160	588		5,880	3,420	21,400	34,500	3,140	892	668	2,240	216
22	3,620	538		21,400	13,500	10,600	26,600	2,740	1,060	537	3,430	195
23	6,250	542		44,800	16,600	6,620	11,500	2,000	3,280	482	2,350	189
24	7,000	532		41,600	13,500	5,170	7,400	1,890	3,430	443	2,600	157
25	7,400	700		24,000	10,600	3,870	4,840	1,570	2,600	7,000	1,780	138
26	5,520	27,300	1,840	13,000	7,400	3,140	3,720	2,600	1,570	13,000	1,370	146
27	5,880	35,200		7,420	4,660	2,730	3,420	2,600	1,100	5,520	1,120	118
28	13,500	15,600		5,880	3,280	2,120	4,660	2,000	800	2,350	957	654
29	6,620	7,820		4,020	3,430	1,680	4,830	1,570	598	1,570	1,480	380
30	3,870	6,250		3,290	.....	1,470	3,870	1,280	504	1,100	660	354
31	2,870	.....		2,600	.....	1,280	.....	1,000	.....	815	528	.....

NOTE.—Stage-discharge relation affected by ice Dec. 21, 1919, to Jan. 1, 1920; discharge estimated by comparison with records for Tygart River, study of weather records, and observer's notes. Wickets open Jan. 31, 1919, Jan. 28–30, Mar. 30, May 30, and Sept. 5, 1920; and discharge was interpolated.

Monthly discharge of Monongahela River at Lock 15, Hoult, W. Va., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 2,430 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	10,600	190	632	0.260	0.30
November	12,500	382	2,840	1.17	1.30
December	27,300	1,180	6,480	2.67	3.08
January	80,800	1,900	9,930	4.09	4.72
February	7,000	668	2,470	1.02	1.06
March	8,260	1,280	3,800	1.56	1.80
April	4,020	900	2,020	.831	.93
May	11,000	1,370	4,470	1.84	2.12
June	15,000	411	2,010	.827	.92
July	21,400	287	3,930	1.62	1.87
August	1,900	341	694	.286	.33
September	1,680	153	408	.168	.19
The year	80,800	153	3,330	1.37	18.62
1919–20.					
October	16,600	190	4,450	1.83	2.11
November	35,300	532	6,910	2.84	3.17
December	34,500	1,780	7,570	3.11	3.58
January	44,800	1,800	9,410	3.87	4.46
February	16,600	1,570	5,680	2.34	2.52
March	37,600	1,280	8,160	3.36	3.87
April	34,500	1,010	5,930	2.44	2.72
May	13,500	1,000	3,620	1.49	1.72
June	12,000	504	1,960	.807	.90
July	13,000	443	2,640	1.09	1.26
August	3,430	390	1,140	.469	.54
September	2,730	118	477	.196	.22
The year	44,800	118	4,840	1.99	27.07

MIDDLE FORK AT MIDVALE, W. VA.

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

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

RECORDS AVAILABLE.—May 3, 1915, to September 30, 1920.

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

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight 300 feet above and 100 feet below cable section. Banks high and in most places wooded. Control slightly shifting.

EXTREMES OF STAGE.—Maximum stage recorded during year ending September 30, 1919, 9.99 feet at 7.30 a. m. January 2; minimum stage recorded, 1.19 feet at 7.30 a. m. September 21.

Maximum stage recorded during the year ending September 30, 1920; 9.65 feet at 7.30 a. m. December 7; minimum stage 1.20 feet at 7 a. m. September 27.

1915–1920: Maximum stage recorded, 16.1 feet at 7.30 a. m. January 28, 1918 (stage-discharge relation affected by ice); minimum stage recorded, 1.12 feet 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 during severe winters.

ACCURACY.—Stage-discharge relation changes during high stages. Determinations of discharge for years ending September 30, 1918–1920, are withheld as additional discharge measurements are needed to fix position of rating curves at critical stages. Gage read to hundredths twice daily.

Discharge measurements of Middle Fork at Midvale, W. Va., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 18	Peterson and Bigwood	2.84	256
June 18	B. L. Bigwood	2.14	106

NOTE.—No discharge measurements were made during the year ending Sept. 30, 1919.

Daily gage height, in feet, of Middle Fork at Midvale, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1.46	4.52	2.72	9.96	2.22	3.84	2.82	2.46	2.08	1.82	1.86	1.74
2	1.48	4.69	2.56	9.36	2.31	3.76	2.63	2.78	1.98	1.72	2.05	1.69
3	1.46	2.97	2.43	5.73	2.25	3.40	2.60	2.74	1.86	1.62	1.82	1.56
4	1.44	2.67	2.42	4.76	2.18	3.08	2.54	2.66	1.72	1.54	1.68	1.50
5	1.40	2.44	2.26	3.54	2.22	3.18	2.52	2.58	1.66	1.49	1.62	1.44
6	1.44	2.28	2.28	3.48	1.96	4.05	2.43	2.47	1.65	1.48	2.11	1.43
7	1.48	2.15	2.74	3.30	2.16	3.76	2.35	2.46	1.58	1.44	2.06	1.39
8	1.49	2.06	2.68	2.97	2.14	3.46	2.30	2.92	1.66	1.40	1.89	1.36
9	1.44	1.96	2.88	2.95	2.28	3.36	2.13	3.16	1.80	1.40	1.72	1.36
10	1.42	1.92	7.57	2.62	2.03	3.08	2.17	5.04	1.58	1.41	1.64	1.32
11	1.40	1.87	6.26	2.88	2.09	2.94	2.30	4.60	1.48	2.31	1.58	1.34
12	1.44	1.81	5.06	2.74	2.06	2.82	2.64	4.10	1.46	1.77	1.60	1.38
13	1.98	1.78	4.02	2.69	2.06	2.72	2.50	3.56	1.44	2.32	1.61	1.40
14	1.75	1.74	3.52	2.61	2.22	2.60	2.48	3.32	1.42	2.38	1.55	1.34
15	1.62	1.72	4.32	3.41	2.40	2.49	2.46	3.04	1.55	3.37	1.50	1.30
16	1.57	1.70	4.38	3.22	2.34	2.40	2.57	2.78	1.66	7.54	1.58	1.28
17	1.53	1.70	3.46	3.16	2.38	2.34	2.84	3.22	1.57	4.86	1.48	1.26
18	1.52	2.68	3.10	4.78	2.34	2.70	2.86	3.18	1.46	3.48	1.46	1.22
19	1.48	3.28	2.82	4.88	2.22	2.78	2.78	3.02	1.40	3.30	1.66	1.21
20	1.50	3.72	2.59	3.98	2.33	2.74	2.69	2.96	1.38	3.92	1.64	1.20
21	1.56	4.32	2.48	3.48	2.52	2.72	2.68	3.17	1.52	4.50	1.54	1.20
22	1.74	3.52	2.60	3.14	3.30	2.57	2.53	3.04	1.42	3.36	2.16	1.26
23	1.66	3.05	3.38	3.90	3.89	2.46	2.44	3.18	1.35	2.73	2.02	2.05
24	1.62	2.70	3.39	4.50	3.53	2.38	3.30	3.08	1.36	2.36	1.82	2.10
25	1.61	2.52	3.85	3.96	3.27	2.32	3.02	3.68	1.52	2.16	1.69	1.68
26	1.73	2.32	3.62	3.54	3.68	2.22	2.79	3.38	3.34	1.88	1.62	1.62
27	1.77	2.20	3.28	3.12	3.47	2.55	2.64	3.12	3.26	1.81	1.54	1.50
28	1.78	2.60	3.01	2.88	3.32	3.46	2.48	2.90	2.81	1.72	1.73	1.48
29	1.79	3.08	2.76	2.62	.....	3.28	2.52	2.58	2.37	1.68	1.68	1.42
30	3.00	2.88	2.47	2.42	.....	3.18	2.40	2.50	2.03	1.62	1.61	1.38
31	4.60	.....	3.03	2.38	.....	3.06	.....	2.14	.....	1.56	1.72	.....
1919–20.												
1	1.36	3.29	2.86	2.95	2.43	2.82	2.18	5.58	2.03	1.50	1.74	1.62
2	1.34	7.14	2.66	3.26	2.44	2.69	2.25	4.05	1.96	1.58	1.94	1.58
3	1.32	4.88	2.46	2.80	2.28	2.70	2.16	3.54	1.96	2.10	1.70	1.50
4	1.30	3.80	2.32	3.46	2.66	3.34	2.16	3.11	3.00	2.22	1.62	1.42
5	1.30	3.28	2.32	4.00	2.74	4.46	2.49	2.96	3.20	2.00	1.58	1.42
6	1.38	2.84	2.31	4.12	2.78	4.15	2.46	2.66	2.98	1.81	1.48	1.40
7	1.84	2.62	9.56	4.18	2.58	3.52	2.68	2.50	2.68	1.82	1.88	1.36
8	1.60	2.42	5.36	4.44	2.56	3.13	2.98	2.40	2.44	1.90	1.90	1.34
9	1.48	2.27	4.17	7.90	2.42	2.95	3.18	2.28	2.27	1.74	1.74	1.36
10	1.46	2.20	3.76	5.25	3.50	2.82	3.22	2.22	2.10	1.64	1.69	1.50
11	1.45	2.16	3.42	4.14	4.10	2.86	3.00	2.15	1.98	1.65	1.90	1.64
12	2.58	2.14	3.27	3.52	3.64	3.40	2.90	2.34	1.94	1.82	1.76	1.54
13	2.92	2.13	4.82	3.04	3.35	6.50	3.18	5.52	1.92	1.73	1.76	1.56
14	2.88	2.04	6.53	2.42	3.00	4.86	3.00	4.54	1.90	1.63	1.93	1.47
15	5.53	1.96	4.68	2.82	3.04	4.15	2.92	3.96	1.86	1.63	1.86	1.42
16	3.91	1.96	3.89	2.84	2.80	4.60	2.89	3.50	1.90	1.85	2.38	1.37
17	4.74	1.94	3.47	3.42	2.93	5.84	3.36	3.08	1.86	1.74	2.10	1.38
18	3.78	1.90	2.97	3.18	2.85	4.56	4.02	2.83	2.06	1.66	1.94	1.38
19	3.00	1.88	2.98	3.22	2.80	7.32	3.71	2.76	1.88	1.60	1.86	1.34
20	2.56	1.84	2.78	3.00	2.70	6.78	3.70	2.64	1.80	1.64	2.27	1.30
21	2.38	1.74	2.64	5.82	3.34	4.90	7.76	2.61	2.00	1.54	2.08	1.26
22	4.58	1.86	2.83	6.88	5.18	4.08	6.50	2.56	2.04	1.49	2.26	1.26
23	4.10	2.04	2.88	8.20	5.08	3.73	4.95	2.49	1.94	1.44	2.56	1.24
24	4.50	2.06	2.78	6.95	5.15	3.32	3.72	2.40	1.92	2.02	2.62	1.22
25	3.84	2.56	2.74	6.12	4.38	3.10	3.35	3.21	1.86	4.28	2.40	1.24
26	3.25	5.86	2.74	4.32	3.64	2.86	3.11	2.99	1.78	3.24	2.18	1.21
27	3.36	5.88	2.58	3.42	3.60	2.68	3.02	2.76	1.70	2.61	2.00	1.21
28	3.22	4.94	2.49	3.30	3.22	2.58	3.20	2.57	1.62	2.28	1.90	1.71
29	2.73	3.88	2.45	2.90	2.84	2.38	3.10	2.40	1.52	2.00	1.80	1.76
30	2.56	3.26	2.39	2.38	.....	2.28	3.09	2.30	1.52	1.88	1.72	1.62
31	2.48	.....	2.29	2.59	.....	2.22	.....	2.14	.....	1.78	1.72	.....

NOTE.—Stage-discharge relation affected by ice Dec. 16, 1919, to Jan. 8, 1920, Jan. 11–22, Feb. 14 to Mar. 4, and Mar. 7–11, 1920.

BUCKHANNON RIVER AT HALL, W. VA.

LOCATION.—About 500 feet below ruins of an old milldam, a quarter of a mile above post office and county highway bridge at Hall, Barbour County, and 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.—June 7, 1907, to May 25, 1909: April 15, 1915, to September 30, 1920.

GAGE.—Vertical and inclined staff on right bank used since April 15, 1915; read by James Newcomb. From June 7, 1907, to May 25, 1909, a chain gage at county highway bridge one-quarter of a mile below was used.

DISCHARGE MEASUREMENTS.—Made from county highway bridge.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 12.2 feet at 7 a. m. January 2 (discharge not determined); minimum stage, 1.75 feet at 6 p. m. September 21 (discharge, 10 second-feet).

Maximum stage recorded during year ending September 30, 1920, 10.7 feet at 5 p. m. January 23 (discharge, 8,530 second-feet); minimum stage, 1.82 feet at 6 a. m. September 25 and at 6 p. m. September 26 and 27 (discharge, 14 second-feet).

1907–1909 (station at highway bridge): Maximum stage recorded, 13.8 feet February 6, 1908 (discharge not determined); minimum stage, 1.40 feet during several days in October and November, 1908 (discharge not determined).

1915–1920: Maximum stage recorded, 14.7 feet March 14, 1918 (discharge not determined); minimum stage, 1.70 feet October 7, 1917 (discharge, 8 second-feet). Highest flood known, prior to establishment of station, reported to have reached a gage height of about 14 feet in 1888, referred to datum of present gage.

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

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

ACCURACY.—Stage-discharge relation for low stages changed slightly; also affected by ice for short periods during winter of 1919–20. Rating curve revised below 2,000 second-feet, October 1, 1919. Rating curve well defined between 10 and 2,600 second-feet; fairly well defined between 2,600 and 4,500 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table, except for periods of ice effect. Open-water records good, winter records fair.

Discharge measurements of Buckhannon River at Hall, W. Va., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 14	Peterson and Bigwood	4.20	1,740
June 16	B. L. Bigwood	2.60	206

NOTE.—No discharge measurements were made during the year ending Sept. 30, 1919.

Daily discharge, in second-feet, of Buckhannon River at Hall, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	76	1,720	474	5,790	260	870	490	265	199	324	76	150
2	45	1,170	396	10,100	213	1,170	426	331	180	208	194	189
3	37	722	331	6,660	175	870	360	396	138	150	290	124
4	45	490	297	2,180	208	628	324	374	104	96	180	96
5	43	403	270	1,070	228	580	297	352	88	78	124	73
6	39	311	244	970	223	1,220	270	297	73	69	146	61
7	36	244	284	770	180	1,280	249	284	67	61	490	65
8	39	213	324	675	150	970	223	770	69	65	331	53
9	43	180	374	490	170	870	199	870	88	65	208	40
10	47	154	3,400	324	124	770	175	2,510	86	57	150	31
11	40	134	4,570	338	114	580	194	2,290	86	970	104	24
12	39	127	3,400	324	124	535	352	1,610	57	426	104	23
13	51	111	1,500	396	189	450	396	1,070	40	410	162	34
14	73	96	970	490	218	410	331	770	37	450	124	45
15	104	88	1,840	1,220	324	360	318	675	36	1,170	93	57
16	86	83	1,500	1,220	426	311	324	490	57	4,870	83	39
17	57	86	1,020	870	381	277	580	450	284	5,790	73	21
18	53	154	675	970	367	311	580	675	228	1,610	71	14
19	55	675	490	1,720	338	474	490	580	104	970	134	13
20	65	1,500	426	1,280	270	418	426	628	71	2,290	162	18
21	55	1,840	352	870	403	410	396	1,960	83	3,220	130	11
22	83	1,220	410	675	628	367	338	1,390	98	1,440	244	15
23	146	770	970	580	820	331	297	1,120	65	870	628	57
24	124	490	870	1,720	870	277	374	870	57	535	304	535
25	98	410	1,220	1,390	675	265	426	1,280	78	374	208	304
26	104	324	1,120	1,020	970	223	367	1,120	1,720	244	130	170
27	162	260	820	675	1,070	270	311	770	2,920	180	117	111
28	146	239	580	535	870	870	270	580	1,070	150	78	83
29	134	490	490	426	.....	820	260	450	870	88	104	65
30	239	535	403	338	.....	675	297	324	381	83	104	50
31	1,960	.....	458	297	.....	580	.....	260	.....	86	93	.....
1919–20.												
1	33	1,180	585		345		170	3,020	210	69	163	84
2	33	6,220	423		306		179	1,960	179	96	163	72
3	32	3,780	360		264	380	206	1,080	141	680	174	59
4	28	1,510	294		330		179	730	242	780	124	46
5	32	780	259	265	585	1,730	237	585	2,620	477	87	43
6	36	585	242			1,960	345	441	2,180	306	62	35
7	33	423	4,270			1,130	495	345	930	306	318	30
8	108	345	4,770	585	390		680	294	540	414	197	35
9	118	282	1,620	3,980			632	248	390	405	141	26
10	78	226	1,180	4,070		520	540	226	282	259	108	46
11	56	197	1,080	1,510	1,730		495	197	206	264	128	75
12	102	215	880		1,180	585	441	192	166	423	188	44
13	1,080	206	980		830	2,180	540	1,510	148	375	148	40
14	1,400	188	4,970			2,720	585	1,840	170	254	152	62
15	4,170	166	3,020			1,620	495	1,180	294	220	242	67
16	2,820	159	1,400	460		1,460	468	880	254	259	188	56
17	3,020	148	880			2,620	780	632	270	324	174	33
18	2,180	134	680		390	1,960	1,340	486	242	206	163	33
19	1,030	131	585			2,920	1,080	398	206	163	131	40
20	632	118	495			5,370	1,080	390	206	131	232	24
21	423	102	450			2,820	4,770	375	206	131	259	33
22	780	99		4,170	1,960	1,400	3,690	338	270	108	242	33
23	1,620	115		8,200	2,290	1,030	1,730	294	318	78	585	23
24	1,620	188		6,000	1,840	780	1,080	264	259	398	585	17
25	1,510	226		4,170		632	780	680	206	4,170	441	16
26	930	2,290	260	1,840	770	495	585	1,080	166	2,820	324	16
27	1,080	3,020		1,180		414	585	680	141	980	215	15
28	1,340	1,730		830		324	680	477	115	585	174	28
29	680	1,130		632		282	632	368	90	375	141	36
30	495	830		477	.....	237	585	282	75	259	115	72
31	390	.....		414	.....	206	.....	242	.....	197	108	.....

NOTE.—Discharge estimated because of ice Dec. 22, 1919, to Jan. 7, 1920, Jan. 12–21, Feb. 6–10, 14–21, 25–29, Mar. 1–4, and 8–11, 1920, from observer's notes, weather records, and comparison with records of flow for stations on Tygart River.

Monthly discharge of Buckhannon River at Hall, W. Va., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 277 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	1,960	36	140	0.505	0.58
November	1,840	83	508	1.83	2.04
December	4,570	244	983	3.55	4.09
January	10,100	297	1,500	5.42	6.25
February	1,070	114	392	1.42	1.48
March	1,280	223	595	2.15	2.48
April	580	175	345	1.25	1.40
May	2,510	260	833	3.01	3.47
June	2,920	36	314	1.13	1.26
July	5,790	57	884	3.19	3.68
August	628	71	175	.632	.73
September	535	11	85.5	.309	.34
The year	10,100	11	567	2.05	27.80
1919–20.					
October	4,170	28	900	3.25	3.75
November	6,220	99	891	3.22	3.59
December	4,970	.....	1,030	3.72	4.29
January	8,200	.....	1,440	5.20	6.00
February	2,290	.....	710	2.56	2.76
March	5,370	.....	1,240	4.48	5.16
April	4,770	170	869	3.14	3.50
May	3,020	192	700	2.53	2.92
June	2,620	75	391	1.41	1.57
July	4,170	69	533	1.92	2.21
August	585	62	209	.755	.87
September	84	15	41.3	.149	.17
The year	8,200	15	748	2.70	36.79

WEST FORK AT BUTCHERVILLE, W. VA.

LOCATION.—At Weston & Clarksburg Electric Railway Co.'s trolley bridge, a quarter of a mile upstream from Butcherville, Lewis County, 3 miles north of Weston. Freemans Creek enters river on left 1 mile below station.

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

RECORDS AVAILABLE.—April 8, 1915, to September 30, 1920.

GAGE.—Chain gage fastened to upstream side of trolley bridge near center of span; read by Vie Ervin and Verna Butcher.

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 small amount of water passes through two small culverts in trolley embankment; straight for 500 feet above and curved for 1,000 feet below station. Stream bed composed of sand and gravel. Control is rock ledge; probably permanent. Growth of aquatic plants may cause backwater at gage during summer.

EXTREMES OF STAGE.—Maximum stage recorded during year ending September 30, 1919, about 24.0 feet at 9.30 a. m. January 2; minimum stage, 3.30 feet at 5 p. m. September 20.

Maximum stage recorded during year ending September 30, 1920, 19.11 feet at 8 a. m. December 7; minimum stage, 3.17 feet at 9 a. m. October 9.

1915–1920: Maximum stage recorded, about 24.0 feet at 9.30 a. m. January 2, 1919; minimum stage, 3.17 feet at 9 a. m. October 9, 1919.

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 during severe winters.

ACCURACY.—Measurements of flow do not indicate noteworthy backwater from growth of aquatic plants. Rating curve not fully developed. Gage read to hundredths twice daily. Data inadequate for determining daily discharge.

Discharge measurements of West Fork at Butcherville, W. Va., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 13	Peterson and Bigwood	8.39	1,070
June 16	B. L. Bigwood	6.20	204

NOTE.—No discharge measurements were made during year ending Sept. 30, 1919.

Daily gage height, in feet, of West Fork at Butcherville, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	3.97	8.04	5.07	17.06	5.06	6.78	5.24	5.86	4.70	4.82	4.53	4.46
2	3.92	6.65	4.99	21.94	5.03	6.26	5.10	5.64	4.56	4.70	4.66	4.71
3	3.91	5.67	4.94	9.26	5.02	5.90	4.98	5.24	4.39	4.58	4.43	4.16
4	3.88	5.22	5.99	7.14	4.98	5.62	4.92	5.02	4.29	4.48	4.26	3.78
5	3.82	4.82	5.72	6.64	4.98	6.26	4.88	5.00	4.22	4.36	4.12	4.06
6	3.78	4.61	5.42	6.22	4.96	6.72	4.82	5.03	4.18	4.28	4.24	3.84
7	3.74	4.50	5.20	6.02	4.94	6.08	4.72	5.19	4.16	4.24	4.83	3.88
8	3.74	4.42	4.85	5.86	4.90	5.68	4.58	6.38	4.14	4.18	4.64	3.79
9	3.70	4.38	5.39	5.72	4.80	7.65	4.44	6.54	4.12	4.14	4.36	3.94
10	3.72	4.34	10.64	5.60	4.72	6.95	4.28	7.04	4.10	4.28	4.04	3.82
11	3.66	4.32	13.00	5.58	4.59	6.38	4.54	8.24	4.06	7.32	3.87	3.86
12	3.72	4.28	9.92	5.60	4.42	6.04	6.30	7.13	4.60	5.70	3.98	3.80
13	4.10	4.24	6.68	5.62	4.90	5.76	5.52	6.72	4.90	4.74	4.38	3.90
14	4.14	4.18	6.49	5.90	7.43	5.60	4.88	6.04	4.84	9.80	4.27	3.78
15	4.06	4.12	9.54	8.72	6.95	5.37	4.56	5.52	5.54	8.23	4.13	3.70
16	4.02	4.04	7.11	8.06	6.16	5.19	5.06	5.19	8.92	10.68	3.98	3.67
17	3.98	4.98	6.23	7.16	6.48	5.12	6.28	5.08	6.66	9.48	4.06	3.68
18	3.94	6.40	5.65	6.48	6.34	5.33	5.62	5.65	5.69	6.48	4.20	3.52
19	3.92	8.24	5.22	6.25	5.72	5.45	5.39	5.19	5.06	5.94	6.26	3.52
20	3.96	8.35	4.92	6.07	5.62	5.34	5.17	12.90	4.62	6.20	5.29	3.38
21	4.90	8.92	.....	5.77	5.57	5.26	4.97	11.60	5.04	5.86	4.66	3.42
22	4.84	7.44	.....	5.49	5.92	5.20	4.82	8.66	4.84	5.62	7.78	3.54
23	4.70	7.06	.....	6.08	5.78	5.04	4.62	7.12	4.50	5.41	6.34	4.88
24	4.48	6.12	6.61	9.62	5.62	4.94	5.48	5.97	5.83	5.13	5.14	5.46
25	4.25	5.12	7.69	8.24	5.72	4.84	5.40	9.66	9.38	4.80	4.71	5.10
26	4.38	4.77	6.70	6.64	7.34	4.78	5.12	7.30	16.56	4.60	4.34	4.60
27	4.20	4.70	6.18	6.02	6.72	4.98	4.94	6.14	10.68	4.42	4.18	4.26
28	4.24	7.88	5.76	5.56	5.98	6.58	4.80	5.64	7.60	4.32	4.21	3.82
29	5.03	7.29	5.35	5.40	.....	6.74	4.96	5.26	5.88	4.26	4.18	3.87
30	6.43	6.34	5.18	5.25	.....	5.76	4.92	5.03	5.11	4.20	4.25	3.74
31	9.92	.....	6.06	5.08	.....	5.44	.....	4.86	.....	4.16	4.96	.....
1919-20.												
1	3.66	8.45	5.45	6.69	5.23	5.33	4.36	11.00	4.33	.....	4.40	3.76
2	3.46	15.67	5.03	6.88	4.91	5.51	4.54	8.90	4.20	4.22	4.32	3.73
3	3.28	7.55	4.91	5.37	4.70	6.17	4.37	6.04	4.34	6.90	4.25	3.68
4	3.46	5.27	4.57	5.32	7.70	6.75	4.72	5.39	6.74	7.78	4.42	3.65
5	3.38	4.03	4.41	5.04	7.55	8.36	4.26	5.15	12.21	6.08	4.29	3.60
6	3.49	4.07	5.51	4.56	6.27	7.69	5.99	4.84	8.00	5.64	4.20	4.02
7	3.35	4.34	18.11	4.77	5.80	6.13	7.68	4.55	6.91	7.05	4.34	4.04
8	3.22	4.17	8.86	6.16	5.55	5.80	7.20	4.40	5.56	7.12	5.23	3.82
9	3.20	3.73	7.57	12.77	5.40	5.31	6.43	4.49	5.18	6.84	4.49	3.72
10	3.20	3.45	7.93	8.49	7.79	5.38	5.46	4.62	4.70	5.38	4.38	4.00
11	3.68	4.52	6.70	6.47	7.05	5.50	4.85	4.22	4.58	5.14	4.39	4.22
12	4.20	4.61	6.13	5.73	5.88	6.00	5.06	5.45	4.30	5.48	5.14	4.22
13	5.12	3.77	8.79	5.25	5.75	11.35	6.67	8.94	4.63	5.22	6.52	4.16
14	7.59	3.47	15.17	4.75	5.75	9.32	5.49	6.64	7.78	5.12	5.92	4.10
15	13.22	3.79	8.85	4.55	5.80	6.67	5.27	5.86	5.76	5.08	4.92	4.06
16	9.81	3.56	6.70	4.99	5.75	6.25	5.36	5.58	5.46	4.96	4.49	3.82
17	10.50	3.39	6.09	7.90	5.50	9.20	7.55	5.28	5.76	4.84	4.30	3.78
18	7.58	3.27	5.61	6.56	5.61	6.70	7.70	5.08	5.65	4.50	4.15	3.73
19	5.88	3.61	5.39	5.97	5.59	12.13	7.16	4.68	4.92	4.44	4.08	3.63
20	5.00	3.49	5.40	5.93	5.50	11.08	8.40	5.08	5.45	4.35	4.20	3.57
21	4.97	3.47	5.33	10.16	5.88	7.75	14.61	5.15	6.18	4.30	3.99	3.52
22	6.20	3.78	5.25	10.70	10.07	6.58	8.66	4.93	6.01	4.24	4.16	3 46
23	7.16	4.29	5.22	17.79	7.68	6.01	6.73	4.64	5.73	4.08	4.52	3.37
24	6.68	4.59	6.02	12.63	6.92	5.64	5.89	4.82	5.38	4.72	4.88	3.54
25	5.82	6.36	6.11	8.60	5.85	5.45	5.21	6.68	5.32	16.16	4.79	3.66
26	5.68	13.15	6.07	6.59	5.94	5.33	6.11	5.48	5.15	10.78	4.49	3.60
27	9.41	11.11	5.59	6.11	5.77	5.02	5.73	5.00	4.87	6.04	4.16	3.48
28	7.10	7.77	5.49	5.75	5.15	4.92	5.56	4.78	4.64	5.72	4.08	3.72
29	5.50	6.21	5.37	5.35	5.05	4.68	5.33	4.56	4.39	5.64	3.94	3.50
30	4.50	5.70	5.19	4.95	.....	4.53	5.83	4.44	4.20	5.48	3.85	3.90
31	4.56	.....	5.14	4.42	.....	4.48	.....	4.38	.....	5.40	3.80	.....

NOTE.—Gage not read Dec. 21–23, 1918. Stage-discharge relation probably affected by ice during parts of December, 1919, January, 1920, and February, 1920.

22926—24—WSP 503——5

BUFFALO CREEK AT BARRACKVILLE, W. VA.

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

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

RECORDS AVAILABLE.—June 3, 1907, to December 31, 1908; May 8, 1915, to September 30, 1920.

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

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

CHANNEL AND CONTROL.—One channel at all stages; straight about 100 feet above and below station. Banks high. Stream bed rocky; some gravel. Control not permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 11.46 feet at 7 a. m. January 2 (discharge, about 5,120 second-feet); minimum stage, 0.55 foot October 5 (discharge, 0.5 second-foot).

Maximum stage recorded during the period October 1, 1919, to July 31, 1920, 10.04 feet at 6.40 a. m. November 26 (discharge, 4,260 second-feet); minimum, 0.90 foot at 3.35 p. m. October 5 (discharge, 4.5 second-feet).

1907–1908, 1915–1920: Maximum stage recorded, 14.22 feet January 22, 1917 (discharge, about 6,800 second-feet); no flow during greater part of September, October, and November, 1908.

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.—Discharge measurements made during 1920 indicate that the high water of January, 1919, probably changed the stage-discharge relation. Stage-discharge relation affected by ice during periods in winter of 1919–20. Rating curve used October 1, 1918, to January 1, 1919, fairly well defined between 100 second-feet and 400 second-feet; poorly defined below 100 second-feet and extended above 400 second-feet on basis of form of previous curve. Rating curve used January 2, 1919, to July 31, 1920, well defined below 1,600 second-feet; above 1,600 second-feet the curve is an extension. Discharge not determined for August and September, 1920, owing to change in stage-discharge relation on the afternoon of August 19. Data insufficient to determine new rating curve. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table, except for days when gage was not read and gage affected by ice. Records fair except those for periods of ice effect and for low stages in summer of 1919 which are poor owing to lack of discharge measurements.

Discharge measurements of Buffalo Creek at Barrackville, W. Va., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 10	Peterson and Bigwood	1.28	38
June 11	R. L. Bigwood	1.12	17.6

NOTE.—No discharge measurements were made during the year ending Sept. 30, 1919.

Daily discharge, in second-feet, of Buffalo Creek at Barrackville, W. Va., for the period Oct. 1, 1918, to July 31, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	1.4	176	68	2,530	41	234	68	105	34	44	7.2	21
2	1.0	67	68	3,340	35	167	60	79	20	29	6.5	32
3	.8	47	53	672	30	135	56	106	14	20	4.8	21
4	.7	43	48	245	35	99	55	87	11	14	4.5	14
5	.5	32	56	193	43	123	48	71	11	12	8.9	12
6	1.1	25	53	143	30	330	43	65	5.9	8.9	29	8.9
7	1.8	19	59	117	23	184	37	95	4.5	65	50	5.9
8	1.5	12	65	134	23	135	35	90	4.5	28	42	4.5
9	1.2	9.1	64	212	21	1,140	31	98	95	16	23	3.8
10	2.4	6.6	1,730	79	18	426	28	1,360	31	97	12	3.4
11	2.9	5.8	670	74	12	193	38	392	20	980	12	3.8
12	2.6	5.8	375	56	15	129	108	184	50	143	20	2.4
13	2.7	3.8	332	52	17	108	71	122	36	193	32	2.1
14	2.5	2.6	405	81	30	90	64	94	22	134	20	1.7
15	2.5	2.5	915	84	129	73	55	74	122	626	12	1.2
16	3.0	3.0	375	167	126	66	105	61	582	821	12	1.9
17	2.2	5.0	229	143	90	59	770	70	360	176	8.9	1.9
18	2.0	186	138	212	88	76	271	150	116	99	12	1.7
19	2.0	290	96	128	66	78	202	70	20	72	200	1.7
20	2.1	505	78	97	59	66	143	92	31	1,040	160	2.6
21	1.8	375	68	83	88	58	114	1,090	626	202	120	3.4
22	1.7	229	138	64	286	48	108	444	78	167	106	12
23	2.8	129	390	87	258	41	86	212	47	95	71	720
24	5.8	91	264	626	151	37	86	167	92	58	60	123
25	5.8	56	228	271	170	35	71	193	72	44	40	66
26	5.0	44	192	143	250	34	56	151	62	36	20	44
27	5.0	41	156	99	180	97	55	104	540	29	16	30
28	4.2	94	120	81	150	151	49	90	159	22	8.9	19
29	4.6	138	102	68	.....	98	43	76	74	22	5.9	14
30	26	91	81	52	.....	83	37	62	59	17	12	11
31	505	.....	91	49	.....	84	.....	48	.....	8.9	14	.....
1920.												
1	11	2,800	193			53	43	184	13	20	.....	.....
2	8.0	720	143			53	48	135	9.8	202	.....	.....
3	7.2	376	111			58	44	116	9.8	1,420	.....	.....
4	5.4	193	90		45	67	112	92	12	481	.....	.....
5	4.5	132	71			672	212	72	481	328	.....	.....
6	5.0	94	64			271	151	62	151	176	.....	.....
7	32	73	1,970			129	330	55	72	135	.....	.....
8		61	626	151		105	234	53	49	300	.....	.....
9		52	2,320	1,420		77	159	47	22	105	.....	.....
10	125	44	873	582		82	110	40	17	72	.....	.....
11		47	258	184	145	99	88	32	14	104	.....	.....
12	980	48	184	122		193	78	35	12	143	.....	.....
13	258	43	926	90		821	102	926	10	77	.....	.....
14	184	40	770	66		330	92	176	14	55	.....	.....
15	720	32	500	48		271	74	128	19	94	.....	.....
16	582	35	202	36		234	72	91	22	286	.....	.....
17	672	31	130	245		1,260	159	64	34	108	.....	.....
18	245	24	102	118		315	234	55	43	91	.....	.....
19	143	26	76	70		1,040	212	53	29	1,530	.....	.....
20	95	23		72		980	212	64	22	184	.....	.....
21	59	21		582	345	315	1,530	68	40	98	.....	.....
22	315	19		167	1,310	193	300	53	38	62	.....	.....
23	167	18		1,040	500	143	234	42	222	47	.....	.....
24	128	26		1,140	426	118	151	37	159	44	.....	.....
25	98	143	50	345	222	99	112	37	176	202	.....	.....
26	105	3,820		143	132	90	94	29	91	102	.....	.....
27	245	1,040		92	86	77	129	26	60	66	.....	.....
28	360	360		70	77	65	245	21	38	50	.....	.....
29	176	184		48	62	59	202	18	29	37	.....	.....
30	135	258		40	.....	52	135	14	23	27	.....	.....
31	139	.....		40	.....	44	.....	12	.....	21	.....	.....

NOTE.—Stage-discharge relation affected by ice Dec. 17, 1919, to Jan. 7, 1920, and Jan. 27 to Feb. 20, 1920. No gage reading Oct. 14–16, 18, 19, Dec. 25–27, 1918, Feb. 25–28, May 17, 18, 28–31, June 1, Aug. 19–21, Oct. 8–12, Dec. 7, 1919, Jan. 14–16, June 9–13, and July 5, 1920: discharge estimated by comparison with records for Monongahela and Tygart River stations, a study of weather records, and observer's notes. Gage heights published for August and September (see "Accuracy" paragraph).

Daily gage height, in feet, of Buffalo Creek at Barrackville, W. Va., for the period Aug. 1 to Sept. 30, 1920.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1	1.20	2.33	11	2.04	4.29	21	3.53	2.16
2	1.26	2.27	12	1.57	3.50	22	4.54	2.13
3	1.14	2.20	13	2.50	2.87	23	3.47	2.11
4	1.07	2.16	14	1.66	2.64	24	2.92	2.08
5	1.04	2.15	15	1.54	2.51	25	2.72	2.06
6	.99	.....	16	1.66	2.51	26	2.56	2.05
7	1.17	2.35	17	1.38	2.34	27	2.46	2.03
8	1.14	2.25	18	1.19	2.29	28	2.50	3.89
9	1.01	2.20	19	2.94	2.23	29	3.99	2.75
10	1.56	6.65	20	3.12	2.19	30	2.78	2.77
						31	2.41	.....

Monthly discharge of Buffalo Creek at Barrackville, W. Va., for the period Oct. 1, 1918, to July 31, 1920.

[Drainage area, 115 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	505	0.5	19.5	0.170	0.20
November	505	2.5	91.1	.792	.88
December	1,730	4.8	249	2.17	2.50
January	3,340	4.9	335	2.91	3.36
February	.....	1.2	88.0	.765	.80
March	1,140	3.4	151	1.31	1.51
April	770	2.8	99.8	.868	.97
May	1,360	4.8	197	1.71	1.97
June	626	4.5	113	.983	1.10
July	1,040	8.9	172	1.50	1.73
August	.....	4.5	37.1	.323	.37
September	720	1.2	39.7	.345	.38
The year	3,340	.5	133	1.16	15.77
1919–20.					
October	.....	4.5	205	1.78	2.05
November	3,820	18	359	3.12	3.48
December	2,320	.....	329	2.86	3.30
January	1,420	.....	233	2.03	2.34
February	1,310	.....	209	1.82	1.96
March	1,260	44	270	2.35	2.71
April	1,530	43	197	1.71	1.91
May	926	12	91.5	.796	.92
June	481	9.8	64.4	.560	.62
July	1,530	20	215	1.87	2.16

CHEAT RIVER NEAR PARSONS, W. VA.

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

DRAINAGE AREA.—716 square miles (determined by Hydro-Electric Co. of West Virginia).

RECORDS AVAILABLE.—January 1, 1913, to September 30, 1920.

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 ending September 30, 1919, 15.02 feet at 7 a. m. January 2 (discharge, about 31,200 second-feet); minimum discharge estimated, 110 second-feet September 20, 21, and 30.

Maximum stage recorded during the year ending September 30, 1920, 11.37 feet at 6 p. m. December 7 (discharge, about 19,500 second-feet); minimum stage, 1.90 feet at 6 p. m. September 19 (discharge, 90 second-feet).

1913–1920: Maximum stage recorded, 17.98 feet March 12, 1917 (discharge, about 40,000 second-feet); minimum stage, 1.52 feet September 6, 1917 (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 a day give correct basis for determining daily discharge.

ACCURACY.—Stage-discharge relation permanent; affected by ice for short periods during winter of 1919–20. Rating curve fairly well defined between 65 and 1,000 second-feet, and well defined between 1,000 and 5,500 second-feet; beyond these limits curve is an extension and may be considerably in error. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table except for periods of ice effect and when gage readings were considered in error. Records fair.

Discharge measurements of Cheat River near Parsons, W. Va., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 19	Peterson and Bigwood	3.47	1,120
June 19	B. L. Bigwood	3.47	1,100

NOTE.—No discharge measurements were made during year ending Sept. 30, 1919.

Daily discharge, in second-feet, of Cheat River near Parsons, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	305	5,100	1,560	13,500	750	4,190	1,150	1,000	295	900	760	285
2	300	3,170	1,150	26,600	800	3,170	760	1,630	420	715	520	231
3	276	2,050	1,050	14,100	900	2,050	850	1,370	450	555	420	199
4	253	1,560	950	10,400	590	1,770	1,100	1,100	420	420	366	175
5	215	1,250	850	5,880	590	1,770	850	950	372	300	295	250
6	290	1,050	760	4,020	520	4,370	590	760	330	253	715	200
7	305	850	950	2,510	485	2,830	850	590	290	290	805	190
8	171	715	1,310	1,630	590	2,670	900	1,200	384	195	630	190
9	138	590	1,700	1,310	850	2,200	850	3,510	354	152	485	210
10	187	590	12,300	1,050	630	2,200	760	6,970	280	378	348	200
11	300	520	13,800	850	390	2,050	805	5,100	244	3,170	384	150
12	440	450	9,100	715	520	1,310	1,630	3,340	195	2,200	450	179
13	630	420	4,020	670	520	900	1,250	2,670	144	850	315	191
14	555	390	3,510	485	850	900	1,050	2,050	195	1,300	555	152
15	378	366	2,830	390	950	950	1,000	1,440	342	1,500	390	124
16	305	336	2,350	320	760	1,000	1,100	1,250	1,910	14,400	305	120
17	235	354	2,050	330	520	1,050	1,560	1,910	2,050	7,200	258	120
18	191	630	1,700	520	630	1,910	1,700	1,770	1,560	2,830	231	130
19	141	1,500	1,500	4,910	520	2,050	1,500	1,500	1,150	1,910	248	150
20	163	1,700	1,150	2,830	590	1,440	1,310	1,310	900	6,520	179	110
21	630	1,440	805	1,100	670	950	1,050	1,910	715	6,740	262	110
22	520	1,150	1,200	1,200	1,310	760	900	2,050	555	4,730	342	200
23	450	805	4,300	1,000	3,000	850	850	1,500	372	3,850	342	400
24	366	630	3,400	6,520	2,200	850	2,050	1,250	384	1,910	390	700
25	1,000	590	2,400	2,830	1,910	715	1,910	1,630	1,000	1,250	276	1,000
26	1,370	520	1,560	1,560	3,680	555	1,050	1,500	2,050	850	203	500
27	1,000	384	1,370	1,100	2,350	850	900	1,100	2,350	630	179	200
28	760	1,000	1,250	950	1,500	2,670	805	805	2,050	555	203	152
29	950	3,680	1,560	1,100	.....	3,170	760	630	1,440	420	130	130
30	3,340	2,350	2,830	1,000	.....	2,350	715	485	1,050	330	138	110
31	6,520	.....	5,880	850	.....	1,630	.....	354	.....	420	175	.....
1919-20.												
1		1,560	1,400		1,000	1,050	760	10,900	390	354	420	590
2		8,860	1,400		1,000		760	6,970	342	485	520	520
3		7,660	630		590		630	4,910	320	1,770	485	485
4		4,370	590		555		670	4,020	1,050	2,830	450	342
5		3,170	715	390	485		850	3,340	2,830	1,770	390	215
6	210	2,050	950		450	1,790	1,050	2,510	2,200	900	420	171
7		1,310	19,300		420		1,150	1,910	1,370	760	485	148
8		715	11,700		354		1,250	1,370	1,000	760	450	124
9		520	6,970	15,900	290		1,370	950	715	590	280	127
10		384	5,100	8,860			1,700	670	590	485	253	195
11		450	4,190	5,290			1,500	555		805	390	271
12	520	1,050	3,340	3,170		4,190	1,310	715		1,200	555	240
13	1,310	950	2,670			12,900	3,000	2,500	680	900	805	203
14	2,350	630	8,140			5,880	1,700	9,350		555	670	155
15	6,090	520				3,680	1,370	6,740		590	715	117
16	2,050	485			620	2,670	1,560	3,680	1,500	850	1,150	102
17	1,630	420		680		11,700	2,510	2,050		850	1,770	134
18	1,200	366				8,860	3,170	1,150		630	2,670	108
19	1,100	336				16,500	3,680	1,050	620	485	3,340	93
20	900	276				10,900	3,850	1,250		520	3,850	108
21	670	248	2,530			5,480	14,700	1,370		520	3,170	124
22	1,700	350		6,740		3,680	7,900	1,370	1,560	485	2,350	152
23	2,670	350		14,100	4,020	2,670	8,380	1,050	1,440	450	2,670	134
24	4,550	305		15,000	3,680	1,700	7,900	850	1,150	450	1,630	124
25	3,680	450		9,100	3,170	1,440	6,300	760	900	5,290	1,250	148
26	2,200	9,100		4,910	2,670	1,500	4,730	1,000	715	3,340	1,000	227
27	4,550	5,100		3,680	2,350	2,200	4,730	760	520	670	850	342
28	3,850	2,670		3,170	1,770	2,050	4,910	590	450	590	805	1,050
29	2,200	1,400	390	2,670	1,370	1,370	4,370	555	390	520	715	1,500
30	1,250	1,400		2,050	.....	950	3,680	450	354	450	670	2,200
31	900	.....		1,370	.....	760	.....	420	.....	390	630	.....

NOTE.—Stage-discharge relation affected by ice Dec. 15, 1919, to Jan. 8, 1920, Jan. 13-21, Feb. 10-22, and Mar. 2-11, 1920. Gage heights considered in error owing to careless gage reading Oct. 11, 12, 25, Dec. 23-25, 1918, Jan. 22, 23, 27-31, Feb. 1-3, July 14, 15, Sept. 5-11, 16-27, 29, 30, Oct. 1-11, Nov. 22, 23, 29, 30, Dec. 1, 2, 1919, Mar. 31, Apr. 1, 2, 13, May 13, June 11-15, 17-21; discharge estimated by comparison with records of flow of Shavers Fork and study of weather records.

Monthly discharge of Cheat River near Parsons, W. Va., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 716 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	6,520	138	732	1.02	1.18
November	5,100	336	1,200	1.68	1.87
December	13,800	760	2,940	4.11	4.74
January	26,600	320	3,620	5 06	5.83
February	3.680	390	1,060	1.48	1.54
March	4,370	555	1,810	2.53	2.92
April	2,050	590	1,090	1.52	1.70
May	6,970	354	1,760	2.46	2.84
June	2,350	144	808	1.13	1.26
July	14,400	152	2,180	3.04	3.50
August	805	130	364	.508	.59
September	670	.....	235	.328	.37
The year	26,600	.....	1,490	2.08	28.34
1919–20.					
October	6,090	.....	1,540	2.15	2.48
November	8,860	248	1,920	2.68	2.99
December	19,300	.....	3,210	4.48	5.16
January	15,900	.....	3,400	4.75	5.48
February	1,020	.....	1,110	1.55	1.67
March	16,500	.....	3,870	5.41	6.24
April	14,700	630	3,380	4.72	5.27
May	10,900	420	2,440	3.41	3.93
June	2,830	320	876	1.22	1.36
July	5,290	354	1,010	1.41	1.63
August	3,850	253	1,160	1.62	1.87
September	2.200	93	348	.486	.54
The year	19,300	93	2,030	2.84	38.62

CHEAT RIVER AT ROWLESBURG, W. VA.

LOCATION.—At Baltimore & Ohio Railroad bridge at Rowlesburg, Preston County, 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, 1920. 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 bridge.

CHANNEL AND CONTROL.—Channel 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 ending September 30, 1919, 11.2 feet January 2; minimum stage 1.9 feet September 19–21.

Maximum stage recorded during year ending September 30, 1920, 9.6 feet at 2 p. m. December 7; minimum stage, 1.9 feet October 6.

1912–1920: Maximum stage recorded, 14.7 feet at 5 p. m. March 12, 1917; minimum stage, 1.4 feet October 6–8, 1914.

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

ICE.—Stage-discharge relation affected by ice during severe winters.
ACCURACY.—Rating curve not developed. Gage read to tenths daily in the morning. Records fair.
COOPERATION.—Gage-height record furnished by the United States Weather Bureau.

Discharge measurements of Cheat River at Rowlesburg, W. Va., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 6	Peterson and Bigwood	3.45	1,660
6	do	3.41	1,560
June 10	B. L. Bigwood	3.00	987

NOTE.—No discharge measurements were made during year ending Sept. 30, 1919.

Daily gage height, in feet, of Cheat River at Rowlesburg, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	2.5	6.1	3.8	8.4	3.1	4.2	3.6	2.9	2.8	2.9	2.6	2.4
2	2.4	4.9	3.6	11.2	2.9	5.1	3.3	3.5	2.9	2.7	2.6	2.4
3	2.1	4.2	3.4	7.5	2.7	4.3	3.3	3.9	3.1	2.6	2.9	2.4
4	2.3	3.8	3.3	5.5	2.9	3.9	3.3	3.6	2.9	2.5	2.7	2.3
5	2.2	3.6	3.2	4.2	3.1	3.7	3.4	3.4	2.7	2.4	2.7	2.2
6	2.4	3.4	3.0	4.2	3.0	4.5	3.4	3.3	2.6	2.4	2.5	2.2
7	2.4	3.2	3.1	4.1	2.9	4.7	3.4	3.2	2.5	2.3	3.3	2.1
8	2.4	3.1	3.1	3.9	2.8	4.2	3.2	3.3	3.6	2.3	3.4	2.1
9	2.3	2.9	3.7	3.7	2.8	3.9	3.2	3.8	2.7	2.4	2.9	2.1
10	2.4	2.9	8.6	3.7	2.8	4.6	3.1	5.9	2.7	2.4	2.7	2.1
11	2.5	2.8	7.6	3.7	2.6	4.3	3.0	6.4	2.5	2.7	2.5	2.3
12	2.4	2.7	7.5	3.7	2.6	3.9	3.2	5.4	2.6	3.9	2.4	2.2
13	2.6	2.6	5.5	3.7	2.6	3.7	3.8	4.6	2.4	3.2	2.5	2.1
14	2.5	2.6	4.8	3.7	2.8	3.5	3.4	4.1	2.4	2.9	2.5	2.2
15	2.7	2.6	4.9	3.7	3.3	3.4	3.3	3.9	2.4	3.2	2.7	2.2
16	2.5	2.6	5.2	3.7	3.5	3.3	3.2	3.7	2.6	5.0	2.6	2.1
17	2.5	2.5	4.5	3.7	3.1	3.3	3.6	3.5	3.6	6.9	2.5	2.0
18	2.5	2.8	4.1	4.2	3.0	3.5	4.3	4.2	4.4	4.7	2.4	2.2
19	2.3	3.4	3.8	5.5	2.9	4.3	3.9	3.9	3.5	3.9	2.3	1.9
20	2.3	4.2	3.5	4.7	2.8	3.9	3.7	3.7	3.1	3.9	2.4	1.9
21	2.4	4.6	3.4	4.2	3.0	3.7	3.6	4.2	3.0	7.3	2.4	1.9
22	2.9	4.0	3.4	3.9	3.8	3.4	3.4	4.4	2.9	5.2	2.4	2.0
23	2.8	3.6	5.9	3.7	4.6	3.4	3.3	4.1	2.8	4.4	2.3	2.1
24	2.6	3.3	4.9	6.0	4.5	3.2	3.3	3.8	2.7	4.4	2.6	2.4
25	2.6	3.2	5.0	5.4	4.0	3.1	4.1	3.7	2.6	3.7	2.5	2.9
26	2.6	3.0	4.9	3.5	4.6	3.1	3.7	3.9	2.6	3.3	2.4	2.6
27	2.3	2.8	4.3	4.1	5.0	3.0	3.4	3.5	3.5	3.1	2.2	2.4
28	3.0	2.8	3.9	3.7	4.3	4.4	3.3	3.4	4.0	2.9	2.2	2.4
29	2.9	4.6	3.7	3.5	.....	4.4	3.2	3.3	3.7	2.8	2.4	2.3
30	2.9	4.4	3.4	3.3	.....	3.9	3.2	3.1	3.2	2.8	2.3	2.2
31	6.4	.....	3.3	3.2	.....	3.8	.....	3.0	.....	2.7	2.3	.....
1919–20.												
1	2.0	4.0	3.8	3.6	3.3	3.3	3.2	5.6	2.6	2.6	2.7	2.8
2	2.1	7.5	3.5	3.6	3.1	3.2	3.2	5.5	2.6	2.6	2.8	2.8
3	2.0	6.0	3.4	3.6	3.1	3.1	3.5	4.5	2.5	3.2	2.8	2.7
4	2.0	4.8	3.2	3.6	2.9	3.4	3.6	4.0	2.5	4.1	2.6	2.6
5	2.0	4.1	3.0	3.6	3.2	4.2	3.7	3.7	3.5	3.7	2.6	2.6
6	1.9	3.8	3.0	3.6	3.2	5.6	4.6	3.4	5.1	3.6	2.5	2.5
7	2.1	3.5	9.0	3.6	3.0	4.4	4.3	3.3	4.1	2.9	2.7	2.5
8	2.0	3.3	7.7	3.6	2.8	3.8	4.1	3.2	3.5	3.0	2.8	2.5
9	2.3	3.2	5.5	7.2	2.8	3.6	3.9	3.1	3.2	3.0	2.7	2.4
10	2.2	3.0	4.8	7.9	2.9	3.6	3.9	3.1	3.0	2.8	2.6	2.6
11	2.1	3.0	4.7	5.6	4.2	3.4	4.3	2.9	2.8	2.8	2.6	2.9
12	2.3	2.9	4.2	4.5	4.0	4.4	4.1	2.8	2.7	3.3	2.6	3.0
13	3.2	2.9	4.0	3.9	3.8	7.9	4.2	3.5	2.7	3.3	3.0	2.7
14	3.5	2.9	7.5	3.5	3.5	6.6	4.7	5.5	2.6	3.0	3.0	2.7
15	5.8	2.9	5.7	3.4	3.5	5.2	4.0	4.7	2.7	2.9	2.9	2.7
16	5.0	2.9	4.7	3.4	3.5	4.9	3.8	4.1	2.9	3.0	2.9	2.6
17	4.8	2.8	4.2	4.3	3.5	7.5	3.8	3.7	3.6	3.1	3.0	2.5
18	4.4	2.8	3.9	3.6	3.7	6.1	4.8	3.5	4.0	2.9	2.9	2.4
19	3.8	2.7	5.0	3.2	3.7	5.1	4.5	3.4	3.7	2.8	3.2	2.4
20	3.3	2.6	4.2	3.3	3.7	9.1	4.0	3.3	3.1	2.8	4.2	2.4
21	3.2	2.6	4.2	3.9	3.7	6.3	7.5	3.5	3.1	2.7	4.0	2.4
22	3.4	2.5	4.2	6.4	4.7	5.3	6.7	3.7	3.6	2.7	3.5	2.3
23	4.4	2.5	4.2	8.3	5.8	4.8	5.2	3.6	3.4	2.6	3.9	2.3
24	5.4	2.8	4.2	9.3	6.5	4.4	4.7	3.3	3.4	2.5	3.7	2.3
25	5.1	2.7	4.2	8.0	5.5	4.0	4.2	3.2	3.2	5.5	3.4	2.3
26	4.3	4.9	4.2	5.7	4.5	4.0	3.9	3.0	3.0	4.2	3.1	2.3
27	4.3	6.3	3.8	4.7	3.8	3.9	3.8	3.1	2.9	3.5	2.9	2.3
28	5.2	5.0	3.8	4.2	3.5	3.9	4.4	2.9	2.8	3.1	2.9	2.5
29	4.1	4.3	3.8	3.9	3.3	3.6	4.4	2.9	2.7	2.9	3.0	3.3
30	3.7	4.0	3.8	3.6	.....	3.5	3.9	2.8	2.6	2.8	3.0	3.0
31	3.4	.....	3.8	3.5	.....	3.3	.....	2.7	.....	2.7	3.0	.....

NOTE.—Stage-discharge relation probably affected by ice Dec. 20, 1919, to Jan. 8, 1920, and Feb. 16–22, 1920.

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, 1920.

GAGE.—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 ending September 30, 1919, 8.55 feet at 4 p. m. January 1 (discharge, 9,060 second-feet): minimum stage, 2.70 feet at 8 a. m. and 7.30 p. m. September 20 (discharge, 40 second-feet).

Maximum stage recorded during year ending September 30, 1920, 8.70 feet at 4.30 p. m. December 7 (discharge, 9,420 second-feet); minimum stage, 2.70 feet September 22, 23, 24, 26, and 27 (discharge, 40 second-feet).

1910–1920: Maximum stage recorded, 9.90 feet January 30, 1912, and March 12, 1917 (discharge, 12,300 second-feet); minimum discharge recorded, 1 second-foot October 1, 1914 (gage height, 2 feet). High waters of 1888 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.—Flow at low stages may be affected by storage of water at pulp mill dam about three-fourths mile above station.

ACCURACY.—Change in stage-discharge relation indicated by discharge measurements made in 1920 assumed to have been caused by the high water in December, 1918, and January, 1919; also affected by ice. Rating curves used October 1, 1918, to December 31, 1918, and January 1, 1919, to September 30, 1920, well defined between 40 and 10,000 second-feet; extended beyond these limits. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table except for periods of ice effect and for days when gage was not read. Records fair.

Discharge measurements of Shavers Fork at Parsons, W. Va., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 19	Peterson and Bigwood	3.63	390
June 18	B. L. Bigwood	3.42	266
19	....do	3.30	196

NOTE.—No discharge measurements were made during the year ending Sept. 30, 1919.

Daily discharge, in second-feet, of Shavers Fork at Parsons, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	123	2,360	295	7,260	300	1,930	440	520	198	236	222	222
2	104	1,930	440	5,070	300	1,020	365	700	245	124	245	158
3	104	1,930	440	4,280	440	700	245	520	236	124	198	141
4	99	652	440	1,720	272	624	300	520	158	98	212	98
5	80	440	295	700	245	605	440	313	158	98	226	158
6	104	246	225	800	245	1,720	440	245	141	98	240	76
7	104	281	365		245	1,660	365	256	98	98	222	98
8	104	225	440		229	700	365	300	98	94	245	111
9	97	225	700		212	520	272	440	141	94	245	124
10	80	225	5,890		195	520	245	1,790	111	119	198	66
11	225	295	3,350		178	700	313	1,260	111	98	245	106
12	225	199	2,220	320	198	624	365	605	98	87	222	66
13	173	135	2,830		198	520	365	800	76	98	158	98
14	173	135	2,510		365	520	440	700	87	605	158	98
15	154	143	1,930		300	365	365	700	87	624	158	98
16	80	150	1,720		245	365	440	520	520	3,900	178	76
17	80	295	1,520		198	365	605	520	402	2,510	198	76
18	80	183	700	300	158	852	652	480	300	1,260	158	98
19	67	225	520	365	158	605	605	605	198	700	144	98
20	61	1,080	480	562	198	300	562	700	158	3,530	158	40
21	104	905	440	652	272	605	440	800	124	1,930	144	76
22	80	905	700	700	300	520	365	905	124	1,200	124	98
23	110	295	2,220	605	300	520	365	605	158	700	158	158
24	135	295	1,930	3,000	440	365	480	562	158	440	150	272
25	605	295	1,590	1,390	520	313	365	440	158	300	141	440
26	905	150	800	700	852	300	300	520	624	245	141	158
27	700	104	652	652	1,320	605	300	681	520	198	158	98
28	602	135	562	605	700	1,520	300	425	1,520	289	108	124
29	504	1,660	440	652	.....	1,200	289	352	960	245	98	103
30	1,460	800	365	440	.....	700	365	245	504	182	98	76
31	3,530	.....	605	245	.....	700	.....	245	.....	245	141	.....
1919–20.												
1	98	3,530	700		198		440	504	245	98	131	124
2	98	4,670	571		198		480	700	222	94	124	119
3	76	1,390	300				365	562	245	198	124	98
4	111	1,140	272				365	440	440	1,720	119	124
5	98	300	272	80			520	410	1,020	425	108	124
6	48	520	1,460			250	480	300	700	365	106	111
7	76	425	7,260				480	272	496	300	106	87
8	98	245	3,530				562	300	365	272	111	68
9	124	198	1,140	3,710			624	300	245	178	98	62
10	158	222	700	2,670			605	245	222	158	106	76
11	158	245	605	2,360			605	256	158	500	111	98
12	178	236	1,260	1,390			440	605	178	905	250	98
13	1,140	245	2,220	365	210	7,260	1,790	1,790	170	440	350	144
14	1,590	222	2,670			4,870	1,200	2,220	158	245	131	98
15	2,220	178	1,790			1,520	905	1,660	480	236	108	87
16	1,520	198	1,140			1,930	700	1,260	365	537	339	76
17	605	222	852			4,670	1,590	440	300	278	272	68
18	520	178		200		4,470	1,020	425	272	158	217	56
19	520	158				5,890	852	418	198	158	562	83
20	440	124				5,470	1,590	554	158	158	1,140	83
21	520	158				1,930	4,870	520	207	158	905	56
22	1,720	272	250	2,830		1,520	4,280	440	352	158	562	48
23	1,660	272		5,470		634	3,170	388	365	134	1,140	40
24	2,220	166		5,070	2,070	605	2,510	365	289	222	700	40
25	1,260	402		1,930	1,020	562	1,930	440	194	1,080	456	48
26	1,320	2,220		1,140	700	562	1,080	267	174	750	352	40
27	1,260	1,930		700	520	520	750	245	222	380	256	40
28	1,020	1,520		365	250	520	905	212	119	245	207	245
29	800	1,390	80	272	250	605	700	207	103	178	198	300
30	300	1,020		245	.....	440	520	245	98	144	182	440
31	700	.....		198	.....	402	.....	222	.....	111	158	.....

NOTE.—Stage-discharge relation affected by ice Jan. 7–17, Feb. 8–10, Dec. 18, 1919, to Jan. 8, 1920, Jan. 14–21, Feb. 3–23, 28, 29, and Mar. 1–12, 1920; discharge estimated from study of weather records, observer's notes, and comparison with Cheat River at Parsons. Discharge interpolated Oct. 28, 1918, Aug. 4, 5, and 24, 1919; no gage readings. Discharge estimated by comparison with records for Cheat River near Parsons for July 11, Aug. 12 and 13, 1920; no gage readings.

Monthly discharge of Shavers Fork at Parsons, W. Va., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 210 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918-19.					
October	3,530	61	357	1.70	1.96
November	2,360	104	563	2.68	2.94
December	5,890	225	1,210	5.76	6.64
January	7,260	.....	1,100	5.24	6.04
February	1,320	158	342	1.63	1.70
March	1,930	300	728	3.47	4.00
April	652	245	392	1.87	2.09
May	1,790	245	589	2.80	3.23
June	1,520	76	282	1.34	1.50
July	3,900	87	664	3.16	3.64
August	245	98	177	.843	.97
September	440	40	124	.590	.66
The year	7,260	40	549	2.61	35.42
1919-20.					
October	2,220	48	731	3.48	4.01
November	4,670	124	800	3.81	4.25
December	7,260	.....	955	4.55	5.25
January	5,470	.....	999	4.76	5.49
February	2,070	.....	332	1.58	1.70
March	7,260	.....	1,530	7.29	8.40
April	4,870	365	1,210	5.76	6.43
May	2,220	207	555	2.64	3.04
June	1,020	98	292	1.39	1.55
July	1,720	94	354	1.69	1.95
August	1,140	98	314	1.50	1.73
September	440	40	106	.505	.56
The year	7,260	40	684	3.26	44.36

YOUGHIOGHENY RIVER AT CONNELLSVILLE, PA.

LOCATION.—At two-span steel highway bridge between New Haven and Connellsville, Fayette County.

DRAINAGE AREA.—1,320 square miles.

RECORDS AVAILABLE.—July 22, 1908, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to downstream side of bridge; read by P. M. Rulli. Elevation of gage zero 860.13 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Bed composed of gravel and rocks. Control is at a riffle about 500 feet below gage, where bed is rock formation; permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 11.51 feet at 1 p. m. January 1 (discharge, 27,700 second-feet); minimum stage, 0.80 foot at 5 p. m. September 21 (discharge, 180 second-feet).

Maximum open-water stage recorded during the year ending September 30, 1920, determined from levels, 12.13 feet at 10 a. m. March 13 (discharge, 30,000 second-feet); a stage of 15.0 feet was observed at 10 a. m. January 9, but the water was held back by an ice jam; minimum stage, 0.90 foot at 5 p. m. September 26 (discharge, 220 second-feet).

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

ACCURACY.—Stage-discharge relation permanent except as affected by ice during winter of 1919–20. Rating curve fairly well defined below 1,000 second-feet and well defined from 1,000 to 30,000 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

Discharge measurements of Youghiogheny River at Connellsville, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*
July 20	J. M. Snavely	1.87	781
1920.			
Jan. 30	B. A. Knight	[a] 3.20	2,720
May 25	R. J. Ferris	2.65	1,570

[a] Measurement made through complete ice cover.

Daily discharge, in second-feet, of Youghiogheny River at Connellsville, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	270	4,290	1,050	17,300	1,100	.....	.....	.....	.....	.....	605	1,050
2	270	3,570	1,000	21,300	1,000	.....	.....	.....	.....	.....	470	750
3	270	2,300	960	11,400	915	.....	.....	.....	.....	.....	440	605
4	188	1,870	1,050	8,900	870	.....	.....	.....	.....	.....	380	500
5	188	1,610	1,200	6,230	675	.....	.....	.....	.....	.....	380	470
6	270	1,260	1,100	3,920	535	.....	.....	.....	.....	.....	570	380
7	352	960	1,050	2,900	500	.....	.....	.....	.....	.....	2,450	380
8	500	710	915	2,100	500	.....	.....	.....	.....	.....	2,150	298
9	640	570	790	2,100	470	.....	.....	.....	.....	.....	1,320	260
10	605	535	1,200	2,100	410	.....	.....	.....	.....	.....	960	470
11	470	352	6,230	2,150	410	.....	.....	.....	.....	.....	675	790
12	500	298	12,100	2,300	410	.....	.....	.....	.....	.....	570	960
13	500	230	11,800	2,300	915	.....	.....	.....	.....	.....	570	870
14	535	188	9,500	2,450	2,010	.....	.....	.....	.....	.....	710	640
15	440	230	9,200	2,910	1,740	.....	.....	.....	.....	.....	915	470
16	352	352	8,900	3,070	1,200	.....	.....	.....	.....	.....	675	410
17	270	380	8,610	3,570	790	.....	.....	.....	.....	.....	790	352
18	230	870	7,500	4,100	535	.....	.....	.....	.....	.....	1,150	325
19	196	2,450	6,470	3,740	500	.....	.....	.....	.....	.....	830	270
20	240	3,570	5,320	3,400	640	.....	.....	.....	.....	.....	570	260
21	410	3,920	4,890	2,910	.....	.....	.....	.....	.....	710	570	188
22	380	3,740	6,970	2,300	.....	.....	.....	.....	.....	1,100	4,890	270
23	325	3,230	11,800	3,070	.....	.....	.....	.....	.....	710	2,450	1,870
24	325	2,450	11,800	7,770	.....	.....	.....	.....	.....	750	1,740	1,200
25	352	1,740	10,800	5,540	.....	.....	.....	.....	.....	570	1,200	830
26	270	1,430	8,900	4,890	.....	.....	.....	.....	.....	410	870	570
27	270	1,320	6,230	3,740	.....	.....	.....	.....	.....	352	710	440
28	255	1,200	5,320	2,450	.....	.....	.....	.....	.....	270	605	352
29	352	1,150	4,890	2,010	.....	.....	.....	.....	.....	1,870	535	325
30	710	1,150	4,480	1,870	.....	.....	.....	.....	.....	1,490	500	260
31	3,740	.....	5,320	1,370	.....	.....	.....	.....	.....	790	1,430	.....

Daily discharge, in second-feet, of Youghiogheny River at Connellsville, Pa., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	270	11,400	4,290	650	2,000	1,500	1,610	8,040	870	1,200	2,150	1,050
2	470	17,300	3,570	650	2,000	1,400	1,740	6,000	750	1,150	2,750	830
3	410	10,800	2,600	650	2,000	1,500	2,150	4,480	710	2,450	1,490	640
4	325	6,230	2,010	650	3,000	1,900	1,870	3,570	750	2,910	960	500
5	298	4,480	1,610	650	3,400	2,800	4,480	2,750	2,150	1,870	710	440
6	410	3,400	1,870	700	2,910	5,000	4,890	2,450	4,480	1,260	640	440
7	1,200	2,750	7,770	800	2,450	5,500	4,100	2,010	2,750	1,370	2,450	500
8	1,050	2,150	9,200	900	1,870	4,290	3,740	1,870	2,150	1,150	1,870	500
9	710	1,870	7,770	2,200	1,870	3,570	3,230	1,610	1,870	960	1,150	440
10	640	1,610	8,040	6,500	2,150	3,920	3,400	1,320	1,490	830	1,490	790
11	605	1,610	5,540	7,230	2,910	7,230	3,570	1,150	1,260	750	1,610	1,320
12	1,050	1,870	4,290	4,680	2,910	13,400	3,230	1,200	1,050	1,200	1,430	1,260
13	2,450	1,870	4,890	3,400	2,750	22,400	4,100	6,720	915	1,100	3,740	830
14	1,870	1,740	9,810	2,600	2,300	12,800	4,100	6,000	1,000	830	3,570	605
15	3,740	1,490	6,970	1,430	1,900	8,320	3,400	3,920	960	750	2,010	570
16	5,540	1,320	4,680	1,300	1,500	9,500	3,070	2,910	1,870	2,150	1,870	500
17	6,230	1,150	3,200	1,200	1,300	17,800	3,570	2,450	24,300	1,740	2,010	440
18	5,100	1,150	2,400	1,100	1,200	12,100	4,480	2,010	19,100	1,050	1,370	380
19	3,230	1,150	1,900	1,100	1,200	8,610	4,890	1,870	9,200	830	1,150	325
20	2,300	1,000	1,500	1,200	1,200	12,800	5,320	2,300	5,320	750	1,260	325
21	1,610	915	1,300	1,300	1,300	9,500	9,500	2,450	5,320	710	1,260	325
22	2,010	870	1,200	1,700	1,600	7,230	8,900	2,300	4,480	605	1,490	298
23	2,750	870	1,100	2,800	2,910	5,770	6,470	2,010	3,740	500	2,300	298
24	2,750	915	1,000	4,400	5,320	5,100	5,320	1,610	3,570	750	1,740	260
25	2,910	1,610	950	6,970	4,480	4,680	4,290	1,610	6,000	3,740	1,260	270
26	2,450	19,800	900	3,920	3,070	4,290	3,400	1,490	3,740	3,070	1,000	230
27	3,400	20,500	850	3,230	2,400	3,920	3,570	1,320	2,450	1,740	870	270
28	4,890	10,100	850	3,070	1,700	3,070	5,770	1,100	1,870	1,150	790	1,430
29	3,920	6,470	800	2,600	1,600	2,600	5,100	1,050	1,610	870	1,150	1,260
30	2,910	5,540	750	2,400	.....	2,150	4,100	870	1,260	710	960	870
31	3,070	.....	700	2,200	.....	1,870	.....	830	.....	870	830	.....

NOTE.—Discharge estimated because of ice Jan. 7–10, Dec. 17–31, 1919, Jan. 1–7, 22–24, 30, 31, Feb. 1, 15–21, 27–29, Mar. 1–3, 1920, from discharge measurements and from study of weather records and gage-height graph. Gage readings Feb. 21 to July 20, 1919, not reliable.

Monthly discharge of Youghiogheny River at Connellsville, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,320 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	3,740	188	473	0.358	0.41
November	4,290	188	1,600	1.21	1.35
December	12,100	790	5,720	4.33	4.99
January	21,300	1,370	4,710	3.57	4.12
August	4,890	380	1,050	.800	.92
September	1,870	188	560	.424	.47
1919–20.					
October	6,230	270	2,280	1.73	1.99
November	20,500	870	4,800	3.64	4.06
December	9,810	700	3,360	2.55	2.94
January	7,230	650	2,390	1.81	2.09
February	5,320	1,200	2,320	1.76	1.90
March	22,400	1,400	6,660	5.05	5.82
April	9,500	1,610	4,240	3.21	3.58
May	8,040	830	2,620	1.98	2.28
June	24,300	710	3,900	2.95	3.29
July	3,740	500	1,320	1.00	1.15
August	3,740	640	1,590	1.20	1.38
September	1,430	230	605	.458	.51
The year	24,300	230	3,010	2.28	30.99

LAUREL HILL CREEK AT URSINA, PA.

LOCATION.—At two-span steel highway bridge at Ursina, Somerset County.

DRAINAGE AREA.—122 square miles.

RECORDS AVAILABLE.—August 12, 1913, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to upstream side of bridge; read by Miss Lizzie R. Case.

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

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Bed composed of gravel and boulders. Control is at a riffle, where the bed is composed of gravel and boulders, a short distance below the gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 6.10 feet at 8 a. m. January 2 (discharge from extension of rating curve, 4,000 second-feet); minimum stage, 1.25 feet February 15 (discharge, 1 second-foot).

Maximum stage during the year ending September 30, 1920, estimated from hydrograph, 7.2 feet at 5 a. m. June 17 (discharge, about 5,200 second-feet); minimum open-water stage, 1.80 feet on September 6 (discharge, 25 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year, except as affected by ice. Rating curve well defined below 2,400 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Laurel Hill Creek at Ursina, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Aug. 9	H. L. Landis	2.03	67	Apr. 13	R. J. Ferris	3.00	595
				May 26	J. M. Snavely	2.34	160
1920.							
Jan. 31	B. A. Knight	a 3.49	248				

a Measurement made through complete ice cover.

Daily discharge, in second-feet, of Laurel Hill Creek at Ursina, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	12	544	134	1,950	154	577	154	238	82	8	116	157
2	24	284	134	3,460	215	512	116	388	82	8	42	146
3	12	260	173	1,130	116	512	116	260	54	8	42	98
4	12	134	173	750	134	645	154	215	54	8	33	85
5	18	116	173	417	98	134	116	194	67	8	42	73
6	116	98	173	142	82	173	134	260	54	8	154	62
7	134	98	173	127	24	116	116	308	54	5	194	59
8	82	82	215	134	8	116	98	715	82	4	134	54
9	33	67	308	134	4	238	82	680	82	42	54	52
10	24	67	785	134	1	388	54	1,510	54	82	62	105
11	33	33	750	134	1	360	116	970	54	18	47	173
12	33	42	715	134	1	194	173	785	42	18	42	242
13	33	33	970	173	1	194	194	512	33	18	79	154
14	24	24	820	173	1	260	116	448	33	18	79	105
15	24	42	890	173	1	238	154	388	42	194	142	73
16	12	33	715	215	8	308	215	388	42	680	64	70
17	12	98	308	215	98	284	238	388	33	238	206	67
18	24	284	260	334	18	238	215	360	18	67	116	62
19	24	448	215	360	5	260	194	284	18	18	85	52
20	67	645	173	308	5	215	194	360	24	54	92	44
21	42	970	173	116	82	215	238	820	33	54	85	47
22	42	512	308	173	260	173	173	610	18	12	970	134
23	42	388	680	334	334	154	154	645	18	8	388	334
24	33	308	645	512	260	173	284	544	8	18	242	190
25	42	360	890	308	308	134	238	417	18	12	190	112
26	42	215	479	238	577	134	215	388	33	18	157	85
27	67	173	417	215	680	134	154	284	67	8	130	52
28	82	215	360	260	360	173	134	238	24	54	102	47
29	98	215	360	154	.....	154	134	173	18	360	88	35
30	116	173	260	173	.....	134	134	154	12	134	92	47
31	970	.....	260	194	.....	134	.....	116	.....	82	228	.....
1919-20.												
1	75	1,730	396	50	280	300	172	980	85	88	650	91
2	65	2,190	272	40	300	360	240	790	70	159	550	75
3	52	1,200	225	40	360	550	190	550	65	294	278	56
4	44	755	195	26	420	1,300	230	446	139	132	186	44
5	34	537	181	26	420	3,000	518	360	465	97	143	44
6	154	136	177	40	420	1,300	472	289	439	91	195	25
7	306	306	465	85	420	700	414	220	300	215	755	48
8	177	225	790	518	420	498	378	195	225	129	336	40
9	186	215	1,020	1,120	420	240	342	168	342	112	210	37
10	132	181	1,840	1,160	400	485	348	146	190	78	225	80
11	118	215	720	755	360	900	372	136	177	122	177	172
12	420	256	366	433	340	2,310	354	240	122	129	177	129
13	177	300	615	306	300	3,260	615	1,340	139	94	324	91
14	245	215	980	200	300	1,160	485	685	143	100	143	85
15	582	195	650	150	280	755	408	452	168	97	177	80
16	582	195	478	130	240	1,120	360	348	582	75	168	91
17	825	136	342	110	240	2,190	524	289	4,160	52	115	40
18	550	100	256	110	240	1,120	518	245	2,440	60	103	36
19	384	97	150	110	240	900	446	283	1,070	85	100	37
20	300	106	85	110	240	790	511	215	615	82	115	48
21	210	112	60	130	240	790	862	267	650	62	97	40
22	300	109	60	150	240	755	755	294	459	48	103	42
23	336	109	60	150	240	650	615	240	360	44	115	34
24	426	103	85	150	240	615	550	210	360	537	75	48
25	300	372	85	150	240	582	402	132	498	256	72	48
26	300	2,980	85	170	240	582	354	146	278	168	60	44
27	504	2,440	85	200	240	342	433	139	225	100	52	48
28	755	980	85	200	240	378	582	136	163	88	150	240
29	685	720	85	200	240	284	550	122	132	78	97	136
30	446	582	70	200	.....	220	685	91	100	70	65	150
31	582	.....	60	240	.....	210	.....	91	.....	126	91	.....

NOTE.—Discharge Jan. 6–11, Feb. 7, 9–15, 18–20, 1919, Dec. 19, 1919, to Jan. 6, 1920, and Jan. 14 to Mar. 5, 1920, estimated, because of ice, from study of weather records, discharge measurements, and gage-height graph. Discharge Apr. 20, 1919, estimated from gage-height graph.

Monthly discharge of Laurel Hill Creek at Ursina, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 122 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	970	12	75	0.615	0.71
November	970	24	232	1.90	2.12
December	970	134	422	3.46	3.99
January	3,400	116	426	3.49	4.02
February	680	1	137	1.12	1.17
March	577	116	248	2.03	2.34
April	284	54	160	1.31	1.46
May	1,510	116	453	3.72	4.29
June	82	8	42	.344	.38
July	680	4	73	.598	.69
August	970	33	144	1.18	1.36
September	334	35	101	.828	.92
The year	3,400	1	211	1.74	23.45
1919–20.					
October	825	34	331	2.71	3.11
November	2,980	97	593	4.86	5.42
December	1,840	60	356	2.92	3.37
January	1,160	26	241	1.98	2.28
February	420	240	303	2.48	2.68
March	3,260	210	924	7.57	8.73
April	862	172	456	3.73	4.16
May	1,340	91	330	2.70	3.11
June	4,160	65	505	4.14	4.62
July	537	44	125	1.02	1.18
August	650	52	197	1.61	1.86
September	240	25	72.6	.595	.66
The year	4,160	25	369	3.02	41.18

CHARTIERS CREEK BASIN.

CHARTIERS CREEK AT CARNEGIE, PA.

LOCATION.—At single-span steel railroad bridge on siding of Chartiers branch of Pittsburgh, Cincinnati, Chicago & St. Louis Railroad at Carnegie, Allegheny County.

DRAINAGE AREA.—260 square miles.

RECORDS AVAILABLE.—June 5, 1915, to September 30, 1920. Records prior to October 1, 1919, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to upstream side of bridge; read by Richard Musiol.

DISCHARGE MEASUREMENTS.—Made from upstream side of railroad bridge, branch line, about 100 feet above the gage.

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Bed composed of mud and slag over a rocky floor. Control is at the first of a series of riffles about 600 feet below gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1920, 16.1 feet at 9 a. m. June 17 (discharge, not determined); minimum stage, 1.60 feet at 4 p. m. September 25 (discharge, 61 second-feet).

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

ACCURACY.—Stage-discharge relation practically permanent throughout the year, except as affected by ice. Rating curve fairly well defined below 2,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records fair.

Discharge measurements of Chartiers Creek at Carnegie, Pa., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 28	B. A. Knight	3.23	420	Apr. 17	J. M. Snavely	4.20	875
Mar. 20	J. M. Snavely	4.87	1,250	17	....do	4.41	983
Apr. 16	.....do	2.58	224	Sept. 1	H. L. Landis	[a]2.06	87.2
16	.....do	2.98	293	1	.....do	2.02	88.5

[a] Made by wading 300 feet below gage.

Daily discharge, in second-feet, of Chartiers Creek at Carnegie, Pa., for the year ending Sept. 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	94	1,260	520	140	180	130	201	520	73	170	308	80
2	151	3,470	445	120	348	160	212	462	73	170	100	52
3	97	1,200	363	110	428	240	180	348	133	290	68	44
4	78	750	304	95	800	400	170	289	113	192	61	39
5	73	520	304	90	428	1,260	190	262	348	140	54	36
6	116	428	289	90	289	220	160	249	212	120	48	40
7	276	378	1,200	95	224	160	170	236	133	144	46	44
8	133	348	700	900	212	150	151	212	102	136	61	38
9	170	304	1,680	1,750	201	150	142	190	93	117	62	46
10	180	276	1,540	900	236	190	133	180	87	110	325	400
11	170	262	750	394	605	333	124	170	81	110	420	192
12	289	249	560	318	560	750	124	190	74	128	132	118
13	289	224	1,890	224	650	750	133	249	73	106	108	94
14	224	201	1,820	190	480	348	124	212	160	94	90	63
15	462	190	850	180	378	520	116	170	97	96	94	53
16	1,200	180	550	160	93	560	262	151	605	100	140	55
17	1,260	170	400	150	65	1,080	800	151	.....	85	80	48
18	605	170	280	150	75	560	520	142	1,970	70	64	41
19	410	151	220	150	95	560	410	142	900	113	65	40
20	348	151	220	240	180	1,200	480	142	685	94	58	38
21	262	133	220	1,890	333	650	1,970	160	685	79	53	37
22	276	142	220	348	750	480	1,080	142	462	70	64	36
23	249	142	220	462	750	410	700	116	440	63	56	34
24	212	142	220	700	700	378	520	116	360	62	50	35
25	190	180	220	249	289	363	394	113	325	63	46	33
26	201	3,370	190	304	212	363	363	100	260	61	45	34
27	800	4,640	190	445	150	348	560	96	205	55	44	36
28	1,080	1,080	180	410	130	276	850	94	205	59	45	45
29	560	850	180	249	130	262	560	89	180	58	102	52
30	410	850	170	304	.....	236	410	86	170	53	53	73
31	560	.....	150	363	.....	212	.....	81	.....	85	152	.....

NOTE.—Discharge Dec. 15 to Jan. 8, Jan. 14–20, Feb. 17–20, Feb. 27 to Mar. 4, and Mar. 6–10 estimated, because of ice, from weather records and study of gage-height graph.

Monthly discharge of Chartiers Creek at Carnegie, Pa., for the year ending Sept. 30, 1920.

[Drainage area, 260 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,260	73	369	1.42	1.64
November	4,640	133	747	2.87	3.20
December	1,890	150	550	2.11	2.43
January	1,890	90	393	1.51	1.74
February	750	65	344	1.32	1.42
March	1,260	130	442	1.70	1.96
April	1,970	116	407	1.57	1.75
May	520	81	189	.727	.84
July	290	53	106	.408	.47
August	420	44	99.8	.384	.44
September	400	33	65.9	.253	.28

BEAVER RIVER BASIN.

SHENANGO RIVER NEAR TURNERVILLE, PA.

LOCATION.—At single-span steel highway bridge, half a mile east of Turnerville, Crawford County.

DRAINAGE AREA.—152 square miles.

RECORDS AVAILABLE.—February 1, 1912, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—A special type of tape gage attached to top of upstream left wing wall was used until September 30, 1919, to show head on weir at upstream side of bridge. Reference mark on tape gage 13.52 feet from crest of weir; elevation of weir crest 975.56 feet, United States Geological Survey datum. The standard chain gage fastened to downstream side of bridge was used until September 30, 1919, to determine the degree of weir submergence; subsequent to that date for observation of daily gage height. Elevation of gage zero 970.00 feet, United States Geological Survey datum. Both gages read by S. A. Marvin.

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

CHANNEL AND CONTROL.—Right bank high and not subject to overflow; left bank subject to overflow. Bed composed of silt and gravel. For tape gage used until September 30, 1919, control for low stages is a timber weir at upstream side of bridge; for medium and high stages, at a riffle about 200 feet below gage, where the bed is composed of clay and boulders; practically permanent. Control for chain gage is at a riffle about 200 feet below gage, where bed is composed of silt and gravel; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 6.92 feet at 6.15 p. m. May 11 (discharge, 2,900 second-feet); minimum stage, 0.02 foot at 7.30 a. m. July 30 (discharge, 2 second-feet).

Maximum stage recorded during the year ending September 30, 1920, estimated from hydrograph, 13.4 feet at 4 a. m. March 13 (discharge, 4,180 second-feet); minimum stage, 3.65 feet several days in September and August (discharge, 6 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year, except as affected by ice. Rating curve well defined below 1,200 second-feet and fairly well defined between 1,200 and 5,000 second-feet. Gage read to quarter-tenths once daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Shenango River near Turnerville, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft*
July 26	H. L. Landis	[a] 0.06	5.7	Jan. 15	B. A. Knight	[b] 4.56	74.5
Nov. 7	J. M. Snavely	4.86	81.9	Feb. 17	R. J. Ferris	[b] 4.59	85.3
				June 14	....do	[c] 3.34	19.9

[a] Measurement made by wading 150 feet below gage.
[b] Measurement made through complete ice cover.
[c] Measurement made by wading 250 feet below gage.

Daily discharge, in second-feet, of Shenango River near Turnerville, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	55	129	90	150	95	231	81	190	107	24	6	7
2	29	145	78	432	43	217	70	245	78	18	6	7
3	27	163	81	432	70	217	66	231	70	16	9	6
4	30	163	86	432	132	190	68	245	47	15	8	6
5	37	176	88	463	49	163	70	231	43	12	6	4
6	51	176	81	301	37	150	74	163	33	11	7	4
7	47	176	78	140	47	142	78	217	25	9	9	3
8	49	163	105	107	51	119	114	273	25	9	15	3
9	57	145	107	76	35	330	112	373	27	9	9	2
10	66	110	102	63	35	373	176	1,710	25	7	6	2
11	61	107	117	59	33	463	402	2,900	22	7	4	4
12	59	100	140	74	33	494	556	2,220	21	7	3	5
13	55	86	137	78	35	358	494	1,040	15	7	3	6
14	45	74	203	59	51	259	402	683	18	6	3	6
15	53	65	344	66	74	190	301	494	16	18	3	6
16	59	61	402	70	57	217	301	432	16	14	3	6
17	74	55	463	70	53	315	373	1,310	12	14	7	4
18	72	273	402	88	61	402	525	1,560	11	12	6	4
19	53	190	287	88	47	463	556	1,190	15	7	6	4
20	43	203	203	81	32	402	402	747	22	6	7	5
21	55	287	147	93	74	301	301	556	16	6	7	7
22	55	330	150	95	81	217	231	463	12	6	6	11
23	78	344	245	114	259	163	190	432	10	6	4	14
24	78	287	217	273	231	127	203	432	2	6	4	15
25	93	217	402	273	330	112	176	402	2	4	3	14
26	93	176	402	330	344	102	190	358	100	3	3	9
27	98	150	402	315	231	107	190	301	53	3	3	6
28	78	129	315	190	217	107	163	245	43	3	3	6
29	102	114	217	163	.....	90	163	163	39	2	5	6
30	90	105	114	98	.....	112	142	134	30	2	7	4
31	112	.....	140	105	.....	83	.....	90	.....	2	6	.....
1919–20.												
1	6	104	285	66	80	65	98	386	12	33	9	9
2	7	130	285	50	74	65	92	285	13	26	9	7
3	9	104	221	50	74	65	86	253	17	22	9	6
4	11	98	152	40	80	65	74	190	20	17	7	6
5	9	104	160	36	86	440	74	145	38	14	6	6
6	11	116	110	30	86	458	68	123	38	11	6	6
7	10	110	116	30	86	386	74	104	26	14	7	6
8	16	92	123	30	92	386	74	92	25	22	7	6
9	16	80	152	36	86	458	68	80	20	130	8	7
10	11	80	285	36	86	754	68	64	23	59	29	12
11	11	80	160	40	86	1,460	68	55	21	47	22	26
12	17	80	237	50	80	3,210	68	55	17	39	26	26
13	19	66	318	60	80	3,880	116	53	9	29	92	30
14	22	66	335	66	80	2,270	138	53	15	23	138	28
15	22	64	318	74	80	1,360	168	51	23	57	80	15
16	16	58	280	74	80	905	269	43	74	26	92	14
17	13	49	240	70	80	829	404	38	92	19	80	11
18	13	42	190	55	80	683	458	34	269	16	62	10
19	12	37	140	50	80	555	477	32	152	16	42	9
20	11	36	100	36	80	477	369	35	221	17	29	7
21	11	37	75	36	80	440	386	43	253	22	21	7
22	16	57	70	36	80	350	515	43	221	21	16	6
23	22	92	65	36	80	300	535	38	168	28	14	6
24	29	86	65	40	80	270	596	34	130	22	14	6
25	26	86	65	50	74	230	458	32	110	22	11	6
26	21	145	70	50	80	190	352	32	92	22	11	6
27	17	285	75	55	80	160	285	26	80	19	7	7
28	33	237	74	65	74	145	318	23	59	14	9	9
29	68	269	74	70	74	123	352	20	35	11	9	10
30	57	335	74	70	.....	116	318	17	29	11	10	11
31	62	.....	68	80	.....	104	.....	14	.....	10	9	.....

NOTE.—Discharge Dec. 16–26, 1919, Jan. 2–13, 17–30, and Feb. 12–24, 1919, estimated, because of ice, from discharge measurements, weather records, and study of gage-height graph. Discharge Mar. 22–27 and Sept. 13–16, 1920, estimated, because of no gage-height record.

Monthly discharge of Shenango River near Turnerville, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 152 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	112	27	63	0.414	0.48
November	344	55	163	1.07	1.19
December	463	78	205	1.35	1.56
January	463	59	173	1.14	1.31
February	344	33	101	.664	.69
March	494	83	233	1.53	1.76
April	556	66	239	1.57	1.75
May	2,900	90	646	4.25	4.90
June	107	2	32	.211	.24
July	24	2	9	.059	.07
August	15	3	6	.039	.04
September	15	2	6	.039	.04
The year	2,900	2	157	1.03	14.03
1919–20.					
October	68	6	20.1	.132	.15
November	335	36	108	.710	.79
December	335	65	161	1.06	1.22
January	80	30	50.5	.332	.38
February	92	74	80.6	.530	.57
March	3,880	65	684	4.50	5.19
April	596	68	248	1.63	1.82
May	386	14	80.4	.529	.61
June	269	9	76.7	.505	.56
July	130	10	27.1	.178	.21
August	138	6	28.7	.189	.22
September	30	6	10.7	.070	.08
The year	3,880	6	132	.868	11.80

SHENANGO RIVER AT SHARON, PA.

LOCATION.—At Chestnut Street single-span steel highway bridge, Sharon, Mercer County.

DRAINAGE AREA.—611 square miles.

RECORDS AVAILABLE.—August 1, 1909, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGES.—Gage heights were determined until November 7, 1919, by measuring the distance from a reference point on the upstream handrail, 22.57 feet above gage datum, to water surface. Bristol water-stage recorder installed on downstream end of right abutment was operated and record used until May 23, 1919. On November 8, 1919, a chain gage was attached to upstream side of bridge and a Sanborn water-stage recorder was installed on downstream end of right abutment. Read by employees of Carnegie Steel Co. Zero elevation of all gages, 840.00 feet, United States Geological Survey datum.

DISCHARGE MEASUREMENTS.—Made from the Mill, Chestnut, or State Street bridges or by wading.

CHANNEL AND CONTROL.—Banks subject to overflow at a stage of about 12 feet. Bed is composed of silt and gravel. The control is a water main, backed with gravel and boulders, about one-quarter of a mile below the gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 12.5 feet at 5 p. m. May 11 (discharge, 11,300 second-feet); minimum stage, 1.8 feet at 5 p. m. July 28 (discharge, 19 second-feet).

Maximum stage during the year ending September 30, 1920, estimated from hydrograph, 13.3 feet at 6 a. m. March 13 (discharge, 13,200 second-feet); minimum stage, 1.90 feet at 5 p. m. September 19 (discharge, 28 second-feet).

ICE.—Water from this river is used for industrial purposes and returned to the stream at sufficiently high temperature to usually prevent the formation of ice for a considerable distance below the station.

ACCURACY.—Stage-discharge relation practically permanent throughout the year; ice effect probably negligible. Rating curve fairly well defined below 200 second-feet and well defined between 200 and 20,000 second-feet. Gage read to tenths twice daily until December 31, 1919; since that date to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good except those for extremely low stages, which are fair.

Discharge measurements of Shenango River at Sharon, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
July 28	H. L. Landis	[a] 1.91	30	Jan. 21	B. A. Knight	[b] 2.85	251
Nov. 9	J. M. Snavely	3.22	333	Feb. 19	R. J. Ferris	3.11	234
				June 15	J. M. Snavely	2.34	124

[a] Measurement made by wading 300 feet above gage.
[b] Measurement made through incomplete ice cover at State Street Bridge.

Daily discharge, in second-feet, of Shenango River at Sharon, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	97	890	370	1,300	390	1,060	260	890	312	129	78	54
2	107	558	312	2,360	260	1,000	245	1,620	260	107	87	97
3	78	490	295	1,620	260	945	230	1,240	216	70	70	78
4	87	430	312	1,000	295	1,000	260	945	203	70	78	62
5	109	535	370	780	260	835	350	780	177	62	78	54
6	230	558	390	655	203	535	430	580	177	70	312	40
7	295	450	410	605	177	470	390	655	152	62	164	40
8	230	410	410	470	230	490	780	1,180	129	54	118	34
9	164	390	430	390	164	1,830	1,240	1,490	164	54	87	34
10	129	350	430	312	129	2,280	1,620	4,710	140	54	87	40
11	107	330	410	278	120	1,690	2,200	10,200	140	62	70	70
12	118	278	470	245	164	1,490	2,360	8,160	129	70	70	47
13	140	245	630	245	177	1,240	1,690	4,260	129	70	54	40
14	177	230	1,240	295	203	1,000	1,360	2,200	129	47	40	40
15	190	203	1,980	350	278	780	1,180	1,690	107	140	34	40
16	177	177	1,620	330	312	1,000	1,560	2,050	107	118	34	47
17	122	203	1,300	330	295	1,760	2,280	2,880	97	87	40	40
18	111	680	1,120	350	278	1,690	1,760	3,650	97	62	78	40
19	97	1,360	945	370	230	1,490	1,490	3,060	78	54	140	40
20	129	1,490	730	330	245	1,240	1,300	2,280	70	54	129	40
21	164	1,300	580	350	350	1,000	1,180	2,050	78	54	97	62
22	312	1,180	835	350	512	835	945	1,690	70	40	62	62
23	260	1,120	1,360	490	1,490	605	730	1,620	62	47	70	70
24	177	945	1,300	1,120	1,490	470	780	2,280	70	40	164	120
25	177	780	1,760	1,120	1,180	390	730	2,050	70	40	47	110
26	230	730	1,560	945	1,240	330	655	1,420	190	40	47	90
27	312	605	1,240	890	1,060	350	605	1,120	780	28	70	65
28	470	470	1,060	780	1,120	470	580	890	390	24	62	55
29	558	470	890	655	.....	430	655	680	216	28	47	47
30	655	410	730	535	.....	390	655	490	140	28	54	40
31	1,000	.....	680	450	.....	312	.....	410	.....	34	70	.....

Daily discharge, in second-feet, of Shenango River at Sharon, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	47	2,280	1,240	230	230	203	295	1,550	89	152	103	60
2	40	1,900	1,000	216	216	203	295	1,300	116	152	164	57
3	40	945	780	190	230	260	278	1,060	97	129	111	54
4	47	890	470	177	278	680	245	730	105	122	82	57
5	47	780	410	177	312	2,440	295	605	107	99	73	72
6	107	655	390	164	330	2,440	295	490	105	89	67	82
7	152	535	430	164	350	1,900	295	370	111	118	72	77
8	152	410	558	164	330	1,420	295	312	122	164	87	67
9	107	330	1,180	177	350	1,240	312	295	89	512	82	60
10	107	278	2,040	203	312	1,420	295	312	87	1,060	127	57
11	177	278	1,060	190	312	2,880	295	230	81	512	260	57
12	245	430	780	230	330	6,730	278	245	81	350	390	68
13	245	390	1,300	230	390	12,500	470	260	85	245	490	67
14	177	312	1,830	230	450	7,730	655	216	105	216	605	77
15	140	245	1,000	230	470	4,370	558	203	105	177	780	80
16	107	216	535	230	450	3,550	1,300	177	260	390	890	75
17	118	203	605	230	410	2,970	2,700	177	1,830	230	730	67
18	97	177	605	216	350	2,040	2,120	164	3,750	164	512	46
19	87	177	535	216	312	1,620	1,620	164	2,120	177	390	30
20	78	164	450	216	278	2,280	1,690	190	1,120	295	245	33
21	87	190	370	216	245	1,900	2,440	260	1,000	216	177	36
22	87	203	350	260	230	1,480	2,790	245	1,000	152	140	38
23	140	312	295	312	278	1,300	2,040	203	835	177	116	38
24	140	330	295	350	295	1,120	1,830	190	680	295	114	35
25	129	350	295	370	295	890	1,480	190	450	203	87	35
26	118	780	245	370	295	730	1,180	164	295	140	73	36
27	97	2,040	245	350	260	580	1,120	129	230	118	67	38
28	780	1,480	260	330	230	490	1,420	122	203	111	67	46
29	1,620	1,120	260	330	203	430	1,620	109	177	129	57	60
30	890	1,690	245	295	.....	370	1,420	78	177	95	64	77
31	945	.....	230	278	.....	330	.....	93	.....	91	64	.....

NOTE.—Discharge, Sept. 24-28, 1919, estimated, from records of flow at New Castle and Turnerville.

Monthly discharge of Shenango River at Sharon, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 611 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918-19.					
October	1,000	78	232	0.380	0.44
November	1,490	177	609	1.00	1.12
December	1,980	295	844	1.38	1.59
January	2,360	245	655	1.07	1.23
February	1,490	120	468	.766	.80
March	2,280	312	949	1.55	1.79
April	2,360	230	1,020	1.67	1.86
May	10,200	410	2,230	3.65	4.21
June	780	62	169	.277	.31
July	140	24	61	.100	.12
August	312	34	85	.139	.16
September	120	34	57	.093	.10
The year	10,200	24	618	1.01	13.73
1919-20.					
October	1,620	40	237	.388	.45
November	2,280	164	670	1.10	1.23
December	2,040	230	654	1.07	1.23
January	370	164	243	.398	.46
February	470	203	311	.511	.55
March	12,500	200	2,210	3.62	4.17
April	2,790	278	1,060	1.73	1.93
May	1,550	78	349	.571	.66
June	3,750	81	520	.851	.95
July	1,060	89	228	.373	.43
August	890	57	235	.385	.44
September	82	30	56.1	.092	.10
The year	12,500	30	566	.926	12.60

SHENANGO RIVER AT NEW CASTLE, PA.

LOCATION.—At West Washington Street two-span steel highway bridge, New Castle, Lawrence County, half a mile above mouth of Neshannock Creek which enters from the left.

DRAINAGE AREA.—797 square miles.

RECORDS AVAILABLE.—January 1, 1910, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to upstream side of bridge; read by J. L. Moseley. Elevation of gage zero 787.00 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Bed composed of gravel and rock. Control is at a riffle, at the head of a low island, about 300 feet below gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 9.33 feet at 4.20 p. m. May 11 (discharge, 10,200 second-feet); minimum stage, 0.93 foot at 5 p. m. July 30 and 8 a. m. July 31 (discharge, 25 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 9.60 feet at 5 p. m. March 13 (discharge, 10,800 second-feet); minimum stage, 0.90 foot several times in September (discharge, 22 second-feet).

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

DIVERSIONS.—The New Castle water supply is taken from the stream above the gaging station. On September 28, 1914, it was reported that the pumpage was equivalent to 6 second-feet.

ACCURACY.—Stage-discharge relation permanent; ice effect negligible. Rating curve fairly well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Shenango River at New Castle, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919		*Feet.*	*Sec.-ft.*	1920		*Feet.*	*Sec.-ft.*
Aug. 1	H. L. Landis	1.14	54	Jan. 17	B. A. Knight	[a] 1.82	253
Nov. 10	J. M. Snavely	2.05	432	June 15	R. J. Ferris	1.53	183

[a] Measurement made through incomplete ice cover.

Daily discharge, in second-feet, of Shenango River at New Castle, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	115	1,360	500	1,120	500	1,360	472	1,005	500	176	52	67
2	131	900	443	2,290	443	1,360	368	2,190	416	138	75	88
3	138	760	416	2,190	348	970	338	1,620	368	118	75	67
4	108	625	472	1,620	443	935	329	1,280	325	99	63	63
5	118	658	530	1,120	416	1,440	388	1,005	300	88	88	93
6	388	795	500	1,120	348	1,280	443	830	235	88	320	72
7	500	690	530	900	338	900	560	690	226	63	329	63
8	416	560	500	760	329	658	500	1,440	213	46	153	63
9	281	500	560	592	314	1,280	1,440	1,440	262	43	88	46
10	231	560	592	443	244	3,730	1,800	4,860	244	102	88	52
11	209	472	560	388	218	2,970	2,290	10,000	200	105	67	67
12	184	443	690	363	180	2,090	2,510	8,360	176	67	63	63
13	168	373	725	338	204	1,620	2,620	7,600	160	63	54	61
14	235	300	1,530	338	244	1,280	1,800	4,000	153	59	40	59
15	218	276	1,800	472	253	1,040	1,620	2,290	153	112	36	63
16	204	253	2,620	500	267	1,120	1,890	2,730	153	153	43	67
17	200	253	2,190	500	443	2,620	3,090	3,340	142	153	43	54
18	184	472	1,710	443	388	2,510	2,290	4,420	118	112	31	52
19	168	1,890	1,440	443	368	2,090	970	4,140	102	88	43	52
20	209	2,190	1,440	530	363	1,530	1,710	2,970	88	88	67	59
21	200	2,190	1,040	500	338	1,280	1,620	2,850	262	63	153	88
22	218	1,530	900	472	472	1,200	1,280	2,400	180	63	124	102
23	235	1,360	1,890	970	1,710	970	1,040	2,090	124	52	102	93
24	244	1,280	1,710	1,530	1,800	690	970	2,730	118	46	88	146
25	253	1,280	1,800	1,710	1,710	625	1,120	3,860	124	43	304	124
26	338	900	2,400	1,360	1,620	500	970	2,290	530	43	200	112
27	388	658	1,620	1,280	1,530	592	970	1,530	970	36	112	83
28	592	560	1,360	1,120	1,200	725	760	1,200	830	31	93	75
29	690	530	1,280	900	.....	690	830	1,005	378	29	67	75
30	830	560	900	690	.....	625	900	795	244	27	63	67
31	1,200	.....	725	560	.....	500	.....	625	.....	27	59	.....
1919-20.												
1	65	2,970	1,890	314	338	314	443	2,090	146	262	160	77
2	85	3,340	1,280	290	348	290	416	1,890	124	222	131	67
3	65	2,190	1,040	290	378	348	388	1,530	153	209	168	56
4	65	1,440	795	244	363	830	363	1,200	168	200	142	56
5	65	1,200	625	253	416	3,210	348	830	176	160	121	56
6	77	970	560	226	443	3,860	388	725	180	192	93	56
7	90	830	795	222	500	3,860	443	625	153	300	93	50
8	149	690	760	200	443	2,730	443	625	146	592	124	46
9	176	560	1,360	218	472	1,620	416	560	156	625	105	46
10	156	443	3,470	249	443	1,800	416	378	146	1,620	124	67
11	416	416	2,290	267	472	3,600	388	290	124	725	156	70
12	560	500	1,360	244	500	5,830	388	363	124	500	338	67
13	416	560	1,620	258	530	10,000	443	388	124	388	358	46
14	343	472	1,990	281	625	10,400	865	368	168	300	416	56
15	240	383	1,620	285	625	8,360	830	329	200	443	935	50
16	200	378	1,040	290	560	5,180	1,360	222	267	290	760	46
17	200	290	830	295	760	4,420	3,730	244	2,190	416	1,040	80
18	180	285	970	304	560	3,600	3,600	222	4,860	314	830	72
19	180	267	935	290	443	2,970	2,290	218	4,000	253	592	46
20	146	253	760	320	388	2,850	3,340	209	1,710	300	416	34
21	138	244	690	340	348	2,850	4,860	1,040	1,360	285	314	43
22	168	244	530	368	338	2,090	4,560	690	1,360	267	244	43
23	180	267	443	383	329	1,800	2,970	443	1,360	222	180	38
24	244	388	388	472	443	1,440	2,730	348	1,200	192	142	30
25	222	500	443	500	443	1,120	2,290	320	865	388	118	22
26	209	625	416	500	388	970	1,620	267	560	281	99	22
27	200	2,190	363	500	388	900	1,360	244	500	200	99	26
28	560	2,290	363	443	363	760	1,800	209	314	160	80	38
29	1,040	1,890	348	443	314	690	2,090	180	285	153	80	43
30	1,360	2,510	363	388	.....	592	1,890	124	295	142	72	70
31	1,530	.....	343	378	.....	500	.....	160	.....	146	72	.....

NOTE.—Discharge, Jan. 20 and 21, 1920, estimated because of unsatisfactory gage height.

Monthly discharge of Shenango River at New Castle, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 797 square miles.]

Month.	Discharge in second-feet.				Run off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	1,200	108	309	0.388	0.45
November	2,190	253	839	1.05	1.17
December	2,602	416	1,140	1.43	1.65
January	2,290	338	889	1.12	1.29
February	1,800	180	608	.763	.79
March	3,730	500	1,300	1.63	1.88
April	3,090	329	1,260	1.58	1.76
May	10,000	625	2,800	3.50	4.04
June	970	88	276	.346	.39
July	176	27	78	.098	.11
August	329	31	103	.129	.15
September	146	46	75	.094	.10
The year	10,000	27	812	1.02	13.78
1919–20.					
October	1,530	65	314	.394	.45
November	3,340	244	986	1.24	1.38
December	3,470	343	990	1.24	1.43
January	500	200	324	.407	.47
February	760	314	447	.561	.60
March	10,400	290	2,900	3.64	4.20
April	5,340	363	1,580	1.98	2.21
May	2,090	124	559	.701	.81
June	4,860	124	780	.979	1.09
July	1,620	142	347	.435	.50
August	1,040	72	277	.348	.40
September	80	22	50.6	.063	.07
The year	10,400	22	797	1.010	13.61

LITTLE SHENANGO RIVER AT GREENVILLE, PA.

LOCATION.—At single-span steel highway bridge known as Quaker Bridge, on Columbia Avenue, Greenville, Mercer County.

DRAINAGE AREA.—107 square miles.

RECORDS AVAILABLE.—January 1, 1914, to September 30, 1918, and November 7, 1919, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Staff attached to upstream corner of right abutment; read by James Marks. Elevation of gage zero 944.50 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Bed is composed of sand and gravel. Control for low stages is a coarse gravel and boulder bar, about 300 feet below gage, permanent; control for high stages is a dam on Shenango River just below the mouth of Little Shenango River.

EXTREMES OF DISCHARGE.—Maximum stage during the period November 7, 1919, to September 30, 1920, estimated from hydrograph, 6.8 feet at noon March 11 (discharge, 3,070 second-feet); minimum stage, 1.12 feet at 8.30 a. m. September 24 (discharge, 11 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the period, except as affected by ice. Rating curve well defined below 1,800 second-feet and fairly well defined between 1,800 and 2,800 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Little Shenango River at Greenville, Pa., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 7	R. J. Ferris	1.81	115	Feb. 18	R. J. Ferris	[a] 2.10	74.1
Jan. 15	B. A. Knight	[a] 2.05	52.7	June 14	do	[b] 1.44	39.6

[a] Measurement made through complete ice cover.
[b] Measurement made by wading 800 feet above gage.

Daily discharge, in second-feet, of Little Shenango River at Greenville, Pa., for the year ending Sept. 30, 1920.

Day.	Nov.	Dec.	Jan.	Feb	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	184	40	80	15	75	374	33	57	94	27
2	.....	126	35	75	15	70	184	30	45	51	24
3	.....	110	30	75	15	67	143	57	41	37	22
4	.....	102	30	75	15	63	115	45	34	38	23
5	.....	102	25	75	30	87	98	39	29	34	24
6	.....	102	15	75	90	85	87	38	29	37	22
7	110	122	15	75	900	87	80	34	131	39	25
8	96	150	25	75	461	90	73	35	228	50	29
9	83	531	25	65	374	94	67	34	960	54	24
10	82	734	30	65	1,020	94	63	32	279	106	24
11	119	244	35	65	2,560	83	63	29	115	158	23
12	133	136	40	75	1,630	83	67	29	98	67	28
13	98	416	50	75	656	171	71	29	76	102	24
14	80	531	55	80	394	138	68	51	67	279	25
15	68	244	65	90	298	171	63	37	212	124	22
16	63	180	65	90	416	212	63	198	90	279	19
17	63	130	55	90	605	734	60	1,020	65	112	17
18	62	110	50	80	461	484	59	1,350	59	148	23
19	60	90	40	55	244	198	54	298	136	73	15
20	59	80	35	35	212	184	70	138	83	56	15
21	60	75	35	25	394	279	67	136	60	48	19
22	76	75	35	15	316	279	63	130	50	54	14
23	87	75	40	15	244	316	51	136	228	48	14
24	85	75	50	15	171	354	51	106	106	39	14
25	94	75	55	15	136	198	51	81	67	32	16
26	262	75	55	15	119	146	50	65	51	29	17
27	394	75	75	15	104	153	50	57	48	34	17
28	262	75	75	15	92	416	35	48	48	30	22
29	198	65	80	15	87	394	32	41	37	32	24
30	461	55	80	.....	83	416	33	54	37	27	27
31	.....	50	90	.....	78	.....	32	.....	54	28	.....

NOTE.—Discharge Dec. 16 to Mar. 6 estimated, because of ice, from discharge measurements, weather records, and study of gage-height graph.

Monthly discharge of Little Shenango River at Greenville, Pa., for the year ending Sept. 30, 1920.

[Drainage area, 107 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
December	734	50	168	1.57	1.81
January	90	15	46.1	.431	.50
February	90	15	55.7	.521	.56
March	2,560	15	395	3.69	4.25
April	734	63	207	1.93	2.15
May	374	32	78.6	.735	.85
June	1,350	29	147	1.37	1.53
July	960	29	117	1.09	1.26
August	279	27	75.5	.706	.81
September	29	14	21.3	.199	.22

PYMATUNING CREEK NEAR ORANGEVILLE, PA.

LOCATION.—At single-span steel highway bridge 2 miles southeast of Orangeville, Mercer County.

DRAINAGE AREA.—170 square miles.

RECORDS AVAILABLE.—January 1, 1914, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain attached to upstream side of bridge; read by C. I. Mitcheltree and D. S. Stecher.

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

CHANNEL AND CONTROL.—Right bank high and not subject to overflow; left is overflowed at a stage of about 5.4 feet. Bed is composed of gravel and boulders. Low-water control is at a riffle about 30 feet below gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 7.75 feet at 8 a. m. May 11 (discharge, 3,060 second-feet); minimum stage, 0.65 foot morning of July 31 and several days in August and September (discharge, 5 second-feet).

Maximum stage recorded during the year ending September 30, 1920, estimated from hydrograph, 8.9 feet at 4 a. m. March 13 (discharge, 4,100 second-feet); minimum stage, 0.5 foot several times in September (discharge, 2 second-feet).

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

REGULATION.—During low stages slight variations in gage height are caused by operation of mills.

ACCURACY.—Stage-discharge relation permanent throughout the year except as affected by ice January 5, 6, 31, February 1, 2, 1919, and December 16, 1919, to March 11, 1920. Rating curve well defined below 1,500 second-feet. Gage read to hundredths twice daily until March 31 and to tenths twice daily after that date. Daily discharge ascertained by applying daily mean gage height to rating table. Records good except those for low stages which are fair, owing to probable effect of mill operation above the station.

Discharge measurements of Pymatuning Creek near Orangeville, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*
July 28	H. L. Landis	[a]0.69	6.3
1920.			
Jan. 16	B. A. Knight	[b]1.85	68.7
Feb. 18	R. J. Ferris	[b]2.25	116
June 15	J. M. Snavely	.86	20.0

[a] Measurement made by wading 10 feet below gage.
[b] Measurement made through complete ice cover.

Daily discharge, in second-feet, of Pymatuning Creek near Orangeville, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	15	182	89	268	108	281	89	182	84	31	7	10
2	15	171	98	509	98	248	75	346	49	21	5	6
3	13	160	89	481	89	218	71	315	27	21	5	6
4	19	160	80	426	71	194	62	307	34	21	6	8
5	13	149	98	426	118	182	54	243	34	19	10	9
6	46	149	108	399	108	171	118	199	31	31	8	6
7	54	138	128	346	80	149	128	182	34	21	6	5
8	46	128	149	268	71	138	171	194	34	15	6	8
9	38	108	153	194	38	610	412	426	34	11	5	9
10	31	98	149	128	38	509	509	1,980	31	11	6	15
11	24	89	132	80	31	467	481	3,060	31	12	7	12
12	19	75	138	62	24	426	595	2,420	27	34	13	10
13	24	71	149	54	38	386	566	1,420	23	12	6	9
14	31	54	256	62	54	346	495	749	21	15	8	6
15	31	46	481	71	85	307	399	566	21	46	7	10
16	24	38	440	80	108	333	333	566	21	21	6	10
17	22	24	426	89	98	346	523	1,100	19	8	5	6
18	19	199	399	108	89	440	509	1,530	15	6	9	10
19	19	399	399	108	80	399	495	1,370	18	8	12	9
20	13	453	268	104	71	346	481	987	15	10	12	7
21	15	440	194	98	80	294	426	686	15	10	9	5
22	24	399	206	89	89	230	346	566	15	8	12	6
23	24	372	294	89	333	176	243	495	15	6	6	6
24	31	320	440	294	359	149	218	566	12	6	5	10
25	38	268	537	333	346	118	206	537	19	6	5	6
26	46	194	481	320	320	89	182	467	50	6	7	8
27	62	160	440	294	307	71	171	412	211	6	9	9
28	71	128	399	243	243	89	153	333	132	6	6	6
29	108	124	315	194	.....	98	171	243	74	6	10	6
30	149	98	243	128	.....	98	171	171	49	7	57	10
31	171	.....	230	118	.....	92	.....	128	.....	6	10	.....
1919–20.												
1	10	537	426	46	130	55	80	582	24	24	46	13
2	12	537	399	46	120	55	89	467	31	24	24	6
3	6	453	359	38	110	55	62	426	46	24	19	4
4	9	399	272	38	110	70	80	268	24	13	13	5
5	6	307	243	38	110	480	80	194	24	19	13	13
6	24	230	138	38	110	500	62	118	19	24	13	6
7	80	189	93	38	120	420	80	98	13	38	10	13
8	27	128	118	38	130	420	71	62	19	108	13	10
9	19	93	294	38	140	500	80	54	13	171	13	10
10	54	75	412	46	150	800	80	38	13	206	54	19
11	36	68	367	46	160	1,600	80	62	13	128	89	13
12	24	98	289	55	160	3,330	89	54	13	71	98	6
13	62	116	367	55	170	3,700	128	54	31	54	194	5
14	54	104	372	60	170	2,200	194	54	24	71	281	10
15	46	75	335	60	160	1,140	206	46	46	54	333	4
16	19	57	240	70	150	880	359	31	228	62	372	4
17	15	62	150	70	130	749	686	24	880	89	359	4
18	15	75	110	70	110	566	595	24	1,420	62	294	10
19	13	36	80	70	110	509	595	38	1,060	80	372	4
20	22	42	70	80	90	566	686	38	686	118	230	4
21	24	46	70	90	80	481	880	80	509	98	182	5
22	38	57	70	90	70	453	1,020	89	372	71	160	4
23	19	68	70	90	70	399	720	71	256	71	62	2
24	38	100	70	100	70	346	625	62	149	62	38	3
25	22	104	70	110	70	289	537	46	89	46	13	4
26	19	248	70	120	60	230	426	31	89	62	13	5
27	21	453	60	130	60	176	426	24	62	54	13	13
28	248	426	55	130	55	128	453	54	54	54	10	89
29	315	453	55	130	55	112	386	24	46	24	6	71
30	346	537	55	130	.....	93	580	24	38	24	13	98
31	346	.....	46	130	.....	71	.....	24	.....	19	10	.....

NOTE.—Discharge Jan. 5, 6, 31, Feb. 1, 2, 1919, and Dec. 16, 1919, to Mar. 11, 1920, estimated, because of ice, from discharge measurements, study of weather records, and gage-height graph.

Monthly discharge of Pymatuning Creek near Orangeville, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 170 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	149	13	40	0.235	0.27
November	453	24	180	1.06	1.18
December	537	80	258	1.52	1.75
January	509	54	208	1.22	1.41
February	359	24	128	.753	.78
March	610	71	258	1.52	1.75
April	595	54	295	1.74	1.94
May	3,060	128	734	4.32	4.98
June	211	12	40	.235	.26
July	46	6	14	.082	.09
August	57	5	9	.053	.06
September	15	5	8	.047	.05
The year	3,060	5	182	1.07	14.52
1919–20.					
October	346	6	64.2	.378	.44
November	537	36	206	1.21	1.35
December	426	46	188	1.11	1.28
January	130	38	73.9	.435	.50
February	170	55	111	.653	.70
March	3,700	55	689	4.05	4.67
April	1,020	62	348	2.05	2.29
May	582	24	105	.618	.72
June	1,420	13	210	1.24	1.38
July	206	13	65.3	.384	.44
August	372	6	108	.635	.73
September	98	2	15.2	.089	.10
The year	3,700	2	182	1.07	14.60

NESHANNOCK CREEK AT EASTBROOK, PA.

LOCATION.—At single-span wooden highway bridge at Eastbrook station of Pennsylvania Railroad, in Lawrence County.

DRAINAGE AREA.—235 square miles.

RECORDS AVAILABLE.—January 19, 1914, to September 30, 1920. Records prior to October 1, 1919, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to upstream side of bridge; read by J. L. Garner. Elevation of gage zero 877.53 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Bed composed of gravel and rock. Control is at a riffle about 500 feet below gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during the period November 1, 1919, to September 30, 1920, estimated from hydrograph, 7.2 feet at 7 p. m. March 12 (discharge, 6,690 second-feet); minimum stage, 0.91 foot at 7.30 a. m. July 21 and estimated for September 18 and 23 (discharge, 28 second-feet).

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

ACCURACY.—Stage-discharge relation permanent throughout the year, except as affected by ice, December 17–21 and January 1 to March 2. Rating curve fairly well defined between 50 and 2,500 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records fair.

Discharge measurements of Neshannock Creek at Eastbrook, Pa., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 10	J. M. Snavely	1.61	171	Mar. 20	R. J. Ferris	3.83	1,780
Dec. 3	R. J. Ferris	1.69	164	20	do	3.81	1,720
Jan. 22	B. A. Knight	[a] 2.16	143	June 17	J. M. Snavely	3.25	1,160
Feb. 19	R. J. Ferris	[b] 1.94	166				

[a] Measurement made through complete ice cover.
[b] Measurement made through incomplete ice cover.

Daily discharge, in second-feet, of Neshannock Creek at Eastbrook, Pa., for the year ending Sept. 30, 1920.

Day.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	300	170	130	170	113	720	71	57	45	45
2	.....	140	65	140	200	140	442	71	71	57	35
3	.....	126	70	160	300	140	261	80	64	45	34
4	.....	57	80	190	760	113	207	71	57	40	35
5	.....	101	90	220	2,120	140	172	71	57	29	35
6	.....	101	110	240	1,550	140	89	71	57	30	32
7	.....	261	130	240	1,400	156	140	71	45	35	30
8	.....	242	140	240	1,100	126	101	71	40	40	45
9	.....	720	140	240	470	126	101	71	40	51	35
10	113	565	140	240	640	156	101	64	51	126	45
11	140	365	130	240	2,730	126	89	71	57	71	71
12	172	207	110	240	5,540	101	140	64	71	35	71
13	101	415	100	240	3,120	156	101	80	80	40	64
14	101	900	90	220	1,250	190	101	101	64	57	64
15	64	342	90	200	600	207	80	64	57	57	38
16	64	126	80	190	1,000	680	80	126	57	51	34
17	71	100	70	170	1,250	1,660	80	1,450	45	35	30
18	57	80	65	160	720	950	80	1,350	45	35	28
19	64	70	65	160	680	470	113	530	45	40	34
20	57	80	70	140	2,240	640	89	565	40	33	30
21	64	90	100	140	1,300	1,770	390	415	32	35	30
22	57	113	140	140	565	1,400	156	207	57	35	34
23	113	126	170	160	470	720	126	261	45	35	28
24	126	126	190	160	365	442	126	280	35	35	30
25	140	207	200	170	280	390	101	300	35	33	29
26	300	140	200	170	280	320	113	224	33	33	32
27	1,100	113	200	170	207	320	80	140	33	40	36
28	530	113	200	170	207	500	89	89	40	35	55
29	365	140	170	170	172	565	71	71	31	35	130
30	530	140	140	.....	156	342	80	71	34	45	85
31	.....	140	140	.....	126	.....	71	.....	40	64	.....

NOTE.—Gage not read Oct. 1 to Nov. 9. Discharge Nov. 1–9 estimated, 430 second-feet. Discharge Dec. 17–21 and Jan. 1 to Mar. 2 estimated, because of ice, from discharge measurements, weather records, and study of gage-height graph. Discharge Sept. 15–30 estimated, because of unsatisfactory gage-height record.

Monthly discharge of Neshannock Creek at Eastbrook, Pa., for the year ending Sept. 30, 1920.

[Drainage area, 235 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
November	.....	.....	273	1.16	1.29
December	900	57	218	.928	1.07
January	200	65	124	.528	.61
February	240	130	191	.813	.88
March	5,540	126	1,030	4.38	5.05
April	1,770	101	443	1.88	2.10
May	720	71	151	.642	.74
June	1,450	64	239	1.02	1.14
July	80	31	48.9	.208	.24
August	126	29	44.4	.189	.22
September	130	28	44.1	.188	.21

MAHONING RIVER NEAR NEW CASTLE, PA.

LOCATION.—At two-span steel highway bridge known as Borough Line Bridge, half a mile above the mouth and 2 miles southwest of New Castle, Lawrence County.

DRAINAGE AREA.—1,070 square miles.

RECORDS AVAILABLE.—August 12, 1914, to February 3, 1919, when the station was discontinued. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to downstream side of bridge; read by W. A. Wallace. Elevation of gage zero 760 feet, New Castle city datum, or 758.12 feet, United States Geological Survey datun.

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

CHANNEL AND CONTROL.—Banks subject to overflow at a stage of about 11 feet. Bed is composed of sand and gravel. Low-water control is a gravel and boulder riffle just above the railroad bridge, about 1,000 feet below the gage. Station may be subject to backwater during high stages in Shenango River.

EXTREMES OF DISCHARGE.—Maximum stage observed during period October 1, 1918, to February 3, 1919, 7.2 feet at 9.15 a. m. January 2 (discharge, 2,900 second-feet); minimum, 2.50 feet at 8.50 a. m. October 1 (discharge, 106 second-feet).

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

REGULATION.—The flood run-off from about half of the drainage area above this gage is stored in a large reservoir at Milton, Ohio, and used to regulate the flow of the stream for steel mill operations.

ACCURACY.—Stage-discharge relation probably permanent but no discharge measurements were obtained during the year to check the rating curve; not affected by ice. Rating curve well defined. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Daily discharge, in second-feet, of Mahoning River near New Castle, Pa., for the period Oct. 1, 1918, to Feb. 3, 1919.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Day.	Oct.	Nov.	Dec.	Jan.	Feb.
1	112	525	222	795	385	16	145	.....	2,030	452	.....
2	138	475	202	2,900	318	17	202	.....	1,780	385	.....
3	138	318	212	2,600	368	18	172	.....	915	385	.....
4	118	279	233	1,320	.....	19	145	.....	712	350	.....
5	131	292	212	795	.....	20	145	.....	575	350	.....
6	292	279	244	795	.....	21	162	1,320	430	350	.....
7	222	222	244	710	.....	22	145	1,040	500	350	.....
8	408	266	266	710	.....	23	202	795	1,110	385	.....
9	244	222	279	500	.....	24	162	550	1,240	915	.....
10	202	233	334	452	.....	25	192	430	1,940	1,240	.....
11	145	192	408	475	.....	26	244	385	1,860	915	.....
12	145	182	658	452	.....	27	182	292	1,700	795	.....
13	154	192	795	430	.....	28	182	266	915	630	.....
14	154	162	1,110	475	.....	29	292	255	740	575	.....
15	162	162	1,940	475	.....	30	525	222	550	475	.....
						31	630	.....	525	385	.....

NOTE.—Gage height Nov. 16–20, not observed

Monthly discharge of Mahoning River near New Castle, Pa., for the period Oct. 1, 1918, to Jan. 31, 1919.

[Drainage area, 1,070 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
October	630	112	209	0.195	0.22
December	2,030	202	803	.750	.86
January	2,900	350	736	.688	.79

CONNOQUENESSING CREEK NEAR HAZEN, PA.

LOCATION.—At single-span steel highway bridge half a mile south of Baltimore & Ohio Railroad station at Hazen, Beaver County.

DRAINAGE AREA.—355 square miles.

RECORDS AVAILABLE.—June 3, 1915, to September 30, 1920. Records prior to October 1, 1919, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain gage attached to downstream side of bridge; read by Wilbert Hazen.

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

CHANNEL AND CONTROL.—Right bank subject to overflow above a stage of about 10 feet; left high and not subject to overflow. Bed composed of gravel and boulders. Control is a deposit of gravel on ledge about 250 feet below gage; permanent.

EXTREMES OF DISCHARGE.—Maximum open-water stage recorded during the year ending September 30, 1920, estimated from hydrograph, 9.9 feet at 9 p. m. March 11 (discharge, 6,800 second-feet); a stage of 15.0 feet, determined from levels, was reached during the night of March 5–6, but the water was held back by an ice jam; minimum stage, 1.34 feet several times in September (discharge, 23 second-feet).

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

ACCURACY.—Stage-discharge relation permanent through the year, except as affected by ice. Rating curve well defined below 5,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of Connoquenessing Creek near Hazen, Pa., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 20	B. A. Knight	[a] 3.08	153	Mar. 21	R. J. Ferris	4.56	1,990
Feb. 20	R. J. Ferris	[a] 3.53	249	21	do	4.49	1,970
Mar. 20	do	6.69	3,830	June 16	do	1.84	118
20	do	6.38	3,500				

[a] Measurement made through complete ice cover.

22926—24—WSP 503——7

Daily discharge, in second-feet, of Connoquenessing Creek near Hazen, Pa., for the year ending Sept. 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	126	1,420	1,580	170	100	480	325	770	89	154	53	24
2	129	1,180	1,340	150	85	600	258	702	83	126	49	24
3	80	1,120	1,020	110	100	900	232	670	85	112	42	24
4	49	670	403	100	130	1,400	181	605	112	83	39	26
5	39	605	365	100	170	2,200	173	545	146	95	34	26
6		637	320	110	200	2,750	166	485	154	106	34	26
7		515	485	150	280	2,300	154	420	132	132	36	28
8		376	875	200	320	2,220	142	365	112	139	39	26
9		315	702	240	280	1,980	150	320	83	126	39	36
10		291	2,140	280	280	1,820	142	272	76	112	34	46
11		258	1,420	280	220	4,010	150	185	60	98	31	65
12		272	1,260	240	180	5,180	142	169	51	78	31	49
13		258	3,110	240	150	2,840	181	154	65	62	39	42
14		605	2,400	220	110	2,220	277	161	92	58	53	36
15		702	880	220	110	2,060	236	143	112	53	49	31
	425											
16		605	320	200	130	1,660		154	206	46	41	26
17		575	170	200	150	1,900		146	3,560	46	34	24
18		575	110	180	170	1,060		181	1,820	39	29	23
19		545	100	180	200	1,580		193	1,180	36	28	24
20		545	70	150	240	3,470			1,180	34	31	23
21		545	60	170	280	1,660	975	600	1,100	31	29	24
22		515	60	200	340	1,260			735	32	28	26
23		545	85	220	420	840			605	31	29	24
24		575	100	240	500	605		146	515	31	26	24
25		637	130	280	550	515		146	455	31	27	24
26	455	702	150	280	500	515		132	376	31	28	26
27	605	3,560	150	280	480	455	408	119	330	34	26	34
28	1,180	1,180	150	240	480	425	670	112	291	31	28	41
29	1,420	1,820	150	220	480	408	702	112	258	36	28	60
30	637	1,900	150	180	.....	386	735	106	177	41	28	72
31	840	.....	170	150	.....	355	.....	103	154	56	26	.....

NOTE.—Discharge Dec. 18 to Mar. 5 estimated, because of ice, from discharge measurements and study of weather record and gage-height graph. Discharge Oct. 6–25, Apr. 16–26 and May 20–23 estimated, because of unsatisfactory gage-height record. Braced figures show mean discharge for periods indicated.

Monthly discharge of Connoquenessing Creek near Hazen, Pa., for the year ending Sept. 30, 1920.

[Drainage area, 355 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
October	.....	.....	454	1.28	1.48
November	3,560	258	672	1.89	2.11
December	3,110	60	659	1.86	2.14
January	280	100	199	.561	.65
February	550	85	263	.741	.80
March	4,010	355	1,610	4.54	5.23
April	.....	142	538	1.52	1.70
May	.....	103	323	.910	1.05
June	3,560	51	464	1.31	1.51
July	154	31	68.4	.193	.22
August	53	26	34.5	.097	.11
September	72	23	32.8	.092	.10
The year	4,010	23	457	1.29	17.10

SLIPPERY ROCK CREEK AT WURTEMBURG, PA.

LOCATION.—At three-span steel highway bridge at Wurtemburg, Lawrence County, 1.4 miles above mouth of creek.

DRAINAGE AREA.—400 square miles.

RECORDS AVAILABLE.—January 1, 1912, to September 30, 1920. Records prior to October 1, 1918, are contained in the annual reports of the Water Supply Commission of Pennsylvania.

GAGE.—Chain attached to upstream side of bridge; read by William F. Wimer. Elevation of gage zero 817.63 feet, United States Geological Survey datum.

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

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Bed composed of sand and gravel. Low-water control is a sand and gravel bar about 200 feet below gage; may shift occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 6.17 feet at 7.30 a. m. May 11 (discharge, 4,990 second-feet); minimum stage, 1.92 feet at 7.30 a. m. September 10 (discharge, 48 second-feet).

Maximum stage recorded during the year ending September 30, 1920, estimated from hydrograph, 8.9 feet at 3 a. m. March 13 (discharge, about 11,000 second-feet); minimum stage, 1.90 feet at 7.30 a. m. September 18 (discharge, 45 second-feet).

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

ACCURACY.—Stage-discharge relation probably permanent throughout the year except as affected by ice December 17 to March 6. Rating curve fairly well defined between 100 and 5,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

Discharge measurements of Slippery Rock Creek at Wurtemburg, Pa., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Aug. 4	H. L. Landis	[a] 2.08	78	Feb. 21	R. J. Ferris	[b] 3.49	249
				June 16	J. M. Snavely	2.21	132
1920.							
Jan. 19	B. A. Knight	[b] 3.12	171				

[a] Measurement made by wading 800 feet below gage.
[b] Measurement made through complete ice cover.

Daily discharge, in second-feet, of Slippery Rock Creek at Wurtemburg, Pa., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	77	1,160	333	1,060	378	965	308	590	266	115	71	378
2	73	660	255	2,700	284	875	250	1,740	266	118	75	183
3	77	520	235	1,860	272	700	284	1,110	250	93	75	210
4	112	411	272	1,010	250	550	333	740	210	93	63	151
5	118	398	326	830	320	550	385	590	178	79	154	130
6	625	359	284	660	250	700	320	492	183	79	165	102
7	1,310	284	284	520	200	555	272	590	174	75	158	90
8	590	230	320	420	158	506	284	1,110	240	71	106	75
9	308	220	326	320	110	1,520	290	1,010	272	71	75	54
10	225	250	308	240	110	1,980	478	3,030	346	75	67	58
11	191	260	398	190	100	1,310	625	4,770	196	79	63	77
12	178	210	625	160	95	920	965	2,540	158	71	57	88
13	169	191	590	150	100	700	700	1,630	133	71	57	90
14	178	183	1,210	130	230	625	492	1,060	130	75	57	83
15	154	151	1,980	150	424	555	417	830	106	130	57	79
16	112	140	1,520	150	492	740	590	830	102	210	55	71
17	102	215	1,010	160	359	2,250	1,360	1,630	106	165	71	67
18	102	830	740	160	278	2,110	965	1,520	106	100	71	67
19	93	1,520	555	160	256	1,410	700	1,010	98	81	112	67
20	106	1,860	478	190	260	1,010	520	830	93	71	130	88
21	151	1,410	424	240	250	740	555	1,210	144	67	98	112
22	260	965	740	300	450	625	478	1,110	112	63	67	266
23	174	740	1,410	398	1,520	520	385	965	88	67	54	492
24	121	590	1,160	1,160	1,210	443	700	1,630	79	67	63	284
25	118	485	1,740	700	875	411	785	1,980	115	60	100	196
26	424	430	1,260	625	875	333	520	1,310	785	58	191	165
27	785	296	920	520	660	398	450	875	1,520	58	187	106
28	492	296	660	424	555	700	398	625	625	60	137	88
29	437	385	590	398	.....	520	430	520	240	57	124	75
30	520	478	520	346	.....	424	411	417	154	57	151	71
31	1,310	.....	520	333	.....	320	.....	365	.....	57	320	.....

Daily discharge, in second-feet, of Slippery Rock Creek at Wurtemburg, Pa., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	75	2,390	.....	60	.....	200	272	1,210	102	140	130	77
2	77	2,250	1,060	70	240	240	240	830	102	124	88	63
3	71	1,520	660	70	200	320	220	590	130	118	90	67
4	71	785	555	80	240	500	205	499	118	106	81	60
5	86	785	398	90	260	1,600	220	385	158	102	60	60
6	215	625	352	100	360	2,860	296	333	127	93	60	63
7	314	520	555	100	420	2,700	272	240	115	98	60	63
8	191	411	660	120	480	1,630	272	210	102	112	79	67
9	144	385	875	130	500	1,210	250	183	98	158	71	67
10	158	314	1,010	160	480	1,310	278	210	95	165	83	83
11	478	308	1,980	200	420	3,200	250	200	86	151	83	102
12	1,010	478	1,110	200	380	7,350	284	230	93	183	79	88
13	965	424	785	160	440	9,100	278	278	137	147	73	79
14	590	333	1,520	130	500	3,570	302	240	250	124	67	67
15	464	260	2,110	100	600	1,630	284	200	140	100	183	60
16	443	245	1,210	80	550	1,410	333	174	151	98	191	57
17	785	220	660	100	500	1,980	1,310	158	2,110	93	240	51
18	700	235	380	130	420	1,520	965	144	3,570	106	158	48
19	464	220	160	160	360	1,110	372	144	1,520	88	93	57
20	346	210	100	160	320	2,700	1,160	174	471	83	71	51
21	284	183	70	166	260	2,110	2,110	1,160	830	83	79	51
22	296	174	60	200	260	1,360	1,210	830	660	67	75	54
23	372	284	60	300	240	920	1,630	372	555	63	61	51
24	272	308	60	380	200	740	1,360	278	492	71	63	51
25	230	365	60	440	200	520	965	260	333	75	63	49
26	191	625	70	440	190	555	740	210	250	67	93	51
27	308	1,980	70	420	190	424	660	144	178	60	57	151
28	1,010	1,310	70	380	190	450	965	165	158	71	63	296
29	1,410	920	70	360	190	391	875	144	151	55	69	200
30	875	1,360	70	320	190	339	740	124	154	69	63	127
31	785	.....	70	260	.....	272	.....	118	.....	79	67	.....

NOTE.—Discharge Jan. 7–22, Feb. 9–13, 1919, and Dec. 17, 1919, to Mar. 6, 1920, estimated, because of ice, from discharge measurements and study of weather records and gage-height graph.

Monthly discharge of Slippery Rock Creek at Wurtemburg, Pa., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 400 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	1,310	73	313	0.782	0.90
November	1,860	140	538	1.34	1.50
December	1,980	235	709	1.77	2.04
January	2,700	130	538	1.34	1.54
February	1,520	95	404	1.01	1.05
March	2,250	320	838	2.10	2.42
April	1,360	250	522	1.30	1.45
May	4,770	365	1,250	3.12	3.60
June	1,520	93	249	.622	.69
July	210	57	84	.210	.24
August	320	54	104	.260	.30
September	492	54	135	.338	.38
The year	4,770	54	476	1.19	16.10
1919–20.					
October	1,410	71	441	1.10	1.27
November	2,390	174	681	1.70	1.90
December	2,110	60	546	1.38	1.59
January	440	60	195	.487	.56
February	600	190	337	.842	.91
March	9,100	200	1,750	4.38	5.05
April	2,110	205	644	1.61	1.80
May	1,210	118	337	.842	.97
June	3,570	86	448	1.12	1.25
July	183	55	102	.255	.29
August	240	57	90	.225	.26
September	296	48	80	.200	.22
The year	9,100	48	472	1.18	16.07

LITTLE BEAVER CREEK BASIN.

LITTLE BEAVER CREEK NEAR EAST LIVERPOOL, OHIO.

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

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

RECORDS AVAILABLE.—May 17, 1915, to September 30, 1920.

GAGE.—Chain gage fastened to downstream side of highway bridge; read by G. W. Garn and Burl Thompson.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—One channel at all stages; at extreme 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 DISCHARGE.—Maximum stage recorded during period May 17, 1915, to September 30, 1920, 11.22 feet at 8 a. m. February 20, 1918 (discharge, 6,900 second-feet); minimum stage, 1.78 feet at 6 p. m. August 22, 1918 (discharge, 12 second-feet).

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

ACCURACY.—Stage-discharge relation permanent from May 17, 1915, to September 30, 1920, except when affected by ice. Rating curve well defined between 20 and 2,500 second-feet; extended beyond these limits. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table except for periods affected by ice. Records good.

Discharge measurements of Little Beaver Creek near East Liverpool, Ohio, during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
1918.			
Oct. 9	Peterson and Hopkins	2.50	71
1920.			
May 11	Peterson and Bigwood	3.36	255
June 14	B. L. Bigwood	4.10	501

Daily discharge, in second-feet, of Little Beaver Creek near East Liverpool, Ohio, for the period May 17, 1915, to Sept. 30, 1920.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1915.						1915.					
1	.....	283	1,410	314	149	16	.....	1,040	725	542	66
2	.....	239	725	542	128	17	128	502	1,120	464	66
3	.....	502	725	1,410	109	18	138	329	542	329	66
4	.....	725	1,740	2,500	100	19	109	283	361	254	905
5	.....	502	2,300	1,180	109	20	97	225	283	211	464
6	.....	361	1,340	584	160	21	268	172	254	225	254
7	.....	268	725	428	198	22	905	138	225	268	160
8	.....	464	1,340	411	138	23	542	138	185	283	118
9	.....	329	1,410	2,800	118	24	411	118	160	239	100
10	.....	239	675	1,180	211	25	378	100	138	198	94
11	.....	185	542	675	149	26	283	160	128	172	94
12	.....	160	628	628	118	27	211	138	185	160	149
13	.....	283	502	628	100	28	185	98	138	138	172
14	.....	329	329	464	87	29	239	81	198	198	128
15	.....	1,340	314	361	78	30	361	1,570	268	239	100
						31	361	.....	268	172	.....

Daily discharge, in second-feet, of Little Beaver Creek near East Liverpool, Ohio, for the period May 17, 1915, to Sept. 30, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915-16.												
1	138	64	165	2,010	1,740		840	975	156	239	102	44
2	522	69	175	5,400	1,180		840	725	140	190	65	43
3	361	59	149	3,100			675	725	3,800	584	55	38
4	268	59		1,570		445	675	1,490	1,920	361	47	33
5	239	59	130	1,340			584	905	780	239	48	30
6	239	59		1,740			502	675	464	182	59	36
7	190	66	122	975		3,700	446	725	542	147	50	43
8	156	105	130	483		4,500	446	675	725	134	81	54
9	134	89	130	464		2,200	542	502	502	122	151	61
10	122	75	126	584		1,260	1,120	411	428	132	107	49
11	111	69	128	975		725	1,260	394	464	126	78	38
12	107	80	128	1,180			905	345	378	118	64	34
13	100	122	126	4,600			675	298	298	100	49	28
14	97	114	118	2,700			1,120	283	254	211	40	27
15	94	107	116	1,120			1,340	483	239	130	34	33
16	100	175	122		525		840	345	239	378	38	40
17	100	149	239			585	975	345	211	483	39	41
18	97	122	2,200				905	314	225	283	39	38
19	100	254	1,490	640			628	268	361	208	35	30
20	104	394	780				542	239	628	158	34	30
21	109	345	628				628	211	584	180	41	27
22	100	283	584	1,570			2,800	225	840	126	47	27
23	87	225	464	1,040		3,700	2,300	428	483	104	134	27
24	84	195	675	675		3,200	1,660	411	378	89	60	27
25	75	180	725	584		3,600	1,260	314	1,660	84	55	25
26	76	168	1,490	584		4,600	975	254	725	75	50	22
27	75	175	905	628		3,500	1,830	211	428	66	102	24
28	75	211	1,410	628		2,800	2,800	225	329	59	90	22
29	75	239	2,300	542		1,920	2,100	225	283	52	81	30
30	72	211	3,600	975	.....	1,410	1,340	225	239	48	66	34
31	69	.....	2,300	1,410	.....	1,040	.....	195	.....	48	42	.....
1916-17.												
1	31	55	268	329	1,830	446	411	225	1,260	298	134	59
2	30	55	225	345	840	361	428	206	840	394	107	56
3	35	54	190	502		329	428	172	584	298	94	64
4	29	66	172	628		361	361	225	428	211	80	46
5	28	111	190	3,200		584	464	905	361	162	69	41
6	27	84	175	3,600		675	1,570	584	1,120	142	64	105
7	28	75	145	1,830		483	1,920	483	1,830	126	97	94
8	26	69	134	1,040		1,340	1,340	446	1,340	116	185	268
9	28	65	134	725		1,180	780	314	1,040	118	74	180
10	33	90	145	725		905	584	314	2,300	483	69	118
11	34	109	142	428		2,600	502	283	1,920	314	64	84
12	31	97	151			3,200	446	239	1,040	225	56	65
13	34	81	190			1,740	394	225	628	298	54	56
14	61	107				1,410	361	225	464	361	126	49
15	54	156			340	1,260	329	190	446	283	122	43
16	56	142				840	314	172	378	206	107	46
17	52	118		460		780	268	160	314	502	69	41
18	44	98				725	254	158	268	628	55	36
19	254	94				584	428	329	239	394	48	35
20	345	81	110			542	378	254	225	268	41	36
21	254	76				542	314	225	185	201	36	36
22	156	72				542	283	411	156	151	38	31
23	107	90		1,340		542	239	542	170	126	130	28
24	87	268		905		2,800	225	446	394	136	211	27
25	70	239		725		1,740	225	345	283	145	124	30
26	66	283		502		1,410	298	268	193	254	84	27
27	61	211	1,920	329		780	268	254	584	1,920	66	27
28	59	156	2,500	464	905	675	225	268	283	628	56	32
29	53	361	1,340	628	.....	628	201	464	1,180	345	47	34
30	50	329	628	2,700	.....	542	198	411	446	225	52	30
31	52	.....	268	1,920	.....	464	.....	298	.....	180	55	.....

Daily discharge, in second-feet, of Little Beaver Creek near East Liverpool, Ohio, for the period May 17, 1915, to Sept. 30, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1917–18.												
1	36	905	193			1,920	193	522	975	104	61	104
2	36	483	185			2,100	208	411	542	59	41	64
3	47	483	170			1,120	225	361	378	64	34	56
4	132	394	142			725	329	329	298	61	39	68
5	178	345	134		65	905	254	283	239	57	39	64
6	114	329	128			975	206	254	298	47	28	136
7	87	298	126			905	185	268	268	43	17	78
8	74	268	70			725	628	239	225	36	47	53
9	69	239	80		1,740	905	628	225	185	36	128	40
10	66	225			2,900	2,100	464	268	180	34	100	33
11	56	211			2,500	1,040	584	298	180	32	81	28
12	54	195			3,500	975	1,490	502	190	211	54	31
13	87	198			4,400	780	1,490	2,010	188	185	45	64
14	84	198			2,400	1,490	1,410	1,740	147	114	30	47
15	72	198			3,600	1,570	905	905	124	81	24	118
16	65	198		115	1,740	780	628	628	116	56	27	56
17	61	198			975	675	725	446	100	46	33	82
18	59	195			1,120	584	1,180	394	92	40	22	97
19	780	156			1,410	502	584	314	81	38	16	69
20	1,490	142	120		6,100	428	464	283	72	41	15	72
21	502	142			2,300	411	502	329	78	36	18	69
22	329	140			1,180	378	584	314	111	33	12	60
23	298	156			780	329	502	464	142	32	13	52
24	1,830	160			725	298	628	411	104	38	14	43
25	3,700	138			780	268	522	905	87	56	14	40
26	1,660	130			1,490	254	446	1,490	75	64	12	33
27	975	138			840	225	394	584	66	52	13	30
28	905	138			628	225	840	411	61	47	13	27
29	675	134			.....	225	905	314	62	40	21	24
30	1,920	149			.....	208	725	483	54	92	75	23
31	1,570	.....			.....	203	.....	1,650	.....	69	66	.....
1918–19.												
1	23	268	102	1,260		675	298	225	314	142	70	298
2	25	185	81	3,100		522	254	1,040	268	118	75	162
3	27	124	87	1,740		428	268	675	225	100	52	124
4	25	107	100	840		394	345	464	208	87	43	107
5	24	90	113	483	115	428	345	378	225	75	94	86
6	134	84	111			584	298	345	254	64	329	75
7	193	80	95			483	268	428	203	54	201	64
8	107	68	97			411	283	542	314	66	116	52
9	78	69	94			3,000	268	1,040	239	64	81	52
10	52	84	225		102	2,700	254	4,700	211	64	69	53
11	45	69	464		81	1,570	345	4,500	168	122	54	64
12	42	62	522	310	151	975	483	2,600	145	114	49	78
13	42	59	725		156	725	378	1,490	149	78	47	61
14	40	56	1,180		193	725	329	1,040	136	70	45	52
15	45	53	2,010		254	628	345	780	162	1,740	47	41
16	40	49	1,180		225	975	628	675	134	1,410	37	48
17	35	66	780			2,300	1,340	1,180	113	483	34	40
18	33	268	522			2,010	905	905	102	298	34	36
19	33	378	428		150	1,260	628	584	95	201	78	32
20	34	483	345	298		905	522	628	86	225	72	69
21	43	464	314	268		725	502	975	725	208	53	94
22	49	345	780	254	254	584	428	975	211	151	90	132
23	47	283	1,180	298	840	483	378	1,260	124	118	81	130
24	43	225	975	840	675	428	411	2,300	100	107	47	120
25	54	185	1,830	675	522	378	394	2,400	156	69	134	87
26	111	160	1,340	502	483	361	361	1,490	1,120	69	147	66
27	142	138	780	411	446	464	314	975	1,120	59	104	56
28	111	142	584	361	378	584	283	628	411	56	75	47
29	107	134	464	329	.....	428	283	522	268	52	68	41
30	136	116	411	268	.....	361	268	411	182	42	126	39
31	329	.....	361	211	.....	345	.....	345	.....	43	584	.....

Daily discharge, in second-feet, of Little Beaver Creek near East Liverpool, Ohio, for the period May 17, 1915, to Sept 30, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	42	1,260	975				298	1,120	107	239	118	102
2	97	2,400	584			180	283	780	100	190	76	114
3	126	1,260	378				283	584	185	268	75	66
4	75	905				3,600	268	483	239	211	59	54
5	64	675	250			6,100	345	428	225	153	40	45
6	111	502				3,200	345	378	195	118	38	43
7	160	428	675			1,490	314	345	158	283	38	47
8	98	361	483			725	314	414	142	502	45	42
9	78	314	780			628	283	283	180	345	84	40
10	254	283	1,920			1,920	254	254	172	225	180	100
11	975	329	780			3,300	225	254	122	314	126	97
12	975	394	725			5,700	211	329	100	298	92	69
13	584	345	3,100			3,900	283	464	92	198	84	56
14	428	268	2,800			1,740	298	361	378	160	82	43
15	428	239	1,340		270	1,260	268	283	211	170	87	40
16	428	211	840	235		1,740	522	239	156	170	97	34
17	1,120	211				3,100	3,100	225	5,900	118	94	33
18	675	206				1,830	2,300	211	3,800	92	116	28
19	446	188				1,260	1,260	225	1,660	160	78	25
20	361	175				2,300	1,120	211	780	92	61	25
21	298	170				1,570	4,100	584	840	104	52	27
22	314	178				1,120	3,300	345	584	94	57	28
23	268	185				840	1,920	268	780	76	42	25
24	239	211	340			725	1,410	239	725	72	40	21
25	203	239				628	975	211	675	66	40	22
26	314	975				628	725	195	446	54	34	25
27	361	2,600				542	780	170	345	49	35	33
28	725	1,490				483	780	151	298	50	36	80
29	675	1,120				446	840	138	254	49	38	68
30	502	1,410			.....	378	675	122	239	52	47	78
31	522	.....			.....	329	.....	114	.....	69	298	.....

NOTE.—Stage-discharge relation affected by ice Dec. 4–6, 1915; Jan. 16–21, Feb. 3 to Mar. 6, Mar. 12–22, Dec. 14–26, 1916; Jan. 12–22, Feb. 3–27, Dec. 10–31, 1917; Jan. 1 to Feb. 9, 1918; Jan. 6–19, 31, Feb. 1–9, Feb. 17–21, Dec. 4–6, Dec. 17–31, 1919; and Jan. 1 to Mar. 3, 1920. Discharge estimated by comparison with records for Yellow Creek, study of weather record, and observer's notes.

Monthly discharge of Little Beaver Creek near East Liverpool, Ohio, for the period May 17, 1915, to Sept 30, 1920.

[Drainage area, 505 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1915.					
May 17–31	905	97	308	0.610	0.34
June	1,570	81	377	.747	.83
July	2,300	128	641	1.27	1.46
August	2,800	138	587	1.16	1.34
September	905	66	163	.323	.36
1915–16.					
October	522	69	138	.273	.31
November	394	59	151	.299	.33
December	3,600	.....	707	1.40	1.61
January	5,400	.....	1,310	2.59	2.99
February	.....	.....	589	1.17	1.26
March	4,600	.....	1,520	3.01	3.47
April	2,800	446	1,120	2.22	2.48
May	1,490	195	453	.897	1.03
June	3,800	140	623	1.23	1.37
July	584	48	176	.349	.40
August	151	34	64.0	.127	.15
September	61	22	34.5	.068	.08
The year	5,400	22	575	1.14	15.48

Monthly discharge of Little Beaver Creek near East Liverpool, Ohio, for the period May 17, 1915, to Sept. 30, 1920—Continued.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1916–17.					
October	345	26	73.4	0.145	0.17
November	361	54	130	.257	.29
December	2,500	.....	334	.661	.76
January	3,600	.....	901	1.78	2.05
February	.....	.....	431	.853	.89
March	3,200	329	1,000	1.98	2.28
April	1,920	198	481	.952	1.06
May	905	158	324	.642	.74
June	2,300	156	697	1.38	1.54
July	1,920	116	327	.648	.75
August	211	36	84.3	.167	.19
September	268	27	60.8	.120	.13
The year	3,600	26	404	.800	10.85
1917–18.					
October	3,700	36	581	1.15	1.33
November	905	130	243	.481	.54
December	.....	.....	125	.248	.29
January	.....	.....	115	.228	.26
February	6,100	.....	1,490	2.95	3.07
March	2,100	203	782	1.55	1.79
April	1,490	185	628	1.24	1.38
May	2,010	225	582	1.15	1.33
June	975	54	191	.378	.42
July	211	32	62.7	.124	.14
August	128	12	37.2	.074	.09
September	136	23	58.7	.116	.13
The year	6,100	12	400	.792	10.77
1918–19.					
October	329	23	72.5	.144	.17
November	483	49	163	.323	.36
December	2,010	81	590	1.17	1.35
January	3,100	.....	532	1.05	1.21
February	840	.....	234	.463	.48
March	3,000	345	866	1.71	1.97
April	1,340	254	414	.820	.91
May	4,700	225	1,180	2.34	2.70
June	1,120	86	272	.539	.60
July	1,740	42	211	.418	.48
August	584	34	101	.200	.23
September	298	32	80.2	.159	.18
The year	4,700	23	396	.784	10.64
1919–20.					
October	1,120	42	385	.762	.88
November	2,600	170	651	1.29	1.44
December	3,100	.....	685	1.36	1.57
January	.....	.....	235	.465	.54
February	.....	.....	270	.535	.58
March	6,100	.....	1,680	3.33	3.84
April	4,100	211	936	1.85	2.06
May	1,120	114	333	.659	.76
June	5,900	92	670	1.33	1.48
July	502	49	163	.323	.37
August	298	34	77.1	.153	.18
September	114	21	50.3	.100	.11
The year	6,100	21	512	1.01	13.81

YELLOW CREEK BASIN.

YELLOW CREEK AT HAMMONDSVILLE, OHIO.

LOCATION.—At covered highway bridge on Steubenville Pike, a fifth of a 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, 1920.

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 shifting. Point of zero flow, gage height about 1.4 feet September, 1915 and 1916, and October, 1917.

EXTREMES OF STAGE.—Maximum stage recorded during the year ending September 30, 1919, 11.46 feet at 8.20 a. m. July 17; minimum stage, 1.59 feet at 6 p. m. October 19.

Maximum stage recorded during the year ending September 30, 1920, 13.2 feet at 10 a. m. June 17; minimum stage, 1.84 feet at 6 p. m. October 4.

1915–1920: Maximum stage recorded, 13.2 feet at 10 a. m. June 17, 1920; minimum stage, 1.28 feet at 7.10 p. m. August 28, 1918. 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 not permanent, affected by ice during part of December, January, and February. Rating curve not fully developed. Gage read to hundredths twice daily. Records good.

Discharge measurements of Yellow Creek at Hammondsville, Ohio, during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*
Oct. 8	Peterson and Hopkins	2.17	16.1
1920.			
May 12	Peterson and Bigwood	2.88	124
June 14	B. L. Bigwood	2.16	38

Daily gage height, in feet, of Yellow Creek at Hammondsville, Ohio, for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	1.64	2.78	2.17	3.51	2.27	3.16	2.66	3.09	2.73	2.22	2.22	3.70
2	1.62	2.54	2.13	4.16	2.26	3.13	2.60	4.00	2.62	2.14	2.20	2.88
3	1.66	2.32	2.08	3.97	2.23	3.03	2.56	3.35	2.53	2.08	2.16	2.61
4	1.70	2.18	2.13	4.11	2.16	2.88	2.51	3.06	2.42	2.04	4.39	2.41
5	1.67	2.10	2.15	7.97	2.13	2.77	2.46	2.96	2.50	2.02	7.45	2.17
6	1.94	2.03	2.13	7.92	2.13	2.70	2.43	2.86	2.64	2.00	7.53	2.03
7	1.90	1.98	2.09	6.12	2.19	2.64	2.38	2.92	2.44	1.97	6.76	1.97
8	1.84	1.96	2.05	5.97	2.19	3.17	2.35	3.40	2.43	1.92	4.86	3.07
9	1.75	1.98	2.27	5.52	2.17	5.87	2.30	4.16	3.50	1.86	3.53	3.03
10	1.70	1.94	3.28	5.40	2.19	5.09	2.28	7.66	2.64	1.95	2.98	2.71
11	1.66	1.90	4.05	5.35	2.25	4.15	2.66	5.42	2.42	2.06	2.72	2.37
12	1.82	1.87	3.99	4.97	2.29	3.68	3.14	4.56	2.34	2.00	2.58	2.23
13	1.84	1.84	3.85	4.87	2.47	3.39	2.89	4.10	2.29	1.95	2.50	2.19
14	1.76	1.80	4.52	4.79	2.43	3.19	2.73	3.79	2.23	1.90	2.42	2.17
15	1.70	1.76	4.21	4.67	2.45	2.97	2.81	3.54	3.24	7.96	2.35	2.13
16	1.66	1.71	3.73	4.58	2.35	4.08	3.75	3.41	2.40	8.51	2.31	2.05
17	1.66	2.65	3.33	4.18	2.30	4.45	4.07	3.72	2.19	9.81	2.27	1.99
18	1.63	2.99	3.11	3.90	2.27	4.26	3.74	3.29	2.80	5.52	2.22	1.95
19	1.60	3.13	3.01	3.32	2.22	3.88	3.48	3.04	2.36	3.64	2.14	1.97
20	1.88	3.35	2.95	2.75	2.17	3.65	3.30	3.20	2.04	3.96	2.35	2.03
21	2.00	3.59	2.87	2.41	2.19	3.39	3.24	3.59	2.42	3.72	2.58	2.25
22	1.88	4.01	4.19	2.27	2.18	3.23	2.98	3.58	2.32	3.54	2.47	2.61
23	1.73	3.99	4.03	3.79	3.76	3.04	2.87	3.48	2.14	3.32	2.37	3.07
24	1.65	2.59	3.95	3.73	3.59	2.93	3.01	3.56	2.03	3.08	2.31	2.95
25	1.76	2.49	4.53	3.53	3.49	2.87	2.84	4.01	2.14	2.72	3.45	2.81
26	2.10	2.45	4.27	3.33	3.41	2.79	2.73	3.95	4.54	2.52	2.86	2.63
27	2.02	2.41	3.87	3.13	3.29	2.65	2.68	3.60	4.48	2.38	2.38	2.45
28	1.97	2.35	3.38	2.92	3.14	2.59	2.64	3.27	2.78	2.32	2.09	2.18
29	2.01	2.25	3.11	2.73	.....	2.52	2.63	3.14	2.43	2.30	1.98	2.02
30	3.00	2.19	2.95	2.52	.....	2.67	2.64	3.00	2.32	2.28	2.17	1.93
31	3.34	.....	2.87	2.35	.....	2.75	.....	2.90	.....	2.25	4.39	.....

Daily gage height, in feet, of Yellow Creek at Hammondsville, Ohio, for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	1.90	4.95	3.85	4.03	4.34	5.39	2.94	3.77	2.16	3.00	2.81	2.56
2	1.87	4.93	3.63	3.94	4.34	5.42	2.88	3.67	2.18	3.01	2.59	2.37
3	1.86	4.76	3.37	3.85	4.36	5.96	2.82	3.63	2.47	3.19	2.51	3.32
4	1.85	4.09	3.04	3.79	4.40	8.14	2.75	3.57	2.45	2.97	2.49	2.29
5	2.11	3.77	2.71	3.70	4.42	8.06	2.68	3.50	2.84	2.89	2.54	2.32
6	2.65	3.52	2.67	3.64	4.47	5.56	2.63	3.44	2.66	2.77	2.44	2.29
7	2.35	3.37	3.27	3.60	4.61	4.29	2.60	3.38	2.30	3.02	2.31	2.24
8	1.98	3.17	3.81	3.55	4.65	3.13	2.55	3.34	2.30	3.24	2.55	2.20
9	1.98	3.05	4.05	3.80	4.74	3.34	2.52	2.80	2.45	3.54	2.89	2.38
10	4.02	2.85	3.99	4.82	4.67	3.72	2.48	2.75	2.19	3.04	2.87	3.20
11	4.16	2.96	3.84	4.79	4.62	4.80	2.45	2.71	2.11	3.11	2.84	2.64
12	4.69	2.89	3.92	4.76	4.65	5.99	2.42	2.82	2.04	3.34	2.62	2.50
13	4.21	2.79	5.89	4.73	4.71	4.04	2.37	3.18	1.99	3.14	2.59	2.42
14	3.79	2.69	6.54	4.54	4.76	3.56	2.32	2.88	2.22	3.01	2.62	2.39
15	4.21	2.64	5.87	4.45	4.73	3.04	2.26	2.70	2.06	3.07	2.66	2.36
16	6.03	2.59	5.91	4.36	4.75	2.78	5.86	2.61	4.62	2.97	2.70	2.29
17	6.85	2.55	6.17	4.14	4.86	5.04	5.54	2.52	11.80	2.84	2.68	2.25
18	6.67	2.51	6.18	4.05	4.96	4.04	5.33	2.51	6.20	2.77	2.54	2.19
19	4.22	2.47	3.95	3.94	5.08	3.49	4.64	2.62	4.42	3.71	2.48	2.20
20	3.64	2.44	4.94	3.91	5.61	4.49	5.64	2.72	3.96	2.87	2.44	2.27
21	3.41	2.34	4.92	3.88	5.68	4.14	7.44	4.25	4.04	2.83	2.46	2.24
22	3.59	2.23	4.89	3.84	5.95	3.92	5.24	3.25	3.58	2.77	2.45	2.23
23	3.71	2.51	4.85	3.90	6.52	3.82	4.60	3.05	3.84	2.71	2.36	2.22
24	3.63	3.03	4.81	4.03	6.44	3.73	4.48	2.77	3.76	2.69	2.42	2.22
25	3.52	3.27	4.74	4.59	6.32	3.64	4.40	2.68	3.73	2.61	2.37	2.25
26	3.45	5.99	4.65	4.45	6.04	3.58	3.73	2.58	3.29	2.56	2.34	2.29
27	3.67	6.07	4.50	4.40	5.85	3.44	3.68	2.50	3.22	2.52	2.36	2.42
28	4.23	4.93	4.37	4.36	5.66	3.36	3.91	2.40	3.15	2.48	2.29	2.53
29	4.12	4.51	4.25	4.30	5.54	3.24	3.92	2.32	3.04	2.45	2.34	2.43
30	3.87	4.30	4.12	4.22	.....	3.16	3.86	2.26	2.98	2.47	2.44	2.59
31	3.78	.....	4.08	4.24	.....	3.02	.....	2.20	.....	2.61	2.78	.....

NOTE.—Stage-discharge relation affected by ice Jan. 3–20, Dec. 15–31, 1919, and Jan. 1 to Mar. 4, 1920.

MIDDLE ISLAND CREEK BASIN.

MIDDLE ISLAND CREEK AT LITTLE, W. VA.

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

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

RECORDS AVAILABLE.—May 7, 1915, to September 30, 1920.

GAGE.—Vertical and inclined staff on left bank immediately below the bridge; read by E. F. Weigand.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

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 bedrock, 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 the year ending September 30, 1919, 19.0 feet at noon January 2; minimum stage, 1.44 feet at 6 p. m. October 21 and 7 a. m. October 22.

Maximum stage recorded during the year ending September 30, 1920, 19.7 feet at 10.30 p. m. November 26; minimum stage, 1.64 feet September 4, 5, 25, and 26.

1915–1920: Maximum stage recorded, 22.22 feet at 5 p. m. January 22, 1917: minimum stage, 1.44 feet at 6 p. m. October 21 and at 7 a. m. October 22, 1918. Highest known flood occurred in August, 1875; gage height about 33.5 feet.

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

ACCURACY.—No discharge measurements made since February 25, 1916. Gage last checked February 22, 1918. Stage-discharge relation affected by ice during parts of January and February, 1920. Gage read twice daily to hundredths.

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

Daily gage height, in feet, of Middle Island Creek at Little, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	2.09	5.04	3.29	10.69	2.89	4.69	3.19	3.44	2.74	2.49	2.24	3.09
2	2.04	3.84	3.14	18.55	2.74	4.54	3.09	4.14	2.69	2.39	2.09	2.89
3	2.04	3.29	2.94	7.19	2.74	3.94	2.99	4.19	2.59	2.29	2.04	2.69
4	1.94	2.94	2.89	4.49	2.79	3.74	2.89	3.64	2.44	2.24	2.04	2.54
5	1.94	2.69	2.79	4.24	2.99	3.84	2.84	3.64	2.59	2.14	2.04	2.39
6	1.89	2.59	2.74	4.14	3.09	5.79	2.74	4.29	2.99	2.09	2.14	2.09
7	1.84	2.34	2.74	4.04	2.94	4.64	2.74	5.39	2.89	2.04	2.19	2.14
8	1.84	2.34	2.74	3.89	2.84	4.09	2.74	6.59	2.74	2.09	2.24	2.14
9	1.79	2.34	3.14	4.79	2.79	5.94	2.74	5.99	2.69	2.34	2.24	2.14
10	1.74	2.34	5.29	4.54	2.69	6.89	2.79	11.79	2.64	2.34	2.19	2.14
11	1.64	2.39	7.79	4.34	2.69	5.04	3.14	6.69	2.64	4.54	2.14	2.04
12	1.79	2.39	4.89	3.99	2.84	4.24	3.79	4.49	2.79	3.54	2.44	2.04
13	1.89	2.34	4.39	3.74	2.74	3.69	3.59	3.84	2.59	3.64	2.74	2.04
14	1.79	2.24	4.89	3.49	2.89	3.49	3.39	3.39	2.34	4.54	2.89	1.99
15	1.74	2.24	8.54	4.44	4.49	3.39	3.09	3.34	2.84	5.29	4.09	1.89
16	1.64	2.19	5.89	4.29	4.79	3.19	3.24	3.24	2.89	4.84	2.74	1.84
17	1.64	2.24	4.84	3.79	4.09	3.14	4.09	3.64	7.84	4.54	2.94	1.74
18	1.64	3.89	3.59	3.99	3.79	3.09	3.94	4.19	3.49	3.94	2.74	1.69
19	1.54	5.64	3.19	4.09	3.54	3.39	3.59	3.49	2.99	3.54	3.34	1.74
20	1.54	7.19	3.04	3.69	3.34	3.34	3.49	7.39	2.79	4.04	3.19	1.74
21	1.49	6.59	2.94	3.49	3.44	3.24	3.24	12.05	2.59	4.54	3.24	1.74
22	1.59	5.89	4.29	3.29	4.09	3.14	3.24	5.09	2.34	4.59	5.59	2.59
23	2.09	4.59	6.99	3.74	4.94	3.04	3.14	4.49	2.34	3.94	4.44	4.09
24	2.09	3.19	4.59	6.99	4.49	2.94	3.64	4.84	2.34	3.34	3.44	3.64
25	2.09	2.99	6.19	5.09	4.09	2.84	3.79	5.24	2.64	2.94	3.04	3.04
26	2.04	2.79	4.59	3.94	4.29	2.84	3.54	4.19	2.79	2.64	2.74	2.74
27	2.49	2.74	3.84	3.49	4.19	3.04	3.24	3.64	4.39	2.29	2.49	2.59
28	2.59	2.89	3.49	3.34	3.84	4.79	3.29	3.29	3.59	2.14	2.44	2.44
29	2.69	3.69	3.44	3.19	.....	3.99	3.09	3.04	3.14	2.04	2.34	2.29
30	2.79	3.64	3.39	3.04	.....	3.59	3.14	2.94	2.84	1.94	2.59	2.24
31	5.74	.....	3.19	3.04	.....	3.39	.....	2.79	.....	2.09	3.44	.....
1919–20.												
1	2.29	11.24	3.89	3.64	3.09	3.54	2.74	5.24	2.54	2.69	2.24	1.89
2	2.29	8.39	3.44	3.59	3.04	3.19	2.74	4.19	2.44	4.74	2.24	1.79
3	2.19	5.64	3.34	3.39	3.04	3.19	2.64	3.74	2.54	7.84	2.14	1.74
4	2.14	4.19	3.24	3.24	5.04	4.19	2.84	3.39	5.89	6.34	2.09	1.64
5	2.04	3.79	3.04	3.19	6.94	6.34	3.59	3.24	12.30	4.44	2.04	1.64
6	2.34	3.54	3.34	3.14	4.99	5.14	3.74	3.09	6.34	3.84	2.04	1.89
7	2.54	3.19	14.39	3.09	4.04	4.04	4.19	3.04	4.19	7.14	2.04	1.74
8	2.39	3.04	7.24	3.09	3.84	3.89	4.29	2.94	3.74	6.84	2.04	1.89
9	2.39	2.99	5.14	12.60	3.64	3.74	3.79	2.89	3.34	4.54	2.09	1.99
10	2.64	2.84	4.04	7.34	4.64	3.54	3.49	2.84	3.09	3.84	3.14	2.69
11	2.79	2.79	3.79	4.64	6.39	3.59	3.34	2.79	3.04	5.34	3.64	3.04
12	3.49	3.09	3.59	3.79	4.54	3.89	3.24	2.89	2.79	6.34	3.04	3.09
13	5.14	3.04	6.69	3.49	4.24	4.79	3.29	6.34	2.74	4.59	2.94	2.89
14	6.14	2.94	12.25	3.44	4.54	4.79	3.14	4.34	2.74	3.44	2.89	2.69
15	6.99	2.84	5.84	3.49	4.14	4.24	3.09	3.64	2.74	3.64	2.69	2.49
16	6.74	2.84	4.24	3.84	3.99	5.74	3.04	3.39	2.69	3.89	2.54	2.29
17	7.34	2.74	4.09	4.14	4.19	8.84	3.34	3.14	2.89	3.34	2.44	2.14
18	4.29	2.74	4.14	3.94	4.04	4.89	4.54	3.04	2.99	3.04	2.34	2.04
19	3.59	2.64	4.34	3.69	4.14	5.24	3.94	2.99	2.79	2.99	2.24	2.04
20	3.14	2.64	4.09	3.49	4.29	9.19	3.79	3.14	2.74	2.79	2.14	2.04
21	2.94	2.64	3.99	3.54	5.59	5.44	15.00	3.54	2.74	2.64	2.04	1.94
22	3.34	2.54	3.79	6.44	9.09	4.04	6.04	3.09	2.89	2.59	2.04	1.84
23	4.39	2.54	3.64	11.64	6.44	3.79	4.04	2.94	6.44	2.44	2.04	1.74
24	3.64	2.74	3.59	9.64	5.34	3.59	3.84	2.94	5.69	2.34	2.04	1.69
25	3.04	5.94	3.54	5.94	4.54	3.44	3.49	2.89	4.84	2.44	2.04	1.64
26	3.24	17.35	3.54	4.54	4.14	3.44	3.49	2.84	4.84	2.94	1.94	1.64
27	3.89	16.40	3.54	3.79	3.99	3.29	4.59	2.74	3.29	2.89	2.04	1.79
28	4.59	6.04	3.54	3.54	3.84	3.19	6.19	2.69	3.19	2.59	2.04	1.84
29	4.24	4.29	3.44	3.34	3.79	2.99	3.94	2.64	3.09	2.54	2.04	1.89
30	3.59	4.89	3.34	3.24	.....	2.84	3.84	2.59	2.89	2.39	2.04	2.04
31	3.64	.....	3.29	3.24	.....	2.79	.....	2.54	.....	2.34	2.04	.....

NOTE.—Stage-discharge relation affected by ice about Dec. 15, 1919, to Jan. 22, 1920.

LITTLE MUSKINGUM RIVER BASIN.

LITTLE MUSKINGUM RIVER AT FAY, OHIO.

LOCATION.—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 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, 1920.

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 in May, 1915.

EXTREMES OF STAGE.—Maximum stage recorded during year ending September 30, 1919, 16.90 feet at 5 p. m. January 2; minimum stage, 1.23 feet July 9 and July 10.

Maximum stage recorded during the year ending September 30, 1920, 22.50 feet at 8 a. m. November 27; minimum stage, 1.24 feet at 8 a. m. September 27.

1915–1920: Maximum stage recorded, 22.5 feet at 8 a. m. November 27, 1919; minimum stage, 1.17 feet at 5 p. m. October 2 and 8 a. m. October 3, 1917. Highest flood known reached a stage represented by gage height about 23 feet.

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

ACCURACY.—No discharge measurements made since February 20, 1918. Gage last checked February 20, 1918. Stage-discharge relation affected by ice during parts of December, 1919, January and February, 1920. Gage read twice daily to hundredths.

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

Daily gage height, in feet, of Little Muskingum River at Fay, Ohio, for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1.47	3.28	2.22	12.45	2.19	3.75	2.34	2.38	2.06	1.50	1.28	3.28
2	1.48	2.70	2.12	16.48	2.12	3.35	2.22	2.64	1.96	1.45	1.28	2.49
3	1.52	2.36	2.05	5.29	2.09	3.04	2.18	2.44	1.91	1.41	1.26	2.16
4	1.52	2.20	2.04	3.53	2.18	2.82	2.16	2.28	1.86	1.36	1.24	2.00
5	1.52	2.06	2.02	3.12	2.18	2.93	2.13	2.21	1.99	1.32	1.32	1.86
6	1.84	1.94	1.96	3.04	2.02	4.42	2.08	2.24	2.02	1.29	3.38	1.80
7	2.30	1.86	1.90	2.86	1.90	3.65	2.04	3.70	1.96	1.27	2.38	1.69
8	1.83	1.76	1.83	2.82	1.95	3.26	2.06	3.43	1.81	1.25	2.00	1.61
9	1.65	1.72	1.86	2.81	1.92	.....	2.06	3.76	1.82	1.24	1.74	1.60
10	1.58	1.68	6.04	2.78	1.86	6.25	2.02	6.25	1.74	1.23	1.54	1.87
11	1.55	1.68	8.55	2.56	1.86	3.70	2.08	4.72	1.65	1.52	1.49	1.99
12	1.49	1.65	5.20	2.40	1.83	3.30	2.28	3.48	1.57	2.09	4.15	1.84
13	1.48	1.59	4.78	2.26	1.92	3.02	2.28	3.17	1.54	2.04	3.70	1.72
14	1.44	1.57	5.98	2.42	2.14	2.88	2.16	2.91	1.48	3.50	3.72	1.61
15	1.42	1.54	6.88	2.60	2.82	2.74	2.11	2.62	1.55	2.82	3.34	1.54
16	1.38	1.52	4.27	2.60	3.16	2.66	2.55	2.54	2.73	2.72	3.26	1.44
17	1.36	1.62	3.34	2.50	2.86	2.67	3.40	2.99	2.62	2.06	2.96	1.40
18	1.36	1.96	2.96	2.55	2.68	3.42	3.14	3.12	2.14	1.76	5.20	1.39
19	1.37	2.94	2.72	2.54	2.51	3.21	2.59	2.68	1.84	2.92	6.10	1.38
20	1.43	4.68	2.56	2.43	2.38	2.94	2.47	5.40	1.64	2.75	2.90	1.38
21	1.64	3.64	2.46	2.32	2.84	2.76	2.66	5.76	1.57	2.00	4.20	1.40
22	1.79	2.99	7.50	2.24	3.88	2.60	2.58	3.50	1.59	1.74	4.35	1.84
23	1.74	2.68	7.30	4.00	3.96	2.46	2.45	4.64	1.54	1.63	2.98	4.86
24	1.66	2.36	4.30	5.75	3.40	2.35	3.16	5.18	1.54	1.56	2.35	2.55
25	1.68	2.22	5.60	3.70	3.14	2.31	2.71	4.59	1.57	1.50	2.18	2.12
26	1.86	2.08	3.92	3.22	3.14	2.25	2.44	3.50	2.72	1.48	2.22	1.89
27	2.05	2.01	3.28	2.92	2.87	2.66	2.32	3.01	2.21	1.39	1.98	1.76
28	2.12	2.22	3.06	2.72	2.73	3.19	2.34	2.70	2.06	1.35	1.84	1.66
29	2.48	2.59	2.80	2.62	.....	2.73	2.20	2.47	1.78	1.33	1.74	1.58
30	3.36	2.42	2.62	2.40	.....	2.53	2.14	2.30	1.58	1.30	1.88	1.52
31	5.78	.....	2.80	2.30	.....	2.44	.....	2.17	.....	1.28	5.20	.....

Daily gage height, in feet, of Little Muskingum River at Fay, Ohio, for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	1.49	11.90	3.54	2.61	2.42	2.46	2.16	3.57	1.69	1.86	1.50	1.30
2	1.46	12.90	3.17	2.80	2.34	2.30	2.13	3.20	1.64	3.94	1.50	1.30
3	1.44	4.79	2.86	2.61	2.42	2.32	2.09	2.94	1.68	5.45	1.50	1.29
4	1.44	3.61	2.64	2.34	5.20	2.42	2.12	2.70	2.94	3.21	1.50	1.28
5	1.41	3.14	2.52	2.20	4.18	8.85	2.16	2.54	8.35	2.49	1.48	1.26
6	4.11	2.79	2.52	1.92	3.26	3.85	2.14	2.41	3.65	2.18	1.43	1.25
7	2.80	2.64	12.15	1.96	2.92	2.94	2.24	2.30	2.80	2.76	1.44	1.26
8	2.19	2.50	5.85	3.81	2.72	2.86	2.29	2.22	2.44	3.28	1.40	1.26
9	2.00	1.83	10.10	12.05	2.58	2.75	2.19	2.16	2.25	2.84	1.47	1.25
10	1.90	2.18	9.90	4.85	4.60	2.66	2.12	2.12	2.29	2.51	1.84	3.09
11	1.95	2.31	4.05	3.42	4.43	2.85	2.04	2.07	1.99	6.20	2.28	2.45
12	6.02	2.45	3.34	3.11	3.53	3.85	2.00	2.28	1.90	8.30	2.04	2.02
13	3.58	2.34	8.45	2.96	3.48	4.75	2.10	9.30	1.95	3.50	2.66	1.84
14	3.48	2.22	11.25	2.74	3.36	3.70	2.12	4.20	2.82	2.88	2.14	1.65
15	5.38	2.14	4.52	2.68	3.14	3.53	2.05	3.20	2.41	2.82	1.92	1.52
16	5.67	2.08	3.69	2.66	2.78	4.22	2.06	2.83	2.15	2.45	2.08	1.46
17	7.50	2.03	3.34	4.15	2.94	8.35	3.12	2.63	2.69	2.61	1.92	1.41
18	3.73	2.00	2.98	3.15	2.72	3.80	3.45	2.49	3.62	2.30	1.75	1.37
19	3.04	1.96	3.06	2.89	2.82	6.10	2.28	2.44	2.58	5.75	1.62	1.34
20	2.66	1.92	2.90	2.77	2.68	8.25	7.35	2.46	2.28	3.15	1.52	1.31
21	2.46	1.86	3.00	8.05	4.54	4.45	15.00	2.45	2.16	2.62	1.48	1.29
22	2.40	1.84	2.75	3.88	8.48	3.55	5.90	2.28	2.54	2.30	1.45	1.28
23	2.32	1.84	2.62	9.25	5.15	3.22	3.84	2.15	4.66	2.14	1.46	1.27
24	2.20	1.95	2.62	10.20	4.28	2.98	3.21	2.28	3.58	1.96	1.44	1.28
25	2.12	8.10	.....	3.48	3.42	2.85	2.86	2.30	2.52	1.90	1.54	1.28
26	2.28	18.30	2.48	3.07	2.97	2.76	2.76	2.12	2.35	1.80	1.47	1.26
27	3.68	20.55	2.44	3.54	2.78	2.64	3.44	2.01	2.20	1.72	1.42	1.24
28	4.76	4.90	2.45	3.02	2.67	2.52	5.82	1.92	2.04	1.62	1.38	1.38
29	3.54	4.65	2.42	2.65	2.50	2.42	3.69	1.84	1.92	1.58	1.34	1.66
30	3.08	4.45	2.33	2.65	.....	2.32	3.38	1.74	1.86	1.53	1.34	1.68
31	3.01	.....	2.38	2.57	.....	2.22	.....	1.72	.....	1.51	1.32	.....

NOTE.—Stage-discharge relation affected by ice about Dec. 16, 1919, to Feb. 3, 1920, and Feb. 11-21, 1920.

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 one-third mile below gage.

DRAINAGE AREA.—7,160 square miles (revised measurement).

RECORDS AVAILABLE.—June 1, 1915, to September 30, 1920.

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 4 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 at Philo, about 4 miles below gage. Except for leakage through lock and dam and leakage and flow to flour mill at left end of dam, and leakage and flow through gate at right end of dam leading to old canal for supply to railroad pumping station, the gage height of the crest of the dam, 8.83 feet, is the point at which flow would be zero.

EXTREMES OF STAGE.—Maximum stage recorded during year ending September 30, 1919, 19.3 feet at 6 p. m. May 10; minimum stage, 9.1 feet at 6 p. m. September 15.

Maximum stage recorded during the year ending September 30, 1920, 24.0 feet at 6 a. m. April 22; minimum stage, 9.5 feet October 1.

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.

REGULATIONS.—Leakage through the lock and the power plants at dam No. 9 and the operation of power plants at dam 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 affected by ice during parts of December, 1919, January and February, 1920. 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.

No discharge measurements were made at this station since April 23, 1917.

Daily gage height, in feet, of Muskingum River at Frazier, Ohio, for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	9.4	10.0	10.2	11.95	10.0	10.5	10.5	10.65	10.85	9.95	9.7	11.15
2	9.4	10.45	10.2	15.05	10.0	10.4	10.6	10.95	10.8	9.8	9.95	10.3
3	9.4	10.35	10.1	15.2	10.0	11.0	10.45	11.5	10.55	9.55	10.0	11.05
4	9.4	10.3	10.0	14.15	9.9	10.85	10.4	11.2	10.5	9.6	9.85	10.35
5	9.4	10.3	9.9	12.95	9.9	10.75	10.4	10.8	10.4	9.6	10.7	9.75
6	9.4	10.2	9.9	12.25	9.85	10.95	10.4	10.6	10.2	9.5	15.25	9.5
7	9.65	9.8	9.9	11.7	9.8	11.0	10.4	10.6	9.95	9.5	17.45	9.5
8	9.95	9.5	9.8	11.45	9.8	11.1	10.4	10.75	9.9	9.5	17.45	9.5
9	10.0	9.5	9.9	11.0	9.8	12.7	10.4	12.6	9.95	9.4	16.0	9.4
10	9.9	9.5	10.25	10.85	9.7	14.15	10.4	18.35	9.9	9.4	13.1	9.5
11	9.9	9.4	10.35	10.7	9.7	14.35	10.55	18.05	9.9	9.5	11.9	9.5
12	9.75	9.4	11.35	10.0	9.7	13.75	11.1	17.1	9.8	10.0	11.35	9.35
13	9.6	9.4	12.3	10.0	9.7	13.0	11.0	16.85	9.55	10.05	10.9	9.85
14	9.5	9.6	13.15	10.35	9.8	12.05	11.0	15.45	9.5	9.9	10.65	9.55
15	9.5	9.6	14.45	10.25	9.8	11.5	10.9	13.65	9.5	9.9	10.45	9.25
16	9.5	9.6	14.35	10.35	9.8	16.75	10.95	13.3	10.4	9.9	10.3	9.8
17	9.4	9.65	13.75	10.3	9.9	17.75	11.65	11.9	10.45	9.95	10.2	9.75
18	9.4	9.95	13.0	10.35	9.9	18.05	12.6	11.95	10.4	10.6	10.0	9.65
19	9.4	10.15	12.0	10.4	9.95	17.4	12.45	12.3	10.1	10.45	10.3	9.6
20	9.4	10.75	11.45	10.3	10.0	15.05	11.4	12.2	9.95	11.75	10.25	9.5
21	9.55	10.9	11.15	10.3	9.9	13.55	11.5	13.2	9.8	14.65	10.35	9.5
22	9.5	11.0	11.0	10.2	9.9	12.65	11.3	13.9	9.8	14.15	10.1	9.75
23	9.4	10.75	12.45	10.25	10.0	12.45	11.0	13.9	9.8	13.1	10.05	10.0
24	9.4	10.5	13.2	10.65	10.65	11.5	10.95	13.7	9.7	12.25	10.5	10.35
25	9.4	10.3	13.4	11.05	11.0	11.2	10.9	14.45	9.6	12.4	10.2	10.35
26	9.4	10.3	13.35	11.25	10.8	10.95	11.0	14.95	10.20	10.6	9.95	10.1
27	9.5	10.3	12.95	10.9	10.55	10.9	10.85	14.15	10.45	10.1	10.15	9.8
28	9.55	10.2	12.6	10.65	10.4	10.8	10.7	12.9	10.35	10.0	10.1	9.6
29	9.65	10.25	11.75	10.5	.....	10.9	10.6	12.15	10.5	9.85	9.8	9.5
30	9.85	10.2	11.05	10.35	.....	10.8	10.0	11.6	10.2	9.8	9.75	9.45
31	10.0	.....	10.75	10.15	.....	10.65	.....	11.05	.....	9.8	10.15	.....

Daily gage height, in feet, of Muskingum River at Frazier, Ohio, for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	9.5	15.0	16.15	9.75	9.55	9.5	10.8	12.4	9.9	10.5	9.7	12.1
2	9.85	17.3	14.65	9.5	9.5	9.4	10.8	12.4	9.9	11.0	9.9	11.55
3	10.45	16.65	13.45	9.5	12.65	9.65	10.6	11.95	10.5	11.45	10.0	10.9
4	10.3	15.8	12.25	9.5	13.2	12.2	10.6	11.65	11.9	11.6	9.9	10.0
5	10.0	14.95	11.55	9.3	12.85	12.4	10.5	11.35	11.15	11.45	9.75	10.5
6	10.0	14.35	11.0	9.3	12.35	12.0	10.4	11.05	10.55	10.95	9.6	12.4
7	10.45	13.7	12.35	9.3	12.0	10.85	11.3	10.9	9.9	11.2	9.6	11.4
8	10.4	12.7	12.0	11.0	11.5	10.35	10.35	10.8	9.8	10.95	9.6	10.95
9	10.15	11.65	13.0	11.4	11.6	12.6	10.5	10.7	10.0	11.65	9.65	10.65
10	9.85	11.05	13.85	10.35	11.35	12.15	10.4	10.6	10.0	11.4	10.25	12.05
11	9.7	11.15	13.6	9.95	11.5	12.25	10.5	10.6	10.0	11.15	11.0	11.55
12	11.4	11.05	12.9	10.0	11.8	15.2	10.4	10.65	10.0	10.8	10.8	11.15
13	11.8	11.0	15.2	10.0	11.85	17.65	10.55	11.65	10.0	11.05	11.25	10.9
14	11.65	10.95	16.75	9.85	11.7	17.35	11.05	11.3	9.9	11.0	12.1	10.65
15	11.5	10.75	15.25	9.8	11.35	16.4	11.05	11.35	9.9	11.35	12.75	10.0
16	11.95	10.5	14.35	9.75	10.85	15.65	11.35	11.1	10.35	11.6	13.1	10.0
17	12.45	10.45	13.4	9.55	10.35	18.1	18.1	10.8	10.45	11.45	12.05	10.05
18	12.6	10.4	12.8	9.45	10.2	17.15	18.45	10.15	11.75	11.0	11.2	9.95
19	12.5	10.05	12.35	9.4	10.2	16.5	17.45	10.45	13.4	11.95	10.75	9.9
20	12.5	10.3	12.05	9.4	9.95	15.9	17.6	10.4	14.9	11.45	10.45	9.9
21	12.25	10.3	11.65	11.9	9.65	15.1	21.95	10.4	14.95	11.4	10.4	9.9
22	11.55	10.5	11.25	11.7	10.2	14.45	23.75	11.35	13.25	10.85	10.4	9.85
23	10.9	10.0	10.95	11.75	11.75	13.6	21.8	11.0	12.45	10.5	10.35	9.8
24	10.8	10.0	10.75	12.0	12.35	12.9	20.15	10.65	12.2	10.4	10.75	9.8
25	10.6	10.1	10.7	11.75	11.85	12.15	18.1	10.5	12.25	10.4	10.15	9.75
26	10.7	13.4	10.55	11.15	11.35	11.8	15.85	10.4	11.95	10.05	10.0	9.7
27	10.95	17.3	10.5	11.0	10.85	11.4	13.8	10.35	11.5	9.9	9.95	9.7
28	11.6	15.85	10.45	11.0	10.4	11.15	13.15	10.3	11.0	9.8	10.65	9.7
29	12.4	15.6	10.0	10.35	10.15	11.0	12.95	10.2	10.8	9.75	10.95	9.7
30	13.4	16.5	10.0	9.85	.....	11.0	12.8	10.05	10.5	9.65	11.45	9.7
31	12.95	.....	10.0	9.7	.....	10.9	.....	9.9	.....	9.7	11.65	.....

NOTE.—Stage-discharge relation probably affected by ice Dec. 18, 1919, to Jan. 9 and Jan. 20 to Feb. 20, 1920.

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, 1920.

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 during year ending September 30, 1919, 20.5 feet at 6 a. m. May 11; minimum stage, 5.0 feet October 5–7.

Maximum mean daily stage recorded during the year ending September 30, 1920, 24.8 feet at 7 p. m. April 22; minimum stage, 3.2 feet July 30 and 31.

Flood of March, 1913, reached a stage of 46.55 feet.

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

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; affected by ice during parts of December, 1919, January, and February, 1920. 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 the lock, and inflow into pool 3 below the measuring section may all affect the stage-discharge relation at low and medium stages. The

break in dam No. 3 which occurred December 2, 1919, was closed August 3, 1920. 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.

No discharge measurements have been made at this station since April 5, 1916.

Daily gage height, in feet, of Muskingum River at Beverly, Ohio, for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	5.3	6.7	6.1	11.25	7.05	7.9	7.75	7.6	8.1	6.8	6.25	8.4
2	5.3	7.05	6.1	15.55	6.75	7.7	7.6	8.75	7.75	6.4	6.55	8.9
3	5.2	6.8	6.1	15.05	6.7	7.75	7.5	9.6	7.55	6.2	6.9	8.6
4	5.1	6.4	6.0	13.55	6.6	8.0	7.4	8.9	7.3	6.1	6.65	7.9
5	5.0	6.05	6.0	12.0	6.5	7.85	7.3	8.2	7.1	6.0	6.5	7.2
6	5.0	5.85	6.0	10.5	6.4	8.4	7.3	7.65	6.9	6.0	14.4	6.85
7	5.0	5.8	5.9	9.5	6.4	8.35	7.25	7.35	6.8	6.0	16.65	6.65
8	5.6	5.8	5.9	8.75	6.4	8.5	7.2	7.65	6.8	6.0	17.3	6.5
9	6.05	5.8	5.9	8.3	6.3	13.15	7.2	9.85	6.8	5.85	16.4	6.4
10	5.95	5.8	7.2	7.8	6.3	13.35	7.2	17.1	6.8	5.8	12.55	6.5
11	5.75	5.7	8.45	7.65	6.2	13.5	7.2	20.0	6.8	5.8	10.15	6.85
12	5.65	5.7	9.7	7.45	6.2	11.85	8.55	17.5	6.75	6.15	9.05	6.75
13	5.5	5.7	11.05	7.3	6.2	11.85	8.7	16.85	6.7	6.95	8.35	6.7
14	5.5	5.6	12.5	7.2	6.2	10.4	8.45	15.75	6.65	7.0	7.95	6.7
15	5.4	5.6	14.0	7.1	6.3	9.15	8.0	13.0	6.5	6.55	7.65	6.55
16	5.3	5.6	13.5	7.1	6.5	15.15	7.7	11.25	7.4	6.9	7.2	6.35
17	5.3	5.65	12.7	7.1	6.5	17.9	8.45	10.05	7.35	7.15	7.4	6.15
18	5.3	6.4	11.65	7.1	6.6	18.3	10.2	9.9	6.95	7.7	7.3	6.0
19	5.3	6.6	10.3	7.0	6.5	17.9	10.55	10.15	6.6	7.45	7.55	6.0
20	5.3	7.4	8.9	7.0	6.4	15.9	9.8	10.65	6.45	8.6	7.15	6.0
21	5.3	7.95	8.15	6.95	6.4	12.85	9.2	12.05	6.3	12.85	7.0	6.0
22	5.3	8.05	10.65	6.8	6.4	11.4	8.8	12.45	6.3	13.25	7.4	6.75
23	5.3	7.45	11.0	6.8	7.1	10.4	8.45	12.7	6.2	11.85	6.9	7.15
24	5.3	7.1	11.5	8.0	7.3	9.5	8.3	12.5	6.2	10.45	6.9	7.4
25	5.3	6.75	12.35	8.05	8.05	8.9	8.2	13.4	6.2	9.1	7.3	7.5
26	5.3	6.4	11.8	8.75	8.4	8.4	8.1	14.2	6.2	7.95	6.95	7.2
27	5.4	6.2	11.4	8.4	7.75	8.2	8.0	13.35	8.55	7.15	6.8	6.85
28	5.5	6.2	10.5	7.75	7.5	8.15	7.9	11.75	7.8	6.65	6.8	6.55
29	5.7	6.2	9.35	7.35	.....	8.1	7.55	10.35	7.5	6.2	6.8	6.45
30	6.15	6.2	8.45	7.2	.....	8.1	7.35	9.35	7.35	6.0	7.0	6.4
31	6.95	.....	8.15	7.1	.....	7.95	.....	8.55	.....	6.0	7.7	.....
1919-20.												
1	6.35	16.45	16.1	4.5	5.8	4.45	5.6	10.15	3.65	5.2	3.6	10.05
2	6.3	19.75	14.35	4.35	5.55	4.25	5.35	9.65	3.5	6.25	4.85	9.9
3	7.1	17.5	12.15	4.05	7.5	4.55	5.15	9.3	4.45	10.1	6.1	8.75
4	7.4	16.15	10.15	3.6	9.85	6.5	4.95	8.55	8.9	8.95	6.05	8.05
5	7.05	14.8	8.0	3.4	10.2	15.1	4.8	7.55	8.8	8.45	5.9	7.7
6	7.0	13.55	7.0	3.4	8.5	15.45	4.65	6.9	6.65	7.6	5.8	10.15
7	7.6	12.75	12.45	3.4	7.65	14.0	4.5	6.3	5.5	7.7	5.8	9.65
8	7.45	11.6	9.75	5.35	7.2	13.15	4.7	5.95	4.9	8.1	5.8	8.75
9	7.55	9.95	13.1	12.0	6.55	10.7	4.7	5.6	4.5	8.65	5.9	8.1
10	7.25	9.0	13.2	6.75	7.1	9.1	4.6	5.4	4.05	8.45	6.25	9.65
11	7.1	8.9	12.1	6.05	7.5	8.7	4.5	5.2	3.85	8.5	8.25	9.95
12	7.95	8.95	11.25	6.35	7.15	12.35	4.4	5.15	3.55	8.0	7.8	9.05
13	9.9	8.85	14.5	6.25	7.8	17.8	4.4	11.3	3.5	7.2	8.8	8.55
14	10.15	8.7	18.0	6.9	7.8	17.3	5.4	8.3	3.4	7.65	8.7	8.1
15	10.35	8.25	15.05	5.8	7.55	16.3	6.1	7.6	3.45	8.55	11.35	7.8
16	11.45	7.8	13.3	5.4	5.7	15.25	6.2	6.85	4.3	8.6	11.7	7.45
17	12.35	7.55	11.8	5.25	4.85	18.65	15.9	6.2	4.4	8.4	10.65	7.25
18	11.35	7.35	10.55	4.5	5.0	17.7	19.1	5.55	5.9	7.65	9.1	7.05
19	11.3	7.15	9.2	3.65	5.55	17.1	17.85	5.3	10.85	9.7	8.0	6.9
20	11.15	7.1	7.4	3.5	5.1	16.35	19.0	5.4	12.75	8.7	7.5	6.75
21	10.75	7.1	6.55	8.7	5.7	14.55	23.55	5.4	13.65	8.1	7.4	6.6
22	10.1	7.0	6.25	7.1	8.1	13.35	24.6	6.8	11.95	7.6	7.35	6.6
23	8.7	7.0	6.2	9.65	7.8	11.95	23.6	7.1	10.9	6.5	7.1	6.6
24	8.1	7.0	6.1	9.5	9.3	10.35	21.65	6.15	10.05	5.6	7.0	6.5
25	7.95	8.9	6.0	7.65	9.0	9.55	19.1	5.75	9.7	5.4	6.8	6.5
26	8.2	16.45	5.85	7.1	7.75	8.35	16.2	5.1	9.35	4.95	6.6	6.4
27	8.8	19.35	5.4	7.15	6.4	7.65	13.5	4.7	8.5	4.2	6.6	6.4
28	10.6	16.4	5.2	6.65	5.4	7.2	11.85	4.45	7.5	3.65	7.05	6.4
29	10.6	15.4	5.05	6.35	4.7	6.7	10.9	4.25	6.55	3.35	8.15	6.4
30	12.1	16.3	4.8	5.95	.....	6.3	10.55	4.0	5.7	3.2	8.7	6.5
31	11.95	.....	4.7	6.4	.....	5.9	.....	3.75	.....	3.2	9.2	.....

NOTE.—Stage-discharge relation affected by ice from about Dec. 21, 1919, to Feb. 26, 1920.

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 1½ miles above station.

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

RECORDS AVAILABLE.—June 1, 1915, to September 30, 1920.

GAGE.—Vertical and inclined staff attached to upstream side of right pier of bridge; read by Hollis 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 the year ending September 30, 1919, 22.9 feet at 7 p. m. June 26; minimum stage, 1.70 feet at 6 p. m. October 11.

Maximum stage recorded during the year ending September 30, 1920, 24.0 feet at 7 p. m. July 25; minimum stage 2.0 feet several days in September.

1915–1920: Maximum stage recorded 31.7 feet at 5.40 p. m. March 13, 1918; minimum stage, 1.35 feet July 2, 3, 1918, at 6 p. m.

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

ACCURACY.—Stage-discharge relation practically permanent; probably affected by ice during periods in December, 1919, and January and February, 1920. Gage read to half-tenths twice daily. Data inadequate for determination of discharge.

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

No discharge measurements have been made at this station since December 23, 1916.

Daily gage height, in feet, of Little Kanawha River at Glenville, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	2.22	6.00	3.85	.....	3.80	5.95	4.55	3.45	3.55	3.85	3.25	2.92
2	2.18	4.70	3.65	.....	3.70	5.05	4.35	4.25	3.35	3.45	3.35	2.90
3	2.12	3.98	3.45	.....	3.60	4.85	4.15	4.05	3.22	3.25	3.15	2.82
4	2.08	3.90	3.35	.....	3.50	4.65	3.90	3.85	3.15	3.15	2.98	2.80
5	2.05	3.75	3.30	5.05	4.05	4.85	3.60	3.65	2.98	3.10	2.90	2.70
6	2.00	3.50	3.22	4.95	3.90	6.25	3.35	3.55	2.88	3.00	2.90	2.70
7	1.95	3.38	3.10	4.82	3.75	5.95	3.15	3.45	2.78	3.00	2.80	2.60
8	1.92	3.15	2.98	5.20	3.55	5.35	3.05	5.95	2.65	2.92	2.75	2.60
9	1.90	2.95	3.05	5.00	3.50	6.75	3.00	5.00	2.60	2.82	2.70	2.60
10	1.85	2.85	12.55	4.82	3.40	5.80	3.00	5.80	2.50	2.78	.....	2.75
11	1.82	2.80	11.90	4.55	3.20	5.10	3.50	6.05	2.50	2.70	.....	2.95
12	2.02	2.75	8.90	4.25	3.00	4.95	3.15	5.85	2.40	2.90	.....	2.95
13	2.28	2.75	5.55	4.05	2.90	4.75	4.85	5.65	2.40	5.75	.....	2.75
14	2.48	2.70	5.05	4.28	3.15	4.55	4.65	5.45	2.50	7.45	.....	2.65
15	2.42	2.70	9.90	6.95	3.85	4.20	4.45	5.25	3.25	6.65	.....	2.60
16	2.38	2.62	6.15	5.95	5.05	3.95	4.50	5.00	5.90	16.15	.....	2.60
17	2.32	2.60	5.05	5.25	4.85	3.75	5.05	4.65	4.10	16.55	3.20	2.60
18	2.25	5.75	4.45	50.5	4.65	3.70	5.00	4.25	4.50	5.95	3.08	2.55
19	2.20	6.50	4.15	6.40	4.50	4.25	4.85	4.10	4.05	6.20	4.40	2.50
20	3.00	6.88	3.98	5.55	4.40	4.40	4.55	5.60	3.65	10.50	4.45	.....
21	3.12	6.90	3.90	5.20	4.25	4.25	4.20	13.35	3.35	8.00	3.85	2.50
22	3.02	5.32	4.70	4.90	4.35	4.05	3.95	6.90	3.15	5.15	3.90	2.55
23	2.98	4.80	6.45	5.35	4.55	3.92	3.75	5.95	3.00	4.85	4.90	3.30
24	3.02	4.38	5.05	9.25	4.70	3.75	3.55	5.50	4.20	4.65	4.35	4.95
25	2.98	3.90	6.65	5.90	4.85	3.62	3.35	7.45	8.15	4.45	4.15	3.65
26	2.92	3.50	5.30	5.00	5.90	3.50	3.20	5.55	20.35	4.25	3.85	3.45
27	2.92	3.25	4.98	4.70	5.60	3.85	3.10	5.05	14.00	3.95	3.65	3.25
28	2.90	3.05	4.78	4.35	5.10	5.95	3.10	4.75	6.25	3.75	3.45	.....
29	2.92	4.85	4.05	4.15	.....	5.05	3.18	4.25	5.05	3.55	3.25	.....
30	5.05	4.10	3.85	3.98	.....	4.88	3.28	4.00	4.75	3.35	3.05	.....
31	8.75	.....	5.15	3.88	.....	4.75	.....	3.80	.....	3.20	3.00	.....

Daily gage height, in feet, of Little Kanawha River at Glenville, W. Va., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	2.70	9.95	4.90	6.75	4.25	4.65	3.72	12.00	3.78	3.30	3.95	2.50
2	2.60	20.75	4.65	5.95	4.10	4.78	3.58	6.55	3.65	3.30	3.82	2.50
3	2.55	8.55	4.45	5.30	4.15	5.60	3.48	5.35	3.60	4.05	3.65	2.50
4	2.50	5.28	4.20	4.90	6.75	5.05	3.40	5.00	4.30	5.00	3.45	2.50
5	2.50	4.80	3.80	4.50	5.55	7.45	3.50	4.60	12.75	4.95	3.25	2.50
6	2.50	4.48	4.35	4.10	5.05	6.65	3.80	4.35	8.25	4.75	3.05	2.50
7	2.65	4.10	22.00	4.15	4.80	5.20	6.05	4.00	5.75	4.55	2.85	2.50
8	2.85	3.70	10.65	5.00	4.15	4.85	5.50	3.65	5.25	4.42	2.65	2.50
9	2.80	3.45	6.10	17 10	4.10	4.65	5.25	3.52	5.05	4.32	2.60	2.50
10	2.65	3.25	6.40	9.45	5.90	4.52	5.00	3.50	4.85	4.15	2.65	2.50
11	2.60	3.05	5.75	5.80	5.55	4.65	4.68	3.52	4.65	4.15	2.85	2.50
12	2.95	2.92	5.20	5.30	5.05	4.95	4.85	4.30	4.35	4.20	3.00	2.42
13	5.10	2.90	10.15	5.00	4.95	9.00	5.90	9.65	4.15	3.98	3.10	2.40
14	6.05	2.82	18.50	4.60	5.05	7.90	4.90	6.45	3.95	4.05	3.00	2.40
15	12.50	2.75	7.05	4.45	4.85	5.95	4.68	5.05	3.80	4.05	2.98	2.40
16	9.50	2.60	5.70	4.70	4.50	5.70	4.60	4.75	3.72	3.92	2.90	2.40
17	11.00	2.52	5.10	7.00	4.32	8.50	6.40	4.55	3.62	3.90	2.90	2.40
18	6.45	2.50	4.65	6.10	4.15	6.70	5.90	4.42	3.52	3.82	2.78	2.30
19	5.50	2.50	4.32	5.45	4.40	13.90	5.20	4.25	3.50	3.68	2.70	2.30
20	5.05	2.50	4.05	5.05	4.80	13.70	8.95	4.25	3.75	3.60	2.68	2.30
21	4.70	2.60	3.92	10.50	5.10	7.55	20.60	4.75	3.92	3.55	2.60	2.20
22	7.00	2.70	3.82	15.95	9.92	6.00	9.50	4.65	4.02	3.50	2.60	2.10
23	6.45	2.75	3.90	21.95	7.65	5.20	5.95	4.48	4.10	3.42	2.65	2.10
24	5.80	4.50	4.15	16.70	6.95	4.95	5.10	5.00	3.95	8.65	2.85	2.10
25	5.95	5.82	4.32	11.30	5.95	4.78	4.90	11.90	3.78	23.15	2.85	2.10
26	6.55	15.40	4.45	6.45	5.50	4.55	4.65	5.25	3.70	9.95	2.72	2.10
27	8.30	10.00	4.52	5.55	5.15	4.35	4.85	4.75	3.65	5.45	2.70	2.10
28	6.00	6.35	4.38	5.00	5.05	4.15	4.95	4.55	3.52	4.85	2.62	2.10
29	5.50	5.50	4.28	4.85	4.85	3.98	4.75	4.20	3.50	4.65	2.60	2.10
30	5.25	5.20	4.35	4.65	.....	3.88	5.40	3.98	3.42	4.45	2.60	2.10
31	5.05	.....	4.55	4.45	.....	3.60	.....	3.88	.....	4.20	2.58	.....

NOTE.—Stage-discharge relation probably affected by ice Dec. 18, 1919, to Feb. 24, 1920. Gage not read Jan. 1–4, Aug. 10–16, Sept. 20, and 28–30, 1919.

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

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

DRAINAGE AREA.—1,500 square miles (measured on map by United States Geological Survey; scale, 1:500,000).

RECORDS AVAILABLE.—April 25, 1915, to September 30, 1920. The upper and lower gages at the lock have been read under direction of the United States Engineer Corps, since November 5, 1905.

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 the year ending September 30, 1919, 22.2 feet at 8 a. m. and 5 p. m. January 2; minimum stage, 9.50 feet October 7–11.

Maximum stage recorded during the year ending September 30, 1920, 19.3 feet at 5 p. m. January 23; minimum stage, 9.30 feet September 22, 23, and 24.

1915–1920: Maximum stage recorded 25.8 feet at 8 a. m., March 14, 1918; minimum stage, 9.30 feet September 22, 23, and 24, 1920.

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 flashboards on dam No. 4.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice during years. Variable leakage through lock and dam may affect the stage-discharge relation at low stages. Gage read twice daily to hundredths. Data inadequate for determining daily discharge.

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

No discharge measurements have been made at this station since March 13, 1917.

Daily gage height, in feet, of Little Kanawha River at Lock 4, Palestine, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	9.60	12.53	10.46	16.40	10.23	11.58	10.58	10.65	10.08	10.22	9.76	9.70
2	9.58	11.52	10.30	22.20	10.18	11.80	10.51	10.78	10.00	10.18	9.82	9.68
3	9.55	10.90	10.18	18.75	10.16	11.30	10.33	11.00	9.90	10.10	9.81	9.67
4	9.54	10.56	10.14	14.02	10.18	11.00	10.22	10.68	9.86	9.88	9.90	9.67
5	9.52	10.42	10.08	12.40	10.16	11.12	10.20	10.48	9.74	9.83	9.96	9.66
6	9.52	10.14	10.00	11.38	10.40	12.03	10.15	10.36	9.73	9.79	9.83	9.64
7	9.50	10.06	9.94	11.07	10.32	12.20	10.10	10.52	9.69	9.73	9.77	9.64
8	9.50	9.95	9.91	11.25	10.20	11.70	10.08	10.78	9.56	9.70	9.75	9.54
9	9.50	9.83	9.90	11.62	10.11	12.75	10.04	11.87	9.56	9.64	9.82	9.52
10	9.50	9.82	12.21	11.26	10.10	12.80	10.03	14.95	9.66	10.25	9.80	9.60
11	9.50	9.78	14.42	10.52	10.04	11.80	10.26	13.13	9.68	10.05	9.76	9.65
12	9.51	9.74	13.98	10.74	10.00	11.28	10.67	11.92	9.70	9.76	9.88	9.62
13	9.52	9.70	12.40	10.69	9.98	11.02	11.04	11.32	9.65	12.97	10.02	9.65
14	9.52	9.68	11.45	10.76	10.22	10.83	10.62	11.45	9.67	12.08	10.05	9.76
15	9.51	9.66	13.42	11.75	11.10	10.72	10.43	10.66	11.20	12.68	10.08	9.73
16	9.51	9.64	13.05	12.42	11.71	10.54	10.51	10.55	10.78	13.72	10.01	9.70
17	9.51	9.63	11.60	11.56	11.36	10.42	10.66	10.55	10.50	15.89	9.86	9.64
18	9.51	9.84	11.03	11.54	11.11	10.50	11.02	10.44	10.58	13.49	10.14	9.60
19	9.51	10.72	10.68	11.82	11.00	10.52	10.68	10.33	10.32	11.25	11.28	9.59
20	9.51	12.00	10.49	11.68	10.75	10.54	10.44	13.38	10.22	11.53	10.43	9.58
21	9.52	12.20	10.42	11.24	10.60	10.52	10.34	15.88	10.17	12.03	10.24	9.58
22	9.52	11.74	10.46	10.86	10.60	10.44	10.32	13.62	9.94	11.50	10.07	9.59
23	9.52	11.00	12.24	11.04	10.80	10.40	10.48	12.12	10.00	10.74	10.64	9.58
24	9.60	10.59	12.15	13.47	10.79	10.24	10.58	11.76	10.02	10.35	9.98	9.56
25	9.80	10.30	12.12	13.02	10.66	10.20	10.58	12.72	10.78	10.18	10.14	9.48
26	9.70	10.20	12.11	11.77	10.59	10.18	10.54	12.46	15.66	10.04	9.99	10.12
27	9.68	10.05	11.42	11.21	11.37	10.61	10.33	11.42	16.89	10.00	9.88	10.04
28	9.66	9.98	11.00	10.87	11.17	11.72	10.27	10.92	14.00	9.84	9.78	9.87
29	9.64	10.36	10.72	10.67	.....	11.50	10.15	10.58	11.22	9.74	9.70	9.74
30	9.88	10.42	10.52	10.34	.....	11.09	10.12	10.40	10.64	9.69	9.70	9.70
31	12.18	.....	10.46	10.34	.....	10.75	.....	10.19	.....	9.69	9.71	.....

Daily gage height, in feet, of Little Kanawha River at Lock 4, Palestine, W. Va., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	9.64	12.85	11.35	11.16	10.50	10.54	10.09	13.62	10.06	9.84	9.95	9.66
2	9.62	18.15	10.98	11.78	10.40	10.50	10.04	13.62	10.06	9.86	9.78	9.62
3	9.59	15.74	10.60	11.62	10.30	11.05	10.04	13.55	10.20	9.96	9.69	9.52
4	9.54	12.26	10.50	10.74	11.09	11.24	10.14	11.87	11.41	11.10	9.64	9.54
5	9.54	11.28	10.32	10.58	12.60	12.96	10.25	11.20	12.90	11.08	9.60	9.52
6	9.54	10.75	10.28	10.41	11.80	12.92	10.24	10.86	14.16	10.54	9.57	9.50
7	9.66	10.46	18.13	10.34	11.16	12.00	10.62	10.60	11.80	10.47	9.51	9.50
8	9.51	10.34	17.09	10.62	10.95	11.22	11.55	10.50	10.87	10.62	9.50	9.50
9	9.50	10.20	13.91	17.00	10.70	10.90	11.14	10.35	10.48	10.86	9.59	9.50
10	9.50	10.18	12.27	16.28	10.90	10.71	10.78	10.28	10.31	10.76	10.08	9.50
11	9.52	10.10	11.98	12.98	11.96	10.76	10.58	10.26	10.22	10.51	9.95	9.50
12	9.66	10.00	11.50	11.62	11.80	11.09	10.40	10.38	10.10	10.26	9.79	9.68
13	9.78	10.10	12.70	11.07	11.31	11.98	10.48	13.90	10.00	10.02	9.72	9.58
14	10.66	10.12	17.60	10.78	11.28	13.43	11.54	13.21	10.14	9.99	9.80	9.50
15	14.11	9.99	15.70	10.64	11.20	12.30	10.98	11.76	10.07	10.69	9.88	9.52
16	13.38	9.98	12.62	10.48	10.85	12.06	10.68	11.10	10.10	10.49	9.84	9.56
17	13.72	9.96	11.72	11.44	10.55	13.30	10.66	10.78	10.06	10.25	9.80	9.51
18	12.93	9.89	11.20	11.98	10.80	13.02	11.75	10.54	10.06	10.04	9.78	9.50
19	11.44	9.88	10.88	11.20	11.10	14.86	11.44	10.46	10.00	9.95	9.76	9.50
20	10.78	9.88	10.72	11.08	10.76	16.79	14.28	10.49	9.98	9.80	10.08	9.45
21	10.47	9.84	10.59	12.41	11.02	14.38	18.62	10.80	9.98	9.76	9.82	9.42
22	11.62	9.84	10.62	15.85	14.02	12.32	16.38	10.76	10.30	9.71	10.07	9.31
23	12.32	9.82	10.72	18.90	13.88	11.50	12.90	10.40	10.52	9.62	9.94	9.30
24	11.68	10.36	10.92	18.45	12.08	11.08	11.82	10.30	10.40	9.54	9.84	9.35
25	11.65	10.93	11.04	15.78	12.17	10.84	11.25	12.96	10.36	11.68	9.80	9.50
26	11.32	16.42	10.85	13.16	11.62	10.65	10.88	13.96	10.35	14.58	9.88	9.50
27	13.28	17.96	10.64	11.83	11.29	10.57	11.02	11.42	10.29	11.82	9.84	9.52
28	13.54	14.48	10.62	11.33	10.78	10.44	11.20	10.74	10.18	10.64	9.84	9.52
29	11.50	11.55	10.61	10.98	10.58	10.40	11.18	10.42	9.93	10.32	9.78	9.52
30	10.79	11.63	10.59	10.70	.....	10.24	11.05	10.32	9.89	10.12	9.72	9.61
31	10.54	.....	10.59	10.60	.....	10.16	.....	10.20	.....	10.08	9.69	.....

NOTE.—Observer made no notes relative to ice; stage-discharge relation probably not affected by ice.

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, 1920.

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 ending September 30, 1919, 22.60 feet at 9. a. m. January 2; minimum stage, 1.90 feet June 20 and 21.

Maximum stage recorded during the year ending September 30, 1920, 25 feet at 8 a. m. December 7; minimum stage, 2 feet October 1–4, August 25, 26, and September 5–8.

1915–1920: Maximum stage recorded, 25.7 feet at 8 a. m. January 22, 1917; minimum stage, 1.50 feet June 28, 29, July 2, and July 24, 1915. 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 January and December, 1919, also January and February, 1920. Gage read to hundredths twice daily.

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

No discharge measurements have been made at this station since March 2, 1916.

Daily gage height, in feet, of South Fork of Hughes River at Macfarlan, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	2.20	5.70	2.10	13.15	3.10	3.75	2.70	3.10	3.00	2.70	2.20	3.20
2	2.20	5.10	3.00	21.70	3.20	3.88	2.25	3.30	2.90	2.60	2.20	3.20
3	2.20	2.75	2.90	13.02	2.65	4.34	3.00	3.20	2.85	2.50	2.90	3.10
4	2.30	2.90	2.90	9.27	2.60	4.70	2.85	3.30	2.80	2.40	2.80	3.10
5	2.30	2.40	2.80	7.22	2.85	4.50	2.80	3.20	2.70	2.80	2.75	3.10
6	2.30	2.40	2.80	6.56	2.70	5.40	3.60	3.10	2.55	2.70	2.80	3.00
7	2.30	2.40	2.70	5.16	2.75	4.00	3.40	3.85	2.50	2.20	2.70	3.00
8	2.30	2.40	2.60	4.41	2.80	3.65	2.70	4.25	2.40	2.20	2.60	3.05
9	2.30	2.40	9.60	3.57	3.15	6.35	4.04	4.30	2.35	2.20	2.50	3.00
10	2.45	2.40	6.30	3.41	2.75	6.45	2.70	12.00	2.30	2.10	2.50	2.90
11	2.50	2.40	6.20	3.43	2.95	7.20	3.60	5.40	2.30	2.05	2.40	2.60
12	2.50	2.30	6.20	3.45	2.70	7.20	4.15	5.20	2.30	2.60	2.40	2.50
13	2.50	2.30	6.00	3.65	2.80	3.50	2.90	4.90	2.20	5.05	2.40	2.40
14	2.30	2.20	5.90	3.75	3.15	2.90	3.70	4.60	2.15	4.60	2.30	2.15
15	2.30	2.20	8.85	4.90	5.50	2.75	3.65	4.35	2.10	8.75	2.30	2.10
16	2.10	2.20	4.40	4.31	4.60	2.30	3.10	4.15	2.20	5.70	2.30	2.10
17	2.10	2.20	4.15	3.93	3.90	4.25	4.20	3.90	2.10	5.05	2.20	2.90
18	2.10	2.30	3.60	3.96	3.87	3.01	4.40	3.35	2.10	4.75	3.10	2.80
19	2.10	4.00	3.45	4.48	3.84	2.60	3.30	3.00	2.00	4.50	3.05	2.75
20	2.30	5.45	3.25	4.89	3.73	3.75	3.35	12.95	1.90	3.70	2.95	2.70
21	2.40	5.20	3.10	4.02	3.52	3.10	2.15	8.35	1.90	3.60	2.70	2.60
22	2.40	4.05	6.70	3.38	3.50	2.90	2.10	5.20	2.00	3.50	4.05	2.50
23	2.35	2.90	5.55	3.99	3.82	2.10	2.75	4.90	2.10	3.40	3.90	2.40
24	2.30	2.90	6.16	6.60	3.87	2.10	3.40	4.75	4.95	3.30	3.90	2.30
25	2.30	2.80	8.32	6.07	3.90	4.10	4.20	4.60	4.60	3.30	3.50	2.20
26	2.40	2.80	5.40	4.02	3.90	3.70	4.10	4.40	4.15	3.10	3.50	2.20
27	2.50	2.70	4.30	3.69	3.80	2.80	4.05	4.15	3.50	2.70	3.30	2.10
28	2.50	2.60	3.40	3.55	3.75	5.45	4.00	3.55	3.30	2.40	3.20	2.10
29	2.50	2.60	3.40	3.36	.....	4.35	3.00	3.20	3.25	2.35	3.20	2.10
30	4.55	2.50	6.00	3.20	.....	3.40	3.00	3.10	2.70	2.30	3.00	2.05
31	6.10	.....	12.74	3.10	.....	3.35	.....	3.00	.....	2.30	3.30	.....
1919-20.												
1	2.00	7.45	6.00	3.40	3.10	3.20	3.40	4.30	2.85	2.50	2.40	2.10
2	2.00	7.40	4.70	3.40	3.05	3.05	3.30	4.20	2.80	2.50	2.30	2.10
3	2.00	5.40	3.85	3.40	2.90	2.90	4.55	4.10	2.75	2.40	2.30	2.10
4	2.00	3.70	3.35	3.40	2.80	4.10	4.25	4.00	2.55	2.40	2.30	2.10
5	2.10	3.50	3.25	3.40	2.70	5.40	4.10	4.00	5.15	2.30	2.20	2.00
6	2.10	3.30	3.15	3.46	2.65	5.30	3.90	3.95	4.35	2.20	2.15	2.00
7	2.10	3.20	23.50	3.46	2.60	5.10	3.80	3.90	3.95	4.45	2.10	2.00
8	2.10	3.15	12.95	3.05	2.60	5.05	3.70	3.80	3.65	4.20	2.10	2.00
9	2.00	3.10	9.25	14.00	2.60	4.95	3.50	3.75	3.25	3.95	2.10	2.10
10	2.00	3.00	8.40	9.70	2.50	4.65	3.40	3.70	2.90	3.73	2.10	4.60
11	2.00	3.00	7.85	7.25	2.40	4.50	3.30	3.70	2.80	3.60	2.20	3.55
12	2.10	2.95	7.50	7.05	2.40	4.35	3.20	5.05	2.80	3.50	2.20	3.05
13	2.10	2.90	7.25	6.35	2.30	4.60	3.20	6.55	2.80	3.10	2.20	2.80
14	2.50	2.90	6.75	6.20	2.20	4.90	3.10	6.55	2.80	2.80	2.30	2.65
15	2.40	2.90	5.60	6.05	2.20	4.90	3.00	6.50	2.80	2.65	2.30	2.60
16	2.30	2.80	5.20	5.60	2.10	4.50	2.90	6.40	2.70	2.60	2.30	2.50
17	2.25	2.70	4.00	5.50	3.20	4.25	2.80	6.40	2.70	2.60	2.30	2.40
18	2.20	2.70	4.10	4.20	4.15	4.20	2.80	6.30	2.60	2.60	2.20	2.30
19	2.90	2.70	3.95	4.20	5.30	14.00	2.75	6.20	2.50	2.60	2.20	2.20
20	2.30	2.60	3.85	4.15	5.05	8.95	9.85	6.10	3.00	2.50	2.15	2.20
21	2.95	2.55	3.80	4.10	4.80	6.35	15.50	6.00	2.90	2.50	2.10	2.20
22	6.50	2.50	3.80	5.25	4.60	5.95	8.65	5.90	2.80	2.40	2.10	2.10
23	5.65	2.40	3.75	12.35	4.50	5.70	5.30	5.80	2.80	2.35	2.10	2.10
24	4.45	2.30	3.70	9.05	4.25	3.75	4.95	5.70	2.80	2.30	2.10	2.10
25	4.30	2.50	3.70	6.05	4.10	3.50	4.20	9.25	2.75	2.30	2.00	2.10
26	5.75	16.50	3.60	4.15	4.00	3.40	3.50	4.50	2.70	2.10	2.15	2.10
27	5.45	14.75	3.60	3.95	3.90	3.40	3.50	3.70	2.70	2.60	2.25	2.10
28	5.70	11.10	3.50	3.80	3.60	3.30	3.40	3.45	2.65	3.70	2.15	2.00
29	6.30	8.25	3.50	3.55	3.50	3.20	3.40	3.25	2.60	2.60	2.10	2.70
30	5.90	7.40	3.50	3.30	.....	3.20	4.45	3.15	2.60	2.55	2.10	3.15
31	5.00	.....	3.30	3.20	.....	3.20	.....	2.95	.....	2.40	2.10	.....

NOTE.—Stage-discharge relation affected by ice Jan. 3-14, 1919, and Dec. 17, 1919, to about Feb. 17, 1920.

HUGHES RIVER AT CISKO, W. VA.

LOCATION.—At Cisko, 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, 1920.

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 the year ending September 30, 1919, 26.5 feet at 10 a. m. January 2; minimum stage, 2.21 feet at 7 p. m. September 6.

Maximum stage recorded during the year ending September 30, 1920, 26.62 feet at 3 p. m. December 7; minimum stage, 2.20 feet at 7 a. m. September 21.

1915–1920: Maximum stage recorded, 30.25 feet at 3 p. m. January 22, 1917; minimum, 2.14 feet October 14 and 15, 1916.

Highest known flood previous to installation of station reached a stage represented by gage height about 30 feet.

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

ACCURACY.—Stage-discharge relation probably permanent; probably affected by ice January and December, 1919, also January and February, 1920. Stages of Ohio River at Parkersburg of about 40 feet or more will probably cause backwater at the gage. Data inadequate for determination of discharge.

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

No discharge measurements have been made at this station since March 14, 1917.

Daily gage height, in feet, of Hughes River at Cisko, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19												
1	2.48	6.05	3.96	16.12	3.50	6.52	3.90	3.90	3.25	3.05	2.68	2.46
2	2.42	4.55	3.67	24.80	3.38	5.75	3.68	5.22	3.13	3.06	2.73	2.34
3	2.34	3.93	3.48	8.00	3.25	4.88	3.52	4.78	3.02	7.20	2.56	2.30
4	2.26	3.56	3.40	5.80	3.40	4.44	3.42	4.18	2.91	7.65	2.50	2.38
5	2.26	3.32	3.34	5.02	3.65	5 18	3.37	3.90	2.82	4.90	2.47	2.30
6	2.43	3.18	3.30	5.00	3.76	7.80	3.28	3.74	2.86	4.14	2.46	2.23
7	2.48	3.12	3.22	4.66	3.48	5.98	3.23	5.50	2.92	5.96	2.48	2.24
8	2.40	2.98	3.12	4.81	3.40	5.09	3.20	5.88	2.88	7.74	2.45	2.23
9	2.37	2.92	3.14	5.58	3.36	9.28	3.26	6.26	2.82	5.32	2.57	2.28
10	2.39	2.82	10.91	6.00	3.25	7.38	3.28	15.42	2.72	4.80	4.27	6.20
11	2.48	2.77	9.05	5.72	3.20	5.50	4.14	7.52	2.65	4.19	4.96	4.84
12	2.53	2.76	6.05	4.93	3.14	4.84	5.22	5.36	2.64	4.42	3.86	3.86
13	2.59	2.64	5.12	4.49	3.22	4.44	4.38	4.66	2.65	4.27	3.47	3.46
14	2.64	2.64	5.98	4.35	3.49	4.21	3.96	4.27	2.58	3.86	3.20	3.12
15	2.65	2.60	10.84	5.94	6.05	4.04	3.73	4.00	2.72	3.66	3.00	2.90
16	2.63	2.68	6.12	5.42	5.98	3.88	3.82	3.84	2.62	3.93	2.92	2.86
17	2.62	2.56	4.90	4.80	5.08	3.78	4.71	4.28	3.32	3.85	2.82	2.68
18	2.60	4.14	4.36	5.01	4.80	3.86	4.40	4.76	3.36	3.52	2.82	2.54
19	2.59	6.18	4.00	4.95	4.52	3.98	4.02	4.10	3.15	3.28	2.84	2.52
20	2.57	7.05	3.78	4.48	4.22	3.93	3.78	10.50	2.84	3.09	2.86	2.58
21	2.64	5.81	3.64	4.20	4.14	3.78	3.70	14.50	2.70	3.02	2.72	2.52
22	2.64	4.65	5.57	4.04	4.52	3.64	3.68	6.56	2.64	2.81	2.65	2.42
23	2.72	4.10	8.66	5.06	4.96	3.52	3.60	5.57	2.58	2.79	2.70	2.36
24	2.50	3.77	5.64	9.45	4.68	3.42	3.74	5.41	2.64	2.74	2.62	2.32
25	2.34	3.54	7.70	5.90	4.34	3.34	4.22	7.55	2.98	5.89	2.51	2.31
26	2.58	3.39	5.72	4.99	4.71	3.28	3.88	5.59	6.29	4.34	2.46	2.36
27	2.64	3.26	4.76	4.55	4.98	4.50	3.64	4.63	5.53	3.68	2.46	2.34
28	2.75	3.72	4.40	4.15	4.50	7.00	3.48	4.16	4.25	3.26	2.34	2.50
29	2.91	5.48	4.16	4.00	.....	5.00	3.44	3.84	3.73	3.02	2.38	2.40
30	4.07	4.48	3.94	3.80	.....	4.34	3.41	3.60	3.28	2.86	2.40	2.59
31	7.80	.....	4.19	3.62	.....	4.10	.....	3.41	.....	2.76	2.38	.....

Daily gage height, in feet, of Hughes River at Cisko, W. Va., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	2.32	13.15	5.26	5.71	3.78	3.98	3.38	9.40	3.20	3.00	2.64	2.57
2	2.28	11.80	4.58	5.96	3.72	4.00	3.35	6.04	3.02	2.82	2.64	2.66
3	2.28	6.38	4.20	5.04	3.68	4.16	3.32	3.06	3.15	2.68	2.56	2.61
4	2.23	4.92	3.90	4.52	6.15	4.54	3.44	4.52	5.52	2.59	2.62	2.67
5	2.26	4.29	3.68	4.22	8.73	9.78	4.88	4.18	14.85	2.52	2.60	2.59
6	2.28	3.91	3.83	3.94	6.02	6.79	4.50	3.92	6.72	2.49	2.57	2.60
7	2.24	3.64	25.11	3.76	4.66	4.92	5.92	3.76	4.86	2.45	3.58	2.48
8	2.26	3.48	8.55	4.54	4.70	4.92	5.64	3.65	4.27	2.52	3.40	2.44
9	2.29	3.36	10.05	17.72	4.38	4.36	4.64	3.52	3.96	2.60	3.10	2.46
10	2.32	3.29	9.15	8.30	6.45	4.19	4.21	3.42	3.76	2.67	2.82	2.35
11	2.30	3.18	6.12	5.66	6.97	4.26	3.92	3.35	3.55	3.10	2.70	2.38
12	2.40	3.26	5.24	4.90	5.47	4.98	3.78	3.44	3.54	3.14	2.66	2.32
13	2.68	3.36	8.34	4.50	5.05	7.05	3.84	9.20	3.49	5.37	2.62	2.36
14	3.88	3.38	15.15	4.54	5.41	6.33	3.92	5.80	3.32	8.97	2.61	2.26
15	8.60	3.36	7.36	4.33	5.12	5.61	3.78	4.64	3.50	10.18	2.72	2.26
16	6.44	3.15	5.62	4.02	4.53	6.32	3.64	4.17	3.42	7.24	2.53	2.26
17	6.91	3.10	5.18	6.10	4.44	12.02	5.08	3.86	3.20	5.68	2.50	2.33
18	5.01	3.03	4.73	5.25	4.78	6.32	5.92	3.72	3.20	4.47	2.72	2.33
19	4.08	2.96	5.55	4.88	6.71	13.55	4.94	3.66	3.06	4.58	3.54	2.22
20	3.64	2.97	5.38	4.60	5.20	11.40	9.25	3.79	2.97	5.72	3.32	2.22
21	3.44	2.84	4.92	7.30	5.42	6.96	20.75	3.98	2.96	4.66	3.06	2.22
22	6.06	2.88	4.65	8.26	11.69	5.45	7.24	3.79	3.15	4.58	5.41	2.24
23	5.41	2.84	4.52	14.79	7.62	4.85	5.94	3.54	5.69	4.06	4.91	2.26
24	4.58	3.22	4.77	13.15	6.36	4.50	5.12	3.39	5.08	3.62	3.92	2.42
25	4.08	5.13	4.85	6.85	5.42	4.26	4.54	7.14	5.08	3.35	3.45	2.60
26	3.83	21.38	4.34	5.22	4.80	4.11	4.30	5.49	4.43	3.11	3.12	2.57
27	6.52	17.95	4.30	4.85	4.71	3.96	4.86	4.32	3.84	2.92	2.90	2.48
28	5.92	6.56	4.29	4.65	4.26	3.76	6.54	3.90	3.48	2.82	2.74	2.44
29	4.86	5.28	4.26	4.22	4.22	3.64	5.18	3.61	3.24	2.71	2.65	2.38
30	4.16	6.50	4.22	4.02	.....	3.50	4.70	3.41	3.08	2.60	2.59	2.38
31	4.14	.....	4.10	4.03	.....	3.49	.....	3.28	.....	2.58	2.59	.....

NOTE.—Stage-discharge relation affected by ice Jan. 3–14, 1919, and Dec. 17, 1919, to about Feb. 17, 1920.

HOCKING RIVER BASIN.

HOCKING RIVER AT ATHENS, OHIO.

LOCATION.—At Mill Street single-span highway bridge, 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, 1920.

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

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Channel straight about 700 feet above and below station. Left bank is overflowed 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 relation will change as dam decays.

EXTREMES OF STAGE.—Maximum stage recorded during the year ending September 30, 1919, 14.7 feet at 7 a. m., January 2; minimum stage, 2.65 feet several days in October and September.

Maximum stage recorded during the year ending September 30, 1920, 19.2 feet at 5 p. m. April 21; minimum stage, 2.75 feet several days in October.

1915–1920: Maximum stage recorded, that of April 21, 1920; minimum stage, 2.65 feet several days in August, October, 1918, and September, 1919.

Highest flood known previous to installation of gage 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 part of December, 1919, January and February, 1920. Gage read to half-tenths twice daily.

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

Daily gage height, in feet, of Hocking River at Athens, Ohio, for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	2.72	3.72	3.46	8.32	3.52	4.62	3.76	4.62	3.40	3.08	3.56	3.66
2	2.72	3.58	3.40	14.6	3.52	4.58	3.68	6.30	3.36	3.02	3.18	3.28
3	2.68	3.16	3.32	10.8	3.48	4.22	3.62	4.98	3.30	3.00	2.96	3.06
4	2.68	3.08	3.28	6.12	3.48	4.06	3.62	4.42	3.28	2.98	2.88	2.98
5	2.68	3.02	3.20	4.68	3.42	4.22	3.62	4.12	3.26	3.00	2.88	2.90
6	2.68	3.02	3.18	4.42	3.42	6.28	3.58	3.90	3.22	2.98	3.16	2.86
7	2.72	2.98	3.18	4.36	3.38	5.22	3.58	3.90	3.18	3.40	3.62	2.86
8	2.82	2.98	3.12	4.20	3.38	4.90	3.52	4.12	3.22	2.98	3.18	2.90
9	2.78	2.92	3.20	4.06	3.32	10.2	3.52	5.62	3.26	2.90	2.96	2.90
10	2.82	2.98	5.58	3.82	3.32	10.8	3.48	12.8	3.18	2.90	2.90	2.90
11	2.82	2.96	7.6	3.78	3.28	6.92	3.90	12.3	3.22	2.90	2.88	3.06
12	2.82	2.92	6.68	3.72	3.28	5.22	5.10	13.6	3.26	2.92	2.82	3.28
13	2.82	2.92	6.42	3.72	3.30	4.72	4.38	11.1	3.22	3.00	2.96	3.02
14	2.82	2.92	10.4	3.68	3.52	4.42	4.02	6.18	3.08	3.78	3.22	2.90
15	2.82	2.92	10.8	3.66	3.66	4.90	3.90	5.20	3.38	4.08	3.02	2.88
16	2.82	2.92	7.3	3.58	3.72	9.8	4.22	4.78	3.88	4.96	2.96	2.82
17	2.82	3.16	5.58	3.72	3.66	9.6	4.62	4.50	4.26	3.80	3.06	2.78
18	2.82	4.02	4.50	3.68	3.58	9.4	4.36	4.36	3.90	3.36	3.16	2.78
19	2.82	4.02	4.26	3.68	3.52	7.8	4.12	4.12	3.70	3.20	3.70	2.78
20	2.86	4.48	4.16	3.66	3.48	6.10	4.00	4.96	3.36	3.16	3.48	2.76
21	2.92	4.32	4.10	3.62	3.52	5.28	3.92	5.26	3.16	3.10	3.28	2.68
22	2.88	3.92	6.62	3.56	3.76	4.80	3.96	4.60	3.10	3.08	3.10	2.98
23	2.88	3.52	7.6	3.80	4.16	4.52	3.88	4.38	3.08	4.68	3.42	4.32
24	2.88	3.42	5.98	5.12	4.06	4.32	4.08	4.32	3.30	3.22	3.18	3.86
25	2.90	3.36	7.0	4.88	3.92	4.16	3.90	4.40	3.36	3.10	3.00	3.16
26	2.96	3.28	5.48	4.32	4.46	4.10	3.72	4.16	3.28	3.02	2.92	3.08
27	2.98	3.22	4.72	4.10	4.28	4.10	3.72	3.92	4.26	2.92	2.90	2.98
28	3.02	3.28	4.40	3.86	4.10	4.28	3.58	3.80	3.70	2.88	2.88	2.92
29	3.38	3.62	4.22	3.78	.....	4.02	3.66	3.70	3.40	2.88	2.82	2.88
30	3.26	3.56	4.02	3.68	.....	3.90	3.58	3.58	3.16	2.86	2.86	2.88
31	3.58	.....	4.16	3.62	.....	3.82	.....	3.56	.....	2.90	3.30	.....
1919–20.												
1	2.82	12.8	6.62	3.84	4.85	3.79	3.90	4.92	3.74	3.77	3.23	3.70
2	2.82	16.4	5.32	3.79	4.55	3.68	3.84	4.60	3.68	3.90	3.28	3.55
3	2.78	16.9	4.90	3.70	5.63	3.68	3.81	4.44	4.42	8.6	3.23	3.43
4	2.78	9.5	4.58	3.68	7.0	3.70	3.79	4.24	4.76	6.93	3.18	3.34
5	2.80	5.58	4.42	3.68	8.8	8.4	3.79	4.11	4.78	4.82	3.12	3.28
6	2.78	4.88	4.32	3.68	6.0	6.04	3.79	4.03	4.13	4.11	3.12	4.87
7	2.92	4.58	13.3	3.57	4.97	4.55	3.84	3.96	3.88	5.15	3.18	3.99
8	2.88	4.76	10.7	5.02	4.57	4.20	3.99	3.88	3.70	9.0	3.12	3.62
9	2.88	4.46	12.4	14.9	4.42	4.13	4.03	3.81	3.68	7.6	3.23	3.99
10	2.90	4.28	13.2	13.6	6.75	4.03	3.88	3.77	3.62	5.60	3.59	6.68
11	2.96	4.48	8.3	6.38	6.64	4.33	3.77	3.70	3.55	4.82	6.15	5.32
12	3.52	4.82	6.62	4.70	5.29	6.68	3.68	4.13	3.51	4.99	5.07	6.85
13	3.52	4.52	9.6	4.44	4.85	9.9	3.79	13.9	3.57	4.42	4.97	4.76
14	3.38	4.18	16.2	4.16	4.63	6.38	4.28	15.6	3.51	4.13	4.44	4.09
15	3.82	4.06	14.0	4.01	4.42	5.27	4.28	6.72	3.68	4.60	5.74	3.77
16	4.66	3.90	6.92	4.09	4.16	7.0	4.09	5.56	3.90	4.76	5.72	3.59
17	9.2	3.80	5.22	4.33	4.06	14.2	7.8	4.85	3.55	4.11	4.38	3.57
18	6.78	3.78	4.62	4.09	4.01	11.4	11.1	4.63	3.51	3.81	3.92	3.51
19	4.66	3.72	4.40	4.03	3.96	10.8	7.2	4.87	3.68	5.48	3.66	3.43
20	3.92	3.68	4.36	4.01	3.84	11.7	10.0	5.17	3.62	5.35	3.57	3.34
21	3.78	3.60	4.26	8.4	5.27	8.2	18.2	4.92	3.47	4.24	3.57	3.28
22	3.70	3.58	4.16	8.3	9.4	6.04	18.2	4.63	3.88	3.84	3.68	3.23
23	3.62	3.52	4.08	9.2	6.60	5.37	11.6	4.35	5.42	3.70	3.74	3.23
24	3.58	4.26	4.02	11.8	5.67	5.02	6.30	4.20	5.78	3.59	3.51	3.34
25	3.50	6.02	3.98	5.72	4.85	4.78	5.44	4.38	6.17	3.55	3.40	3.59
26	3.62	14.6	3.92	5.32	4.35	4.67	5.05	4.11	4.55	3.45	3.32	3.36
27	6.62	18.2	3.90	6.04	3.96	4.60	5.56	3.92	4.03	3.40	3.23	3.28
28	10.0	18.5	3.82	4.58	3.90	4.38	5.96	3.88	3.81	3.34	3.40	3.28
29	7.4	10.4	3.78	4.89	3.92	4.24	5.22	3.79	3.66	3.28	5.96	3.40
30	5.18	8.2	3.76	5.27	.....	4.09	4.95	3.74	3.57	3.23	4.38	3.23
31	4.68	.....	3.76	6.00	.....	3.99	.....	3.70	.....	3.23	4.06	.....

NOTE.—Stage-discharge relation probably affected by ice Dec. 14, 1919, to Feb. 22, 1920.

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, 1920.

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; permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 31.1 feet at 8 a. m. October 27 (discharge, about 109,000 second-feet); minimum stage, 2.85 feet at 8 a. m. October 8 (discharge, 1,020 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 10.57 feet at 8 a. m. April 3 (discharge, 22,800 second-feet); minimum stage, 2.95 feet at 8 a. m. July 31 (discharge, 1,120 second-feet).

1914–1920: Maximum stage recorded, 39.5 feet July 16, 1916 (discharge, about 152,000 second-feet); minimum stage recorded, 2.37 feet August 29, 1917 (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; affected by ice December 15, 1919, to January 22, 1920, and January 27 to March 9, 1920. Rating curve well defined between 1,200 and 45,000 second-feet; extended beyond these limits. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good for open water, and fair for periods affected by ice.

Discharge measurements of New River at Eggleston, Va., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 24	Peterson and Bigwood	3.70	2,140
June 25	B. L. Bigwood	4.38	3,340

NOTE.—No discharge measurements were made during the year ending Sept. 30, 1919.

Daily discharge, in second-feet, of New River at Eggleston, Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	1,740	18,100	4,770	7,750	5,930	7,210	6,430	8,020	5,690	3,710	3,120	1,740
2	1,670	11,300	3,120	13,700	4,990	6,950	5,220	9,450	4,990	3,310	3,510	1,670
3	1,600	8,020	3,510	26,300	4,120	6,690	4,770	8,020	4,990	3,120	3,310	1,670
4	1,600	6,950	3,510	21,700	4,770	6,690	4,990	6,180	4,990	2,940	2,940	1,740
5	1,600	5,930	4,120	12,000	5,930	6,950	5,450	5,690	4,990	2,940	3,910	1,740
6	1,670	4,990	3,310	9,160	5,450	6,690	4,990	5,930	4,770	2,770	2,770	1,400
7	1,400	4,770	2,600	8,020	5,220	6,950	4,120	4,770	4,330	2,940	2,440	1,340
8	1,220	4,550	2,600	7,480	4,990	6,690	4,330	6,180	3,120	3,710	2,280	1,400
9	1,460	4,120	2,600	7,210	4,990	7,210	4,550	6,690	3,120	3,710	2,120	1,530
10	1,460	3,710	3,120	6,950	3,310	8,870	4,550	6,430	4,550	3,510	1,970	1,530
11	1,340	3,510	3,120	6,430	3,310	9,160	4,770	6,180	3,910	3,310	1,970	1,460
12	1,340	4,120	3,120	5,690	4,120	8,020	7,480	5,690	4,120	2,940	2,120	1,400
13	1,400	4,120	3,310	5,690	4,120	6,690	4,770	6,180	4,770	2,600	2,440	1,530
14	1,170	3,510	3,310	6,430	5,450	6,430	3,910	6,690	4,990	2,770	2,770	1,530
15	1,200	2,940	6,950	5,930	8,020	6,180	4,770	8,020	4,330	3,120	2,770	1,340
16	1,340	3,120	8,580	5,450	6,690	5,450	5,450	6,950	3,310	3,310	3,510	1,340
17	1,600	3,910	14,400	5,220	5,450	3,120	6,180	6,690	3,310	3,310	3,120	1,460
18	1,460	8,870	15,500	5,690	5,690	3,310	6,180	6,690	3,710	3,510	2,600	1,340
19	1,530	8,020	10,700	6,180	5,450	5,220	5,930	6,430	4,330	4,550	2,280	1,400
20	1,670	6,430	11,000	7,480	5,450	5,690	5,450	6,950	3,910	9,160	2,120	1,600
21	1,670	5,450	7,480	5,690	5,220	5,930	5,450	12,300	3,910	9,160	2,120	1,400
22	2,120	4,990	12,300	6,180	5,930	5,690	5,450	13,000	4,330	6,690	1,900	1,460
23	2,120	4,330	31,300	5,930	5,930	4,990	5,450	11,000	4,550	6,690	1,740	1,530
24	1,970	3,910	14,800	6,180	6,690	4,330	5,450	7,750	4,990	6,690	1,670	1,530
25	4,770	3,510	9,750	6,430	7,480	4,550	5,450	6,690	7,210	6,430	1,600	1,600
26	43,900	3,310	8,300	7,210	10,000	4,550	5,450	8,300	11,600	5,690	1,670	1,600
27	69,500	3,510	7,750	8,020	10,400	4,990	4,330	11,300	10,400	5,930	1,460	1,600
28	17,000	4,330	6,950	7,480	8,300	6,430	3,310	9,160	8,870	5,450	1,400	1,600
29	8,020	5,450	6,430	7,210	.....	7,480	5,690	8,300	8,020	3,910	1,400	1,530
30	13,700	5,220	5,690	6,950	.....	5,450	5,690	7,480	4,990	3,120	1,600	1,340
31	27,100	.....	7,210	6,690	.....	5,450	.....	5,930	.....	3,120	1,740	.....
1919-20.												
1	1,280	1,600	1,670		3,250		6,180	2,940	1,600	1,530	1,280	3,710
2	1,280	1,670	2,120				7,480	2,770	1,900	1,740	1,400	3,310
3	1,400	1,600	2,280			2,400	21,700	3,310	2,440	1,900	1,400	2,940
4	1,400	1,740	2,280	1,380			13,000	3,910	3,510	2,280	1,340	2,440
5	1,530	1,900	2,120		6,020		12,700	3,310	6,690	2,770	1,340	2,280
6	1,460	1,670	1,970				11,300	2,440	10,700	2,940	1,460	2,280
7	1,400	1,460	1,820				8,580	1,970	7,210	1,600	1,460	1,820
8	1,400	1,530	2,280			5,300	7,750	2,440	5,220	1,740	1,820	2,440
9	1,460	1,460	5,930				6,950	2,940	4,120	1,670	1,970	1,600
10	1,670	1,340	6,180			3,510	6,180	2,600	3,510	1,740	2,600	1,530
11	1,600	1,340	9,450	1,980		3,510	5,930	3,510	2,940	1,820	6,180	1,670
12	1,740	1,530	8,580			3,310	3,310	2,120	2,770	1,970	6,690	2,600
13	1,740	1,900	7,480			4,120	4,990	2,120	2,120	3,710	6,180	2,770
14	2,770	3,710	5,930			7,750	5,220	3,120	1,670	5,450	5,930	2,770
15	3,120	1,740				7,480	3,910	3,710	1,530	2,940	8,300	2,440
16	3,710	1,820				6,180	3,910	2,280	1,530	2,620	7,480	2,600
17	3,510	1,600	3,420			5,930	4,120	2,280	1,530	2,300	6,950	2,770
18	3,310	1,740				5,690	4,120	1,970	1,600	1,970	6,950	2,280
19	3,120	1,740		1,650	2,440	6,430	3,120	1,900	1,670	1,900	7,750	1,970
20	2,600	1,670				9,450	3,300	2,940	1,670	1,820	7,750	2,600
21	1,900	1,460				10,000	3,500	3,910	3,310	1,600	8,300	2,440
22	1,530	1,400				10,000	3,100	3,510	7,480	1,900	7,750	1,900
23	1,740	1,400		3,310		8,870	2,940	3,310	5,450	1,820	7,750	1,460
24	1,970	1,400		9,160		5,930	2,770	2,600	4,550	1,900	7,480	2,770
25	2,440	1,460		8,020		3,910	2,600	1,970	3,510	1,900	6,950	6,950
26	3,710	1,460	1,380	5,930		3,510	2,940	3,120	3,120	1,670	5,930	5,450
27	3,510	1,600				3,710	2,280	3,710	2,600	1,530	3,510	5,450
28	2,600	1,740				3,510	2,940	2,940	1,970	1,530	4,120	4,990
29	1,740	1,670		3,250		3,310	2,940	2,280	2,940	1,400	6,180	3,310
30	1,670	1,600			.....	4,990	3,120	1,740	1,460	1,170	5,690	3,120
31	1,600	.....			.....	5,690	.....	1,600	.....	1,120	4,120	.....

NOTE.—Stage-discharge relation affected by ice Dec. 15, 1919, to Jan. 22, 1920, and Jan. 27 to Mar. 9, 1920; gage reading considered in error Oct. 15, 1918, and Aug. 19–21, 1919; no gage readings Apr. 20–22, 1920; discharge estimated from study of observer's notes, weather records, and comparison with New River at Radford. Discharge interpolated July 16 and 17, 1920, on account of no gage readings.

Monthly discharge of New River at Eggleston, Va., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 2,920 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	69,500	1,170	7,140	2.45	2.82
November	18,100	2,940	5,500	1.88	2.10
December	31,300	2,600	7,460	2.55	2.94
January	26,300	5,220	8,210	2.81	3.24
February	10,400	3,310	5,840	2.00	2.08
March	9,160	3,120	6,130	2.10	2.42
April	7,480	3,310	5,200	1.78	1.99
May	13,000	4,770	7,580	2 60	3.00
June	11,600	3,120	5,170	1.77	1.98
July	9,160	2,600	4,330	1.48	1.71
August	3,910	1,400	2,340	.801	.92
September	1,740	1,340	1.510	.517	.58
The year	69,500	1,170	5,540	1.90	25.78
1919–20.					
October	3,710	1,280	2,130	.729	.84
November	3,710	1,340	1,660	.568	.63
December	9,450	.....	3,090	1.06	1.22
January	9,160	.....	2,570	.880	1.01
February	.....	.....	3,330	1.14	1.23
March	10,000	.....	5,170	1.77	2.04
April	21,700	2,280	5,760	1.97	2.20
May	3,910	1,600	2,750	.942	1.09
June	10,700	1,460	3,410	1.17	1.30
July	5,450	1,120	2,060	.705	.81
August	8,300	1,280	4,970	1.70	1.96
September	6,950	1,460	2,890	.990	1.10
The year	21,700	1,120	3,310	1.13	15.43

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, 1920. Upper and lower gages at the lock have been read since December, 1887, under the direction of the United States Engineers Corps.

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 STAGE.—Maximum stage recorded during the year ending September 30, 1919, 38.6 feet at 5 p. m. January 2; minimum stage, 18.50 feet at 7 a. m. October 12.

Maximum stage recorded during the year ending September 30, 1920, 34.4 feet at 5 p. m. December 7; minimum stage, 18.90 feet at 7 a. m. October 4.

Highest stage recorded occurred May 23, 1901, at 6 a. m.; upper gage 49.65 feet; lower gage 47.70 feet (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 as determined in September, 1917, amounted to about 110 and 260 second-feet, depending upon which of the two gates was closed.

ACCURACY.—Stage-discharge relation practically permanent except as may be affected by change in leakage through lock and dam; not affected by ice. Daily discharge not computed because no discharge measurements have been made since 1917. Gage read twice daily to hundredths. Records good.

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

Daily gage height, in feet, of Kanawha River, at Lock 2, Montgomery, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	19.38	30.10	22.15	27.05	21.40	23.40	22.55	21.45	21.45	21.80	20.22	20.48
2	19.18	25.95	21.80	37.20	21.30	23.60	22.35	22.30	21.25	21.30	21.30	20.12
3	19.25	23.85	21.25	34.60	21.00	23.45	21.70	24.50	21.20	20.85	21.70	19.85
4	19.50	22.75	20.95	29.70	20.85	22.80	21.40	23.40	21.10	20.58	20.78	19.68
5	19.10	22.10	20.80	26.40	21.20	22.35	21.30	22.60	20.82	20.42	20.48	19.68
6	19.25	21.80	20.65	24.50	21.10	22.60	21.30	22.00	20.50	20.35	20.28	19.65
7	19.25	21.15	20.48	23.40	20.95	23.00	21.40	21.70	20.30	20.40	20.22	19.38
8	19.22	21.05	20.42	22.90	20.85	22.90	21.10	21.70	20.45	20.95	20.15	19.22
9	19.18	20.65	20.45	22.70	20.72	22.60	20.85	21.80	20.35	20.90	20.02	19.12
10	19.05	20.55	20.80	22.15	20.75	23.20	20.75	24.70	20.12	20.62	19.88	19.15
11	18.92	20.55	21.95	21.80	20.60	24.10	21.00	25.65	19.92	20.38	19.72	19.52
12	18.80	20.48	22.25	21.55	20.48	23.30	22.20	24.20	20.05	20.35	19.88	19.58
13	19.10	20.28	22.20	21.45	20.20	22.60	24.40	23.00	20.18	22.30	19.85	19.48
14	19.10	20.25	21.90	21.35	20.60	22.10	23.40	22.50	20.82	23.50	20.30	19.38
15	19.02	20.15	23.70	21.50	21.20	21.85	24.60	22.35	20.32	23.10	20.28	19.25
16	19.00	20.08	26.10	21.70	21.90	21.60	22.15	23.20	20.28	23.70	26.20	19.18
17	18.98	20.05	24.40	21.70	21.85	21.30	22.20	22.75	20.32	27.30	20.26	19.10
18	18.78	19.98	24.85	22.50	21.50	21.30	22.65	23.00	20.95	24.60	20.05	19.10
19	18.85	20.58	23.90	25.90	21.50	21.60	22.60	22.90	21.35	23.20	20.18	19.08
20	19.10	22.10	22.95	25.20	21.20	21.40	22.10	22.60	21.05	25.30	19.90	19.12
21	19.20	22.20	21.85	23.90	21.10	21.55	21.70	23.50	20.65	26.00	19.82	19.10
22	19.55	21.90	22.50	23.10	21.20	21.50	21.20	24.70	20.65	25.30	19.70	19.10
23	19.52	21.50	28.25	22.55	22.10	21.25	21.30	24.65	20.90	23.60	19.95	19.18
24	19.60	21.10	28.50	25.45	22.85	21.15	21.30	23.60	20.78	22.90	19.88	19.55
25	19.48	20.85	25.60	26.30	23.00	20.92	21.30	25.00	21.75	22.45	19.65	19.55
26	22.75	20.75	24.40	24.60	24.40	20.95	21.80	25.35	27.70	21.90	19.48	19.45
27	31.45	20.42	23.55	23.60	25.60	20.98	21.30	24.20	28.35	21.20	19.35	19.35
28	26.00	20.42	22.80	22.90	24.40	25.00	21.05	23.80	27.40	20.75	19.42	19.28
29	23.80	21.00	22.30	22.50	.....	25.35	20.85	23.30	24.60	20.45	19.42	19.25
30	23.95	22.55	22.00	22.00	.....	23.85	21.10	22.50	23.00	20.20	19.28	19.12
31	29.55	.....	21.50	21.60	.....	23.00	.....	21.90	.....	20.22	19.50	.....
1919–20.												
1	19.18	20.25	21.20	20.15	21.25	21.25	21.20	21.05	20.45	19.85	19.20	20.62
2	19.10	28.40	20.90	20.58	20.82	21.00	22.20	20.95	20.05	19.70	19.08	20.25
3	19.02	25.65	20.72	20.35	20.78	20.95	25.60	20.82	20.42	20.28	19.05	19.98
4	18.92	23.25	20.48	19.80	21.36	21.00	25.95	20.72	20.55	22.85	19.05	20.00
5	19.18	21.90	20.40	19.80	23.85	21.60	24.70	20.65	23.95	23.10	19.02	19.70
6	19.18	21.30	20.22	19.80	23.70	23.40	24.90	20.58	26.10	22.00	19.10	19.58
7	19.20	20.90	31.95	20.00	22.75	23.80	24.40	20.40	25.80	21.40	19.08	19.68
8	19.22	20.45	30.25	20.15	22.10	22.55	24.50	20.55	23.30	21.60	19.08	19.50
9	19.22	20.25	25.90	22.50	21.55	21.70	23.85	21.20	22.20	21.20	19.25	19.48
10	19.15	19.98	24.30	23.20	21.40	21.65	23.50	21.30	21.35	20.88	19.40	19.52
11	19.22	19.90	24.30	23.05	22.35	21.30	23.10	21.00	21.00	20.45	19.32	19.45
12	20.25	19.82	24.10	22.10	22.25	21.25	22.50	20.85	20.60	20.28	20.05	19.70
13	22.00	19.85	23.40	21.40	22.00	26.40	22.10	22.05	20.40	20.58	20.65	19.75
14	21.05	19.85	23.40	20.98	21.70	26.90	22.40	23.30	20.18	20.55	20.05	19.65
15	21.00	19.92	24.20	20.52	21.60	25.50	22.25	22.80	20.08	20.80	20.30	19.35
16	21.95	20.12	23.25	20.28	21.60	24.10	21.60	21.95	20.10	20.38	21.20	19.62
17	22.40	19.98	22.50	20.30	21.15	25.00	21.55	21.40	20.25	20.15	21.50	19.55
18	21.90	19.75	22.00	20.32	20.88	25.05	21.20	21.05	20.38	20.02	21.00	19.78
19	21.20	19.68	21.40	20.05	20.90	26.40	21.20	20.72	20.40	19.82	20.72	19.52
20	20.78	19.60	21.10	20.00	20.88	31.10	21.70	20.62	20.22	19.78	21.75	19.32
21	20.50	19.60	20.78	20.75	20.82	28.00	23.20	20.65	20.80	19.70	22.90	19.25
22	20.10	19.68	20.75	27.70	21.30	25.35	24.30	21.00	22.40	19.95	22.70	19.42
23	19.78	19.65	20.65	31.80	23.30	23.85	23.80	20.88	22.80	19.85	22.20	19.35
24	21.30	19.72	20.38	30.25	24.00	23.15	22.70	20.88	21.95	19.62	21.85	19.10
25	23.10	19.95	20.45	29.30	24.15	22.30	21.85	22.50	21.05	19.65	21.30	19.08
26	22.45	20.80	20.30	26.55	23.40	21.98	21.40	22.40	20.85	19.78	21.00	19.85
27	21.85	22.50	20.12	24.40	22.45	21.70	21.40	21.80	20.38	19.65	20.50	20.32
28	21.20	22.30	20.15	23.30	21.90	21.45	21.35	21.50	20.05	19.58	20.62	20.32
29	20.65	22.05	20.25	22.30	21.40	21.45	21.35	21.05	20.05	19.45	21.15	20.40
30	20.48	21.50	20.08	21.80	.....	21.20	21.10	20.72	19.78	19.40	21.00	20.28
31	20.18	.....	19.92	21.50	.....	20.98	.....	20.60	.....	19.32	20.65	.....

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 June 30, 1906; May 10, 1907, to September 30, 1920.

GAGE.—Chain gage attached to downstream side of bridge near center of second span from left side of river; read by W. J. Hancock, and W. C. England.

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 STAGE.—Maximum stage recorded during year ending September 30, 1919, 16.3 feet at noon January 2; minimum stage, 2.07 feet at 6 p. m. September 19. Maximum stage recorded during the year ending September 30, 1920, 14.0 feet at 6 p. m. December 7; minimum stage, 2.0 feet at 7. a. m. September 24.

1895–1920: Maximum stage recorded, 22 feet during night March 13–14, 1918; minimum discharge, 46 second-feet September 30 to October 6, October 17, 24, 27–31, November 7, 10, and 11, 1904.

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

ACCURACY.—Stage-discharge relation changed during 1918; new rating curve not fully developed. Gage read to hundredths twice daily.

Discharge measurements of Greenbrier River at Alderson, W. Va., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 21	Peterson and Bigwood	3.36	1,660
June 23	B. L. Bigwood	3.77	2,400

NOTE.—No discharge measurements were made during the year ending Sept. 30, 1919.

Daily gage height, in feet, of Greenbrier River at Alderson, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	2.59	6.82	4.14	8.48	3.42	4.50	3.97	3.36	3.16	3.58	2.73	2.53
2	2.54	5.07	3.81	15.90	3.22	5.25	3.74	5.72	3.42	3.30	3.38	2.77
3	2.48	4.12	3.64	10.38	3.14	4.65	3.55	5.12	3.16	3.11	3.26	2.64
4	2.45	3.65	3.41	6.66	3.16	4.25	3.43	4.39	3.00	3.08	2.98	2.48
5	2.41	3.45	3.32	5.08	3.22	4.00	3.40	3.99	2.88	2.88	2.81	2.39
6	2.38	3.35	3.20	4.56	3.14	4.09	3.35	3.73	2.84	2.80	2.84	2.31
7	2.37	3.23	3.09	4.26	2.98	4.27	3.27	3.58	2.77	3.99	3.00	2.24
8	2.34	3.16	3.05	4.06	2.96	4.13	3.19	3.62	2.74	4.09	2.84	2.22
9	2.33	3.06	3.01	3.81	2.93	4.23	3.13	5.20	2.70	4.53	2.73	2.17
10	2.33	2.97	3.08	3.64	2.91	5.17	3.08	8.12	2.64	3.10	2.64	2.21
11	2.34	2.91	3.64	3.41	2.80	4.80	3.12	7.04	2.65	2.89	2.54	2.23
12	2.33	2.86	4.56	3.44	2.75	4.33	5.70	5.32	2.77	2.80	2.53	2.21
13	2.30	2.80	4.57	3.40	2.86	4.00	5.10	4.52	2.82	3.24	2.53	2.25
14	2.26	2.75	4.20	3.36	3.26	3.79	4.40	4.29	2.84	4.04	2.97	2.17
15	2.27	2.69	7.14	3.42	3.67	3.63	4.03	4.66	2.83	4.65	2.88	2.19
16	2.32	2.72	6.44	3.41	3.67	3.47	3.70	4.59	3.05	5.81	2.71	2.18
71	2.34	2.73	4.89	3.40	3.50	3.37	4.55	4.24	3.26	6.88	2.62	2.14
18	2.34	3.15	4.46	4.61	3.37	3.45	4.76	4.42	3.82	5.17	2.61	2.12
19	2.29	3.72	4.01	6.38	3.27	3.65	4.27	4.18	3.76	4.61	2.58	2.08
20	2.34	3.72	3.76	5.28	3.21	3.71	3.95	3.96	3.34	7.83	2.51	2.12
21	2.36	3.53	3.58	4.58	3.17	3.60	3.73	4.49	3.56	5.93	2.51	2.13
22	2.46	3.42	5.91	4.21	3.31	3.47	3.57	4.82	3.74	5.13	2.47	2.16
23	2.50	3.25	8.99	4.14	4.00	3.37	3.45	4.42	3.30	4.85	2.41	2.20
24	2.63	3.14	5.97	7.41	4.43	3.33	3.43	4.12	3.15	4.79	2.37	2.22
25	2.79	3.02	5.18	6.26	4.25	3.23	3.39	5.76	4.62	4.02	2.35	2.23
26	5.26	2.94	4.86	4.98	5.93	3.16	3.35	5.59	5.79	3.67	2.36	2.22
27	5.13	2.92	4.48	4.44	5.55	3.42	3.26	4.48	7.84	3.33	2.45	2.36
28	4.22	2.99	4.11	4.06	4.55	7.73	3.21	4.10	6.09	3.15	2.32	2.25
29	3.82	5.16	3.86	3.86	.....	5.61	3.16	3.79	4.79	3.03	2.25	2.21
30	4.17	4.76	3.61	3.64	.....	4.67	3.14	3.53	3.99	2.91	2.24	2.14
31	11.15	.....	3.64	3.46	.....	4.27	.....	3.34	.....	2.81	2.31	.....

Daily gage height, in feet, of Greenbrier River at Alderson, W. Va., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	2.10	2.86	3.70	2.91	3.46	3.42	3.28	3.42	2.88	2.50	2.23	2.55
2	2.05	6.30	3.50	2.83	3.31	3.35	5.18	3.38	2.81	2.56	2.25	2.49
3	2.06	5.54	3.36	2.83	3.27	3.29	5.98	3.44	2.78	2.71	2.23	2.42
4	2.13	4.32	3.24	3.01	3.89	3.27	4.85	3.38	2.84	3.85	2.19	2.38
5	2.05	3.80	3.07	2.96	4.09	3.50	5.70	3.28	4.45	4.02	2.18	2.33
6	2.08	3.50	3.27	2.79	4.01	5.32	6.10	3.15	6.58	3.38	2.16	2.27
7	2.10	3.27	10.32	2.84	3.75	4.40	5.48	3.09	4.72	3.09	2.25	2.26
8	2.17	3.08	10.52	2.94	3.56	3.94	5.18	3.15	4.04	2.99	2.21	2.24
9	2.08	2.94	6.20	3.51	3.43	3.70	5.06	3.22	3.61	2.96	2.15	2.24
10	2.08	2.86	5.64	5.03	3.39	3.60	4.95	3.22	3.38	2.82	2.27	2.21
11	2.08	2.80	5.40	4.76	3.69	3.44	4.70	3.15	3.18	2.73	2.38	2.21
12	2.32	2.77	4.72	4.11	3.83	3.52	4.32	3.08	2.95	3.16	2.43	2.22
13	2.77	2.75	4.44	3.73	3.73	6.20	4.18	3.10	2.82	3.48	2.44	2.22
14	2.85	2.75	5.80	3.63	3.75	7.08	4.68	4.95	2.76	3.23	2.51	2.22
15	2.76	2.73	5.14	3.25	3.76	5.25	4.26	4.30	2.72	2.98	3.13	2.19
16	2.81	2.70	4.60	3.09	3.69	4.56	3.95	3.89	2.78	2.85	2.93	2.16
17	2.78	2.69	4.18	3.26	3.59	5.25	3.76	3.61	2.70	2.76	2.70	2.15
18	2.83	2.61	3.86	3.02	3.53	6.02	3.58	3.41	2.60	2.69	2.67	2.12
19	2.73	2.56	3.61	3.21	3.49	8.18	3.45	3.30	2.68	2.80	3.24	2.09
20	2.68	2.55	3.46	2.83	3.31	10.41	3.92	3.25	3.42	2.65	3.52	2.06
21	2.56	2.52	3.20	3.15	3.21	6.65	5.00	3.38	4.58	2.56	5.08	2.05
22	2.50	2.49	3.13	7.41	3.41	5.18	6.45	3.55	4.28	2.52	4.03	2.03
23	2.59	2.51	2.98	8.31	4.31	4.55	5.22	3.42	3.78	2.47	3.60	2.02
24	3.50	2.57	3.01	8.49	5.26	4.20	4.50	3.32	3.36	2.37	3.32	2.02
25	4.38	2.62	3.11	9.49	5.23	3.96	4.05	3.33	3.13	2.39	3.15	2.13
26	3.87	2.66	3.09	6.26	4.51	3.82	3.82	3.42	2.92	2.69	2.96	2.15
27	3.44	4.27	2.98	4.93	4.01	3.78	3.78	3.48	2.76	2.57	2.80	2.18
28	3.22	4.67	3.03	4.39	3.73	3.68	3.72	3.34	2.71	2.53	2.70	2.30
29	3.05	4.04	3.06	4.03	3.59	3.58	3.66	3.20	2.62	2.47	2.60	2.24
30	2.85	3.80	2.98	3.76	.....	3.44	3.55	3.08	2.56	2.35	2.58	2.31
31	2.75	.....	2.88	3.63	.....	3.32	.....	2.97	.....	2.27	2.66	.....

NOTE.—Stage-discharge relation may have been slightly affected by ice during January and February, 1920.

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, 1920.

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 STAGE.—Maximum stage recorded during the year ending September 30, 1919, 16.3 feet at 8 a. m. January 2; minimum stage, 1.34 feet September 8 and 9.

Maximum stage recorded during the year ending September 30, 1920, 22.0 feet at 11.30 a. m. December 7; minimum stage occurred sometime between August 2 and 22, or September 2–8 when water was below gage.

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

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

ACCURACY.—Changes in stage-discharge relation may be caused by floods; ice effects during part of December, 1919, and January, 1920. Gage read to half-tenths twice daily.

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

No discharge measurements have been made at this station since June 7, 1917.

Daily gage height, in feet, of Little Coal River at McCorkle, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	2.09	3.39	2.59	10.70	3.02	3.84	3.62	4.54	2.99	2.99	2.99	2.44
2	2.09	3.02	2.59	14.70	2.94	3.76	3.46	6.59	2.82	2.86	3.26	2.35
3	2.09	2.84	2.59	7.46	2.94	3.69	3.32	4.84	2.76	2.49	3.29	2.22
4	2.04	2.72	2.54	4.99	2.92	3.64	3.29	4.09	2.66	2.39	2.84	2.09
5	2.04	2.66	2.54	4.49	2.86	3.84	3.26	3.59	2.62	2.19	2.49	1.79
6	2.04	2.52	2.49	4.14	2.84	4.79	3.19	3.42	2.56	2.04	2.24	1.64
7	2.02	2.42	2.49	4.69	2.84	4.79	3.14	3.34	2.52	2.86	1.99	1.49
8	1.99	2.36	2.44	3.56	2.76	4.16	3.04	3.54	2.54	3.29	1.94	1.36
9	1.99	2.34	2.46	3.56	2.74	4.12	3.04	4.36	2.49	2.54	1.94	1.39
10	1.96	2.34	2.56	3.39	2.69	3.96	2.99	6.63	2.49	2.36	1.94	1.94
11	1.94	2.26	2.84	3.26	2.62	3.79	3.39	5.12	2.49	2.26	1.96	2.34
12	1.94	2.19	3.59	3.24	2.56	3.66	5.74	4.24	2.52	2.26	1.99	2.62
13	1.94	2.12	3.16	3.16	2.64	3.59	4.39	3.86	2.56	3.02	2.04	2.39
14	1.94	2.04	3.62	3.14	2.72	3.39	3.92	3.64	2.52	5.12	2.12	2.09
15	1.89	2.04	5.82	3.54	2.82	3.29	3.79	3.52	2.59	4.44	2.06	2.04
16	1.89	2.09	3.94	3.89	2.84	3.19	3.69	3.36	2.59	4.04	2.04	1.94
17	1.84	2.26	3.49	3.76	2.86	3.14	3.64	3.36	2.66	4.14	2.12	1.86
18	1.84	2.44	3.19	3.94	2.86	3.19	3.52	3.42	2.56	4.12	2.34	1.82
19	1.92	2.49	3.09	5.24	2.84	3.16	3.42	3.39	2.54	3.59	2.69	1.76
20	1.84	2.59	3.06	4.29	2.92	3.14	3.32	6.19	2.49	3.46	2.79	1.72
21	1.96	2.64	2.94	3.86	2.96	3.14	3.22	8.25	2.69	3.49	2.49	1.72
22	1.99	2.64	2.92	3.56	3.02	3.09	3.19	5.16	2.56	3.19	2.29	1.94
23	2.16	2.64	3.64	3.76	3.19	3.04	3.49	4.19	2.59	3.09	2.16	2.19
24	2.14	2.59	3.62	6.54	3.24	3.04	3.64	4.12	2.96	2.56	2.04	2.14
25	2.14	2.47	3.59	5.22	3.34	2.99	3.54	6.39	3.16	2.26	2.04	2.06
26	2.14	2.49	3.46	4.14	3.94	2.94	3.46	4.94	6.39	2.19	2.09	2.04
27	2.06	2.54	3.39	3.59	4.22	3.89	3.36	4.09	5.19	2.09	2.12	1.96
28	2.09	2.54	3.09	3.42	3.89	5.96	3.29	3.74	4.09	2.12	2.16	1.86
29	2.22	2.54	2.94	3.32	.....	4.59	3.29	3.39	3.49	2.39	2.26	1.82
30	2.89	2.52	2.86	3.14	.....	3.96	3.29	3.26	3.22	2.24	2.44	1.76
31	3.94	.....	2.99	3.12	.....	3.82	.....	3.09	.....	1.99	2.62	.....
1919–20.												
1	1.69	7.20	4.49	3.56	3.86	4.39	3.54	3.69	3.09	2.76	1.04	1.04
2	1.64	14.40	4.14	3.56	3.69	4.26	5.69	3.54	2.89	2.76	.....	.....
3	1.64	7.30	3.92	3.52	3.59	4.29	5.92	3.54	2.82	2.86	.....	.....
4	1.59	5.44	3.74	3.49	3.56	4.46	5.22	3.54	2.89	2.86	.....	.....
5	1.66	4.62	3.59	3.44	3.54	5.64	4.82	3.49	9.40	2.59	.....	.....
6	2.36	4.04	5.66	3.42	3.49	5.59	4.59	3.44	6.49	2.19	.....	.....
7	2.36	3.82	19.84	3.39	3.49	5.44	5.29	3.46	5.09	2.14	.....	.....
8	2.42	3.62	7.90	4.32	3.49	5.42	5.06	3.59	4.39	3.06	.....	.....
9	2.36	3.49	6.09	10.25	3.46	4.34	4.82	3.76	4.09	3.29	.....	1.09
10	2.16	3.29	5.89	7.05	3.62	4.19	4.59	3.99	3.79	3.09	.....	1.04
11	2.19	3.22	5.74	5.59	4.54	4.06	4.24	3.94	3.44	2.94	.....	1.09
12	5.54	3.32	5.42	5.39	4.74	4.09	4.06	4.02	3.16	2.99	.....	2.59
13	4.04	3.42	6.19	5.14	4.64	7.30	4.52	4.24	3.22	2.79	.....	3.69
14	3.99	3.52	8.45	4.44	4.56	6.82	4.46	4.34	2.99	2.72	.....	3.14
15	4.26	3.50	6.95	3.94	4.45	6.02	4.29	4.39	2.94	2.64	.....	2.89
16	7.20	3.42	5.54	3.96	4.36	5.59	4.09	4.39	3.14	2.54	.....	2.54
17	6.83	3.36	5.19	3.94	4.26	7.20	4.04	3.94	3.02	2.42	.....	2.19
18	5.19	3.22	4.59	3.89	4.16	6.54	3.94	3.84	2.69	2.29	.....	2.09
19	4.19	3.12	4.44	3.86	4.04	10.72	3.62	3.79	2.54	2.04	.....	1.89
20	5.69	3.02	4.14	3.84	3.96	8.80	6.02	3.89	2.66	1.89	.....	1.69
21	4.64	2.96	3.94	5.64	3.99	6.19	5.49	3.96	3.54	1.69	.....	1.54
22	3.19	2.96	3.86	9.20	5.02	5.56	5.29	4.16	4.32	1.44	.....	1.39
23	3.12	3.16	3.74	11.90	5.66	5.04	5.12	4.04	4.16	1.26	1.04	1.29
24	6.24	3.19	3.66	12.25	5.72	4.69	5.02	3.86	3.84	1.12	1.04	1.24
25	5.52	3.26	3.64	8.30	5.54	4.34	4.49	4.04	3.56	2.24	1.04	1.04
26	4.64	4.99	3.64	6.64	5.14	4.16	4.36	3.99	3.24	2.54	1.04	2.94
27	4.44	6.32	3.49	5.64	4.89	4.02	4.19	3.74	2.96	2.34	1.04	2.69
28	4.32	5.74	3.46	4.92	4.69	3.69	4.06	3.59	2.84	1.99	1.04	2.39
29	4.09	5.09	3.49	4.66	4.54	3.56	3.94	3.42	2.72	1.82	1.12	2.26
30	3.49	4.74	3.49	4.34	.....	3.42	3.86	3.36	2.72	1.66	1.04	2.09
31	3.34	.....	3.49	4.02	.....	3.32	.....	3.24	.....	1.49	1.04	.....

NOTE.—Stage-discharge relation may have been slightly affected by ice during December, 1919, and January, 1920. Water below gage Aug. 2–22, and Sept. 2–8, 1920.

RACCOON CREEK BASIN.

RACCOON CREEK AT ADAMSVILLE, OHIO.

LOCATION.—About 200 feet above covered highway bridge at Adamsville, Gallia County, 5 miles southwest of 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, 1920.

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 STAGE.—Maximum stage recorded during the year ending September 30, 1919, 16.15 feet at 5 p. m. January 2; minimum stage, 1.79 feet at 5 p. m. October 12.

Maximum stage recorded during the year ending September 30, 1920, 21.10 feet at 5 p. m. April 21; minimum stage, 2.00 feet at 5 p. m. August 11.

1915–1920: Maximum stage recorded 21.10 feet at 5 p. m. April 21, 1920; minimum stage, 1.75 feet at 7 a. m. September 26, 1917 (discharge, 18 second-feet).

High-water marks indicate maximum stage of about 24.5 feet previous to installation of gage.

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

ACCURACY.—Stage-discharge relation practically permanent; affected by ice part of December, 1919, and January and February, 1920. Gage read to hundredths twice daily.

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

No discharge measurements were made at this station during the years ending September 30, 1919 and 1920.

Daily gage height, in feet, of Raccoon Creek at Adamsville, Ohio, for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	2.02	2.66	2.85	8.86	3.54	4.18	3.18	4.88	4.32	2.40	3.25	2.90
2	2.04	2.48	2.69	15.68	3.13	4.11	3.69	6.18	4.23	2.39	2.98	2.82
3	1.98	2.30	2.93	15.31	3.00	4.25	4.32	6.46	5.02	2.28	2.58	2.74
4	1.95	2.28	2.92	14.56	3.13	4.40	4.08	6.33	5.38	2.54	2.54	2,74
5	2.00	2.36	2.80	12.56	3.09	5.86	3.83	5.93	4.88	2.22	2.44	2.72
6	1.98	2.35	2.73	7.21	3.02	6.19	3.38	5.52	4.63	2.26	2.42	3.22
7	1.92	2.18	2.72	5.91	2.94	5.78	3.18	5.24	4.16	2.33	2.34	3.14
8	2.04	2.04	2.60	4.71	2.82	5.35	2.98	4.63	4.00	2.32	2.38	2.96
9	1.93	2.04	4.15	4.18	2.77	10.20	2.90	10.78	3.73	2.18	2.40	3.14
10	1.86	1.96	8.80	3.93	2.77	11.83	2.83	13.23	3.31	2.42	2.40	4.36
11	1.81	1.96	10.02	3.68	2.76	10.78	2.85	12.94	3.24	2.28	2.44	4.03
12	1.80	1.94	8.72	3.28	2.72	9.28	3.11	10.62	3.20	2.34	2.56	3.05
13	1.96	1.98	8.04	4.13	2.98	7.86	3.28	9.48	3.22	3.48	3.08	2.40
14	1.90	2.02	8.76	4.63	3.00	5.44	3.45	8.58	3.12	4.02	6.42	2.38
15	1.92	2.08	10.68	4.13	3.48	5.80	3.50	7.10	3.18	3.96	7.06	2.40
16	1.91	2.22	9.36	3.74	4.02	6.08	4.56	6.83	3.38	4.52	8.04	2.41
17	1.84	2.36	8.38	3.60	4.04	5.23	5.08	6.40	3.38	4.20	7.34	2.38
18	1.89	2.80	7.10	3.48	3.88	5.11	4.68	6.12	3.28	3.70	7.54	2.40
19	1.93	3.65	6.42	3.42	3.74	5.20	4.18	5.98	3.00	3.83	8.50	2.40
20	2.03	4.26	5.95	3.40	3.62	5.01	3.97	5.88	3.12	3.78	9.00	2.55
21	2.10	4.53	5.28	3.38	3.58	5.44	3.62	6.36	3.29	3.54	8.28	2.88
22	2.10	4.21	6.01	3.16	4.28	5.06	3.46	6.40	3.10	3.18	6.92	3.47
23	2.12	4.08	7.39	3.76	3.92	4.70	3.39	6.00	2.74	2.98	4.22	4.08
24	2.10	3.90	9.43	5.48	4.00	4.11	3.40	5.88	2.90	3.01	3.80	4.50
25	2.18	3.77	8.42	7.48	4.28	3.90	3.34	5.62	2.80	3.24	2.75	3.74
26	2.10	3.62	6.16	6.36	4.16	3.51	3.40	5.10	2.68	2.88	2.40	3.08
27	2.11	3.61	5.58	4.96	4.12	3.88	3.44	4.92	2.70	2.68	2.16	2.94
28	2.23	3.41	5.08	4.48	4.23	3.90	3.69	4.86	2.89	2.50	2.22	2.88
29	2.23	3.24	4.66	4.46	.....	3.73	3.58	4.76	2.53	2.38	2.35	2.84
30	2.14	3.14	4.38	4.41	.....	3.28	3.98	4.58	2.42	2.35	2.35	2.74
31	2.44	.....	4.18	4.00	.....	3.38	.....	4.40	.....	2.76	2.94	.....

Daily gage height, in feet, of Raccoon Creek at Adamsville, Ohio, for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	2.52	8.28	12.85	3.70	4.32	4.75	4.50	6.70	4.52	4.80	3.56	2.75
2	2.50	11.31	8.13	3.58	4.22	4.74	4.52	6.42	4.42	5.05	3.53	2.14
3	2.41	11.42	5.10	3.67	5.72	4.68	4.48	6.29	4.54	5.12	3.39	2.12
4	2.46	10.76	4.20	3.64	7.68	4.64	4.56	5.96	7.82	5.24	3.04	2.15
5	3.78	9.97	4.02	3.32	8.10	4.97	4.84	5.85	9.00	4.60	2.63	2.14
6	4.40	9.02	4.53	3.98	6.68	5.38	4.58	5.80	5.76	4.18	2.42	2.16
7	3.86	7.38	17.24	4.22	4.20	6.81	4.62	5.54	4.17	4.31	2.39	2.16
8	3.26	6.02	16.80	9.66	4.15	5.11	4.66	5.49	3.36	5.02	2.48	2.12
9	2.94	6.00	17.13	12.85	4.62	4.84	4.80	5.44	3.22	5.02	2.30	2.25
10	2.88	5.68	15.16	12.00	5.14	4.90	4.64	5.10	3.19	4.82	2.45	2.36
11	2.82	5.28	14.00	10.14	5.15	5.08	4.62	4.98	3.16	4.81	2.05	3.51
12	2.79	4.86	13.32	6.28	5.42	7.12	4.58	5.88	3.15	4.70	2.40	6.48
13	3.55	4.42	12.73	4.48	5.40	8.01	4.67	9.50	3.44	4.52	2.70	7.32
14	4.30	3.92	13.08	5.20	5.26	6.78	4.72	11.96	3.38	4.51	2.70	7.42
15	4.16	3.68	13.20	5.14	5.13	5.98	4.72	9.10	3.36	6.05	2.65	7.25
16	4.18	3.70	13.65	5.04	5.11	5.70	4.82	7.38	3.42	6.20	2.31	5.32
17	6.08	3.80	11.28	4.88	4.90	6.58	5.09	6.53	3.56	5.67	2.12	4.14
18	5.50	3.36	7.28	4.84	4.14	9.53	5.14	6.44	3.60	5.09	2.70	4.02
19	4.16	2.98	5.26	4.88	4.12	14.70	6.66	6.08	3.62	6.95	2.68	3.72
20	3.92	2.95	4.80	5.88	5.76	15.22	14.18	5.94	3.92	6.78	2.52	3.70
21	4.32	2.84	4.64	7.68	7.54	13.82	20.40	5.78	5.70	6.12	2.76	3.69
22	4.08	2.88	4.20	9.30	9.52	12.48	20.57	5.68	7.11	5.72	3.00	3.64
23	2.78	2.70	3.88	10.06	11.17	9.14	19.40	5.68	6.72	5.04	2.93	3.63
24	2.50	2.69	3.78	15.15	9.98	7.38	16.68	5.42	6.26	4.42	2.86	4.02
25	2.48	3.26	3.72	14.36	8.43	6.04	11.89	4.98	6.08	4.00	2.77	4.12
26	3.74	15.06	3.70	11.96	7.10	5.30	8.46	4.96	5.74	3.63	2.70	4.12
27	4.63	17.70	3.76	10.03	6.20	4.84	7.62	4.90	5.68	3.20	2.70	4.12
28	3.98	17.74	3.80	7.11	5.08	4.60	7.53	4.88	4.84	2.82	2.88	4.88
29	3.64	17.62	3.60	6.22	4.99	4.59	6.83	4.68	4.72	2.70	3.48	4.95
30	3.18	16.35	3.50	4.88	.....	4.56	6.88	4.62	4.52	2.62	3.80	4.86
31	4.00	.....	3.58	4.59	.....	4.56	.....	4.60	.....	2.76	3.88	.....

NOTE.—Stage-discharge relation affected by ice Dec. 14, 1919, to Jan. 26, 1920, and may be slightly affected during parts of February, 1920.

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, 1920.

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. Gage washed out by flood on January 28, 1918; replaced March 6.

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

CHANNEL AND CONTROL.—Channel 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 during the year ending September 30, 1919, 17.0 feet at 5 p. m. January 2; minimum stage, 1.80 feet September 29 and 30.

Maximum stage recorded during the year ending September 30, 1920, 21.2 feet at 5.45 p. m. March 20; minimum stage, 2.0 feet several days in October, June, July, and September.

1915–1920: Maximum stage recorded, 24.8 feet at 4 p. m. January 28, 1918; minimum stage, 1.10 feet September 26, 1917.

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

ACCURACY.—Stage-discharge relation probably permanent except as affected by ice. Gage read to tenths twice daily; records fair.

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

No discharge measurements were made at this station during the years ending September 30, 1919 and 1920.

Daily gage height, in feet, of Guyandot River at Wilber, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	2.9	4.4	2.8	9.5	3.9	3.8	8.3	4.9	4.25	5.0	5.4	2.0
2	2.9	6.4	2.8	16.95	3.9	3.8	6.65	6.4	3.9	4.8	6.3	2.0
3	2.9	7.25	2.8	15.9	3.9	3.8	5.3	6.7	3.9	4.6	6.7	2.0
4	2.9	6.9	2.8	13.1	3.9	3.8	5.0	6.0	3.85	4.5	5.9	2.0
5	2.9	6.3	2.8	8.9	3.9	3.8	4.8	5.8	3.8	4.3	5.6	2.0
6	2.9	4.8	2.8	7.95	3.9	3.8	4.7	5.3	3.7	4.0	5.1	2.0
7	2.6	4.0	2.8	7.25	3.9	3.8	4.6	5.0	3.6	4.0	5.0	2.0
8	2.6	3.8	2.8	6.6	3.9	3.8	4.4	5.0	3.6	4.15	4.9	2.0
9	2.6	3.8	2.9	5.9	3.85	3.6	4.1	5.9	3.5	4.0	4.8	1.9
10	2.6	3.8	3.2	5.8	3.8	3.6	4.0	5.4	3.2	3.8	4.6	1.9
11	2.6	3.4	3.9	5.6	3.8	3.6	4.0	6.7	3.1	3.8	4.4	1.9
12	2.6	3.4	4.1	5.0	3.8	3.9	4.0	6.0	3.0	3.8	4.4	1.9
13	2.6	3.1	5.4	4.8	3.9	4.75	4.0	5.7	3.0	8.75	4.25	1.9
14	2.6	3.05	6.3	4.8	4.45	5.3	4.0	5.2	3.0	9.0	3.9	1.9
15	2.6	3.0	8.05	4.2	3.95	5.9	4.7	5.0	2.8	8.5	3.2	1.9
16	2.6	2.6	9.6	3.9	3.9	4.8	5.0	4.9	2.7	8.05	2.8	1.9
17	2.6	2.6	8.5	3.9	3.9	4.4	4.7	4.8	2.6	8.0	2.55	1.9
18	2.6	2.7	7.1	4.05	3.9	4.05	4.6	4.6	2.6	8.45	2.25	1.9
19	2.6	3.05	6.0	4.65	3.9	4.0	4.2	4.2	2.6	8.8	2.2	2.0
20	2.6	3.5	5.3	5.4	3.9	3.95	4.1	4.0	2.6	8.7	2.2	2.4
21	2.6	4.0	4.8	6.0	3.95	3.9	4.0	4.0	2.6	7.8	2.2	2.4
22	2.9	3.9	4.9	5.4	4.9	3.9	3.9	3.9	2.6	7.05	2.2	2.15
23	3.0	3.6	6.15	5.0	4.9	3.8	3.8	3.9	2.7	6.2	2.2	2.05
24	2.8	3.2	5.75	5.0	4.6	3.8	3.8	3.95	2.9	5.9	2.1	2.0
25	2.6	3.05	4.9	4.8	4.15	3.8	3.8	4.65	3.35	5.8	2.0	2.0
26	2.4	3.0	4.1	4.6	4.0	3.8	3.8	5.4	3.75	5.4	2.0	2.0
27	2.8	2.8	3.8	4.2	4.0	3.9	3.8	6.8	4.25	5.2	2.0	2.0
28	3.0	2.8	3.8	4.05	3.8	5.45	3.8	8.0	4.9	5.0	2.0	2.0
29	3.15	2.8	3.8	3.95	.....	6.6	3.95	7.1	5.4	5.0	2.0	1.8
30	2.9	2.8	3.8	3.9	.....	8.95	4.5	6.25	5.4	4.8	2.0	1.8
31	2.9	.....	5.05	3.9	.....	9.6	.....	5.0	.....	4.8	2.0	.....
1919-20.												
1	2.2	8.1	11.75	3.8	4.1	4.8	5.1	5.0	4.5	2.8	2.1	3.5
2	2.25	14.5	17.0	3.8	4.0	4.8	7.15	4.8	10.0	2.6	2.8	3.35
3	2.25	8.5	19.15	3.8	3.8	4.8	6.6	4.6	11.1	2.4	5.1	3.3
4	2.2	4.4	16.4	3.8	3.8	4.8	5.0	4.55	6.4	2.4	6.9	3.3
5	2.0	4.0	14.5	3.8	3.8	4.8	4.8	4.5	5.4	2.1	5.85	3.35
6	2.0	3.8	17.0	3.8	3.8	4.8	4.8	4.5	4.9	2.0	4.0	3.4
7	2.0	3.8	16.05	4.0	3.8	4.8	4.8	4.5	4.3	2.3	4.0	2.25
8	2.0	3.8	12.1	4.7	3.8	4.9	4.9	4.5	3.8	2.7	4.75	2.2
9	2.0	3.5	9.2	6.5	3.8	7.15	6.15	4.2	3.4	2.9	7.5	2.0
10	2.0	3.5	6.58	6.4	3.8	9.9	7.0	4.2	3.2	3.0	6.6	2.0
11	2.4	3.3	5.58	5.9	3.8	13.1	6.2	4.0	3.2	3.0	4.5	2.0
12	2.5	3.3	5.0	5.6	3.8	14.25	6.0	3.9	3.2	2.8	4.0	2.4
13	3.1	3.0	5.0	5.3	3.8	10.0	5.6	3.8	3.0	2.7	4.0	2.2
14	4.0	3.0	5.0	4.6	3.8	6.85	5.6	3.8	2.8	2.5	4.0	2.1
15	4.9	3.0	4.6	3.9	3.9	6.25	5.3	3.8	2.7	2.4	3.2	2.1
16	6.4	3.0	4.6	3.8	6.4	7.8	5.15	3.8	2.9	2.2	3.2	2.0
17	7.55	3.0	4.4	3.8	7.0	11.4	5.0	3.8	3.05	2.0	3.4	2.0
18	8.0	3.0	4.2	3.0	6.25	15.9	5.0	3.8	3.7	2.0	3.2	2.0
19	7.25	2.8	4.2	3.0	5.8	18.5	5.0	3.8	3.4	2.4	3.4	2.0
20	6.25	2.8	4.0	2.8	5.6	20.6	5.0	3.8	3.3	2.6	3.8	2.0
21	5.0	2.8	4.0	3.9	5.3	18.75	5.0	3.8	3.2	2.4	3.85	2.0
22	4.2	2.8	4.0	11.0	5.5	14.85	5.0	3.8	3.0	2.2	3.8	2.0
23	3.5	2.8	4.0	14.0	7.7	9.6	5.0	3.8	2.9	2.1	3.8	2.0
24	4.2	2.8	3.8	16.5	8.4	7.2	5.0	3.8	2.8	2.1	3.7	2.0
25	8.0	2.8	3.8	11.0	6.25	6.5	5.0	3.8	2.6	2.1	3.6	2.0
26	9.5	3.15	3.8	7.9	5.2	6.15	5.0	3.8	2.4	2.1	3.6	2.0
27	7.25	3.9	3.8	6.4	5.1	5.8	6.58	3.8	2.3	2.1	3.6	2.0
28	5.1	3.9	3.8	5.65	5.0	5.8	6.65	3.8	2.1	2.1	3.6	2.3
29	4.6	3.8	3.8	5.45	4.9	5.5	5.0	3.8	2.0	2.1	3.6	2.3
30	3.8	6.1	3.8	5.1	.....	5.3	5.0	3.8	2.25	2.1	3.5	2.3
31	4.15	.....	3.8	4.7	.....	5.1	.....	3.8	.....	2.1	3.4	.....

NOTE.—Stage-discharge relation probably affected by ice Dec. 15, 1919, to Jan. 25, 1920.

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, 1920.

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 STAGE.—Maximum stage recorded during the year ending September 30, 1919, 33.25 feet at 5 p. m. January 2; minimum stage, 2.64 feet October 12 and 14.

Maximum stage recorded during the year ending September 30, 1920, 35.0 feet night of December 7; minimum stage, 3.04 feet at 7 a. m. October 2.

1915–1920: Maximum stage recorded 39.24 feet at 7.20 a. m. January 29, 1918; minimum stage, 2.64 feet, October 12 and 14, 1918.

Highest known flood previous to installation of gage reached a stage 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 part of December, 1919, and January, 1920. Gage read to hundredths twice daily.

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

No discharge measurements have been made at this station since March 17, 1917.

Daily gage height, in feet, of Guyandot River at Branchland, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	3.02	10.68	4.40	12.64	4.48	7.98	7.84	5.16	4.30	4.51	3.65	2.98
2	2.98	6.42	4.25	31.50	4.32	6.83	7.04	9.84	4.08	4.10	4.12	2.91
3	2.94	4.95	4.10	28.85	4.22	6.01	6.12	10.32	3.95	3.86	6.67	2.93
4	2.88	4.52	3.98	15.00	4.16	5.54	5.61	7.82	3.84	3.68	5.22	2.88
5	2.86	4.20	3.92	9.25	4.14	5.48	5.28	6.45	3.70	3.62	4.41	2.90
6	2.83	3.98	3.84	7.68	4.14	6.93	5.06	5.58	3.58	3.52	4.02	2.91
7	2.79	3.84	3.76	6.82	4.08	8.90	4.86	5.19	3.48	3.52	3.72	2.91
8	2.76	3.74	3.68	6.30	4.05	7.90	4.72	5.24	3.46	3.44	3.60	2.89
9	2.73	3.60	3.62	6.08	4.02	8.02	4.62	5.56	3.45	3.40	3.50	2.85
10	2.71	3.56	3.62	5.66	4.00	7.43	4.54	6.20	3.45	3.56	3.40	2.81
11	2.67	3.46	3.75	5.48	3.96	6.84	4.69	6.58	3.41	3.46	3.33	2.83
12	2.66	3.44	4.83	5.00	3.90	6.15	7.39	7.36	3.34	3.38	3.27	2.80
13	2.67	3.42	5.26	4.96	3.86	5.65	7.66	6.21	3.34	3.45	3.32	2.78
14	2.65	3.36	5.12	4.88	4.06	5.26	6.59	5.52	3.34	13.46	3.36	2.78
15	2.76	3.32	9.68	5.35	4.22	5.04	5.76	5.29	3.78	10.64	3.33	2.76
16	2.85	3.30	12.22	5.82	4.32	4.78	5.50	5.31	3.58	7.70	3.28	2.77
17	2.87	3.34	8.32	6.10	4.40	4.61	5.58	5.36	3.42	12.76	3.32	2.78
18	2.92	3.41	6.03	5.98	4.40	4.52	5.38	5.43	3.36	10.46	3.31	2.79
19	2.94	3.45	5.12	6.20	4.38	4.58	5.15	5.81	3.27	6.78	3.38	2.97
20	2.98	3.50	4.76	6.20	4.42	4.66	4.94	7.38	3.82	6.40	3.54	3.06
21	3.06	3.56	4.40	6.20	4.48	4.68	4.77	14.88	3.75	7.43	3.53	2.86
22	3.19	3.60	4.35	6.50	4.71	4.62	4.62	10.23	3.59	6.00	3.46	2.94
23	3.33	3.69	5.15	6.42	5.02	4.56	4.60	7.82	3.50	5.08	3.29	2.99
24	3.44	3.77	5.15	11.18	7.20	4.48	4.66	6.63	3.88	4.50	3.22	2.92
25	3.52	3.82	6.70	13.46	7.20	4.36	4.66	9.69	4.06	4.13	3.10	2.91
26	3.43	3.76	6.20	9.38	8.91	4.28	4.76	11.88	6.20	3.98	3.02	2.93
27	3.41	3.66	5.12	7.54	11.99	4.88	4.82	10.40	9.07	3.81	2.96	3.05
28	3.82	3.66	4.95	6.09	9.70	14.37	4.77	7.50	7.60	3.68	2.92	3.16
29	3.97	3.75	4.70	5.46	.....	12.98	4.70	5.69	6.16	3.60	2.89	3.09
30	4.33	4.05	4.49	5.07	.....	8.65	4.60	5.02	5.24	3.48	3.09	3.05
31	10.84	.....	4.45	4.72	.....	7.55	.....	4.62	.....	3.46	3.15	.....

Daily gage height, in feet, of Guyandot River at Branchland, W. Va., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	3.06	9.38	5.79	4.48	5.36	5.76	4.72	5.49	3.90	3.61	3.18	3.50
2	3.05	28.65	5.38	4.58	5.10	5.56	8.04	5.23	3.78	3.68	3.16	3.45
3	3.10	23.38	5.08	4.61	4.90	5.48	17.66	5.03	4.06	3.79	3.17	3.40
4	3.11	10.61	4.84	4.48	4.90	5.56	11.28	4.86	4.34	4.04	3.16	3.36
5	3.20	7.42	4.72	4.39	5.11	6.22	9.12	4.67	11.06	4.79	3.15	3.31
6	3.28	6.03	7.30	4.61	5.40	6.95	7.82	4.54	18.04	4.68	3.20	3.29
7	3.29	5.39	29.00	5.06	5.30	6.68	8.92	4.44	11.13	4.31	3.20	3.26
8	3.88	5.10	31.85	6.82	5.22	6.38	8.01	4.70	7.33	4.18	3.22	3.21
9	4.12	4.88	15.28	16.70	5.09	5.98	7.86	5.82	5.86	4.26	3.21	3.19
10	3.95	4.68	10.82	12.43	5.04	5.65	7.52	6.94	5.24	4.42	3.20	3.19
11	3.92	4.50	11.00	9.40	5.64	5.35	6.42	6.42	4.76	4.22	3.28	3.19
12	4.28	4.54	10.28	7.44	7.31	5.30	5.84	6.08	4.44	4.02	3.39	3.91
13	5.55	4.60	11.98	6.22	7.32	12.10	5.72	5.87	4.20	3.82	3.52	3.67
14	7.03	4.74	14.65	5.65	7.02	20.52	5.52	5.64	4.12	3.81	3.56	3.61
15	5.70	4.69	13.98	5.22	6.80	12.82	5.32	5.20	4.06	3.81	3.61	3.54
16	7.32	4.60	11.00	5.06	6.34	10.34	5.12	4.80	3.97	3.72	3.56	3.48
17	10.48	4.52	8.35	5.12	5.92	13.25	5.02	4.62	3.88	3.62	3.70	3.39
18	7.21	4.44	7.00	4.98	5.81	14.98	4.94	4.47	3.80	3.53	4.00	3.33
19	5.79	4.38	6.18	4.92	5.44	18.32	4.83	4.44	3.78	3.49	3.99	3.26
20	5.05	4.28	5.75	4.85	5.26	26.08	5.56	4.62	4.76	3.43	4.24	3.19
21	4.68	4.21	5.42	7.11	5.52	16.00	7.04	4.82	3.98	3.40	4.40	3.16
22	4.46	4.19	5.20	21.02	8.48	10.52	7.62	4.87	4.64	3.44	4.34	3.11
23	4.42	4.20	5.07	31.30	13.06	8.45	7.74	4.74	5.80	4.46	4.09	3.08
24	5.24	4.16	4.92	30.10	12.05	7.22	7.42	4.60	5.03	3.44	3.90	3.06
25	7.52	4.30	4.78	22.00	10.32	6.36	6.44	4.50	4.55	3.39	3.75	3.06
26	8.00	6.71	4.68	14.75	8.70	5.99	5.92	4.40	4.25	3.40	3.66	3.20
27	6.62	7.60	4.58	10.40	7.10	5.63	5.86	4.40	4.02	3.36	3.58	3.14
28	5.40	8.05	4.51	8.25	6.32	5.28	6.05	4.35	3.86	3.26	3.53	3.42
29	4.90	7.48	4.46	6.80	5.90	5.04	6.14	4.29	3.76	3.22	3.74	3.25
30	4.62	6.62	4.48	6.16	.....	4.85	5.82	4.12	3.67	3.23	3.61	3.49
31	4.41	.....	4.44	5.68	.....	4.68	.....	4.02	.....	3.21	3.53	.....

NOTE.—Stage-discharge relation probably affected by ice Dec. 20, 1919, to Jan. 10, 1920.

MUD RIVER AT YATES, W. VA.

LOCATION.—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, 1920.

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 is overflowed 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 STAGE.—Maximum stage recorded during the year ending September 30, 1919, 20.0 feet at 10 a. m. June 27; minimum stage, 1.06 feet October 6 and 7.

Maximum stage recorded during the year ending September 30, 1920, 17.85 feet between midnight and 6 a. m. January 10; minimum stage, 1.45 feet at 5.30 p. m. October 7.

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 part of January, 1920. Gage read to hundredths twice daily.

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

No discharge measurements have been made at this station since May 29, 1917.

Daily gage height, in feet, of Mud River at Yates, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1.16	3.96	2.32	13.05	2.94	5.46	3.64	5.64	2.90	3.30	2.84	3.32
2	1.13	3.08	2.25	17.90	2.80	4.80	3.24	6.44	2.70	3.02	2.88	2.60
3	1.10	2.64	2.16	17.35	2.71	4.06	3.06	5.00	2.56	2.82	2.53	2.34
4	1.08	2.32	2.14	10.83	2.76	4.85	2.95	4.12	2.48	2.66	2.36	2.15
5	1.08	2.22	2.06	6.15	2.74	5.30	2.90	3.64	2.44	2.57	2.22	2.06
6	1.06	2.12	2.05	4.46	2.64	6.50	2.82	3.36	2.40	2.54	2.14	2.02
7	1.06	2.04	1.99	4.22	2.58	5.65	2.73	3.82	2.32	2.47	2.60	1.95
8	1.11	1.96	1.99	4.42	2.56	4.74	2.69	4.86	2.30	2.35	2.70	1.96
9	1.15	1.90	1.95	5.25	2.52	7.60	2.84	7.82	2.30	2.28	2.16	1.88
10	1.17	1.84	2.26	4.62	2.47	5.47	2.81	13.92	2.22	2.24	2.03	1.88
11	1.20	1.78	2.90	4.15	2.39	4.54	4.00	7.60	2.18	2.19	2.02	2.54
12	1.27	1.76	4.74	3.67	2.34	4.04	4.58	5.06	2.12	2.13	1.97	2.80
13	1.30	1.75	3.66	3.46	2.62	3.73	4.08	4.22	2.22	5.48	1.90	2.35
14	1.30	1.72	3.40	3.60	4.05	3.51	3.54	3.77	2.32	5.00	1.88	2.18
15	1.28	1.72	8.35	4.75	4.48	3.36	3.30	3.56	8.95	3.13	1.79	2.02
16	1.24	1.70	6.02	4.98	4.68	3.25	3.42	3.26	4.18	5.88	1.94	1.93
17	1.23	1.72	3.95	4.37	3.95	3.20	4.37	3.39	3.08	5.62	1.98	1.84
18	1.22	1.80	3.34	4.30	3.69	3.20	3.88	3.28	2.70	3.42	2.08	1.64
19	1.20	1.88	3.00	4.24	3.58	3.22	3.40	3.17	2.56	4.99	2.07	1.56
20	1.30	2.49	2.79	4.16	3.24	3.18	3.16	7.58	2.33	6.05	2.12	1.56
21	1.34	2.88	2.69	3.80	3.04	3.06	3.03	11.55	3.88	3.95	2.03	1.58
22	1.33	2.88	4.00	3.52	2.98	2.94	2.92	6.48	4.02	3.16	1.90	1.74
23	1.31	2.62	6.05	4.10	2.89	2.82	8.72	4.78	3.15	2.78	2.28	2.04
24	1.32	2.42	5.65	9.80	3.18	2.76	7.40	5.50	3.60	2.56	2.14	2.44
25	1.36	2.28	5.70	6.05	4.78	2.70	5.60	9.35	5.86	2.42	2.06	2.60
26	1.42	2.18	4.45	4.58	6.32	2.66	4.17	8.42	13.90	2.32	1.96	2.28
27	1.49	2.14	3.48	4.20	6.30	4.04	3.71	5.10	18.30	2.22	1.88	2.12
28	1.48	2.10	3.16	3.79	5.69	8.01	3.40	4.08	12.35	2.46	1.70	2.04
29	1.52	2.14	2.98	3.49	.....	5.18	3.50	3.62	5.60	2.52	1.62	1.96
30	2.15	2.22	2.84	3.26	.....	4.24	3.94	3.26	3.90	2.18	1.59	1.84
31	4.02	.....	3.80	3.08	.....	3.74	.....	3.01	.....	2.12	2.60	.....
1919–20.												
1	1.76	9.18	4.32	3.76	3.68	4.05	3.01	3.51	2.22	2.38	1.92	1.75
2	1.73	15.70	3.83	3.70	3.47	4.64	3.64	3.44	3.72	3.88	1.84	1.59
3	1.78	13.35	3.56	3.50	3.43	5.02	3.80	3.25	7.05	5.44	1.73	1.66
4	1.65	6.39	3.32	3.38	3.64	5.54	3.73	3.07	4.75	3.38	1.72	1.64
5	1.62	4.58	3.18	3.20	3.82	7.58	4.90	2.95	9.50	2.68	1.79	1.58
6	1.76	3.90	4.25	3.00	3.62	6.19	4.24	2.86	7.00	2.46	1.72	1.53
7	1.50	3.61	14.60	2.98	3.44	4.76	6.60	2.80	4.49	2.42	1.69	1.50
8	1.50	3.50	15.88	6.76	3.32	4.34	6.25	2.70	3.64	2.71	1.78	1.60
9	1.59	3.34	9.90	16.92	3.22	3.92	4.66	2.56	3.21	2.88	1.92	2.06
10	1.64	3.22	7.32	14.40	3.44	3.88	4.14	2.48	2.94	3.62	2.25	2.03
11	1.82	3.18	6.25	7.20	3.78	3.90	3.76	2.82	2.73	3.56	2.22	2.45
12	2.02	4.04	5.84	5.24	3.94	4.60	3.50	3.18	2.62	3.37	2.28	3.85
13	6.38	3.84	9.05	4.58	3.78	6.42	3.95	9.77	2.62	3.04	2.30	3.22
14	4.14	3.66	16.20	4.14	4.20	6.78	3.86	9.85	2.62	2.46	2.28	2.76
15	5.47	3.40	14.12	3.98	4.12	5.56	3.60	7.30	2.51	2.34	2.28	2.64
16	6.55	3.20	8.38	4.84	3.86	5.45	3.34	4.88	2.70	2.15	2.26	2.54
17	10.43	3.04	5.44	5.85	3.52	10.25	3.33	3.74	2.78	2.08	2.12	2.38
18	10.11	2.94	4.59	6.10	3.48	7.20	3.24	3.67	2.42	2.05	2.05	2.22
19	6.62	2.84	4.15	6.07	3.63	12.70	3.14	3.59	2.40	2.02	1.92	2.06
20	3.58	2.74	3.95	6.10	3.56	14.95	12.65	3.58	3.10	1.96	1.90	1.92
21	3.63	2.66	3.80	7.85	3.87	8.10	16.50	3.28	3.15	1.94	1.86	1.80
22	4.69	2.65	3.64	13.27	5.64	5.55	9.75	3.12	3.58	1.92	1.84	1.74
23	4.93	2.88	3.50	15.54	6.98	4.65	6.00	2.92	4.48	1.84	1.78	1.71
24	5.62	3.32	3.36	16.02	6.11	4.28	4.85	2.82	3.39	1.89	1.68	1.68
25	7.94	3.90	3.23	12.84	5.38	4.02	4.28	2.88	3.30	1.94	1.61	1.70
26	5.35	8.60	3.10	7.25	4.92	3.79	4.02	2.70	2.88	1.94	1.58	1.78
27	6.16	14.60	3.03	6.10	4.44	3.60	4.60	2.62	2.51	2.04	1.56	1.72
28	5.23	8.25	3.01	5.28	4.01	3.48	4.31	2.54	2.38	1.98	1.72	1.62
29	4.26	5.54	3.16	4.50	4.25	3.35	3.78	2.46	2.31	1.88	1.98	1.62
30	3.59	5.22	3.22	4.06	.....	3.06	3.58	2.35	2.29	1.70	2.02	2.12
31	3.38	.....	3.38	3.89	.....	2.97	.....	2.25	.....	1.79	1.89	.....

NOTE.—Stage-discharge relation probably affected by ice Jan. 1–10, 1920.

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, 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, 1920.

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 stage-discharge relation.

EXTREMES OF STAGE.—Maximum stage recorded during the year ending September 30, 1919, 21.1 feet at 8.45 a. m. January 2; minimum stage, 1.04 feet at 5.30 p. m. October 5.

Maximum stage recorded during the year ending September 30, 1920, 21.45 feet at 8.30 a. m. January 9; minimum stage 1.16 feet at 7 a. m. September 25.

Highest flood known previous to installation of gage 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 part of December, 1919, and January, 1920. 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. Gage read to hundredths twice daily.

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

No discharge measurements have been made at this station since March 25, 1917.

Daily gage height, in feet, of Twelvepole Creek at Wayne, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept
1918-19.												
1	1.26	5.16	2.09	12.82	3.76	5.30	4.55	5.40	2.82	1.83	1.60	1.69
2	1.19	3.39	2.08	20.20	3.45	4.78	4.44	6.00	2.56	1.72	1.88	1.66
3	1.15	2.52	2.05	9.08	3.11	4.48	4.44	4.78	2.45	1.66	1.77	1.61
4	1.10	2.39	1.98	5.72	2.87	4.12	4.34	4.51	2.32	1.61	1.73	1.59
5	1.05	2.34	1.95	4.52	2.81	5.52	4.01	4.09	2.18	1.59	1.67	1.53
6	1.08	2.28	1.96	4.18	2.78	6.25	3.48	3.92	2.11	1.57	1.65	1.46
7	1.13	2.21	1.95	4.06	2.71	5.36	3.22	3.92	2.26	1.55	1.63	1.42
8	1.16	2.13	1.92	3.96	2.67	4.84	3.25	4.45	2.19	1.51	1.59	1.46
9	1.16	2.03	1.93	3.83	2.61	8.10	3.06	5.82	2.15	1.45	1.57	1.77
10	1.16	1.97	2.07	3.70	2.58	5.70	2.89	7.65	2.09	1.41	1.55	1.66
11	1.15	1.99	2.58	3.60	2.53	4.78	5.18	5.72	2.08	1.37	1.48	1.54
12	1.19	1.98	3.08	3.51	2.45	4.15	5.42	4.75	2.06	1.35	1.40	1.43
13	1.17	1.95	3.21	3.30	2.59	3.98	4.68	4.18	2.12	1.44	1.33	1.35
14	1.19	1.93	3.82	3.17	3.69	3.89	4.05	3.85	2.18	1.43	1.39	1.23
15	1.21	1.93	5.60	3.46	4.28	3.69	3.68	3.41	2.50	1.39	1.39	1.21
16	1.21	1.89	3.98	3.72	3.71	3.48	4.16	3.17	2.49	1.36	1.37	1.19
17	1.19	2.00	2.98	3.52	3.47	3.33	4.58	3.35	2.55	1.61	1.39	1.18
18	1.17	2.45	2.32	3.46	3.33	3.60	3.78	3.35	2.42	1.59	1.40	1.22
19	1.18	2.70	2.04	3.41	3.20	3.49	3.14	3.21	2.31	2.56	1.38	1.21
20	1.26	2.83	1.93	3.34	3.40	3.40	3.10	8.24	2.23	2.48	1.33	1.22
21	1.32	2.66	2.14	3.25	3.37	3.35	3.08	7.92	2.46	2.03	2.64	1.36
22	1.37	2.42	2.88	3.19	3.22	3.33	3.16	5.78	2.43	1.83	3.09	2.53
23	1.38	2.18	2.83	4.55	3.30	3.31	3.48	5.26	2.88	1.73	2.08	3.54
24	1.27	2.10	3.42	7.98	3.19	3.25	4.40	5.58	3.50	1.62	1.98	3.39
25	1.40	2.07	4.64	6.48	3.52	3.18	3.96	9.66	4.49	1.58	1.88	2.45
26	1.72	2.02	3.69	5.20	6.58	3.17	3.54	6.41	4.72	1.52	1.82	1.82
27	1.99	1.97	3.44	4.06	5.20	5.10	3.38	4.82	4.17	1.42	1.76	1.45
28	1.97	2.02	3.20	3.87	4.00	6.62	3.20	4.12	3.64	1.35	1.67	1.39
29	1.99	2.17	2.99	3.84	.....	5.62	3.52	3.62	2.95	1.29	1.49	1.37
30	3.58	2.18	2.76	3.80	.....	4.76	4.53	3.27	2.07	1.27	1.48	1.36
31	5.55	.....	3.52	3.81	.....	4.62	.....	2.97	.....	1.31	1.69	.....

Daily gage height, in feet, of Twelvepole Creek at Wayne, W. Va., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	1.36	13.78	3.85	3.89	3.52	3.92	3.51	3.41	2.15	1.81	2.30	1.81
2	1.35	19.58	3.05	3.97	3.43	3.90	4.09	3.25	2.08	2.32	2.13	1.76
3	1.33	9.68	2.66	3.97	3.31	3.76	5.96	3.17	7.40	2.02	1.73	1.72
4	1.33	5.20	2.14	.....	3.22	3.68	5.30	3.08	4.95	1.78	1.57	1.62
5	1.41	5.00	2.09	.....	3.13	3.78	5.35	2.96	5.98	1.56	1.44	1.82
6	1.41	5.52	7.86	.....	3.04	3.65	7.46	2.91	5.30	1.44	1.52	1.72
7	1.45	4.92	20.73	2.92	2.97	3.51	7.49	3.07	4.31	2.31	1.54	1.58
8	1.40	4.73	11.36	7.58	2.99	3.45	5.80	3.56	3.32	2.40	1.81	1.45
9	1.40	4.53	5.40	20.34	2.98	3.48	4.86	3.93	2.89	2.91	1.90	1.41
10	1.57	4.52	4.80	8.99	2.91	3.44	4.40	3.54	3.06	2.00	1.92	1.37
11	1.85	4.45	4.34	6.32	2.87	3.48	4.00	3.27	2.95	2.06	1.88	1.33
12	3.14	4.11	4.18	5.61	2.92	3.95	4.58	3.60	2.82	2.51	1.81	2.67
13	3.78	3.76	11.18	5.07	2.82	5.35	6.80	3.94	2.66	3.00	1.78	2.24
14	3.86	3.29	13.62	4.76	2.73	4.65	5.66	3.70	2.38	2.31	1.70	1.93
15	4.98	3.04	5.58	4.62	2.70	4.46	4.66	3.44	2.14	2.10	2.14	1.88
16	6.92	2.90	4.96	4.44	2.66	6.21	3.52	3.26	2.07	1.93	2.01	1.86
17	10.70	2.82	4.69	4.75	2.61	8.75	3.31	3.04	2.04	1.83	1.94	1.80
18	5.29	2.86	4.44	4.01	2.52	6.46	3.27	3.08	2.27	1.99	1.92	1.75
19	4.89	3.00	4.19	3.50	2.43	14.75	3.21	3.45	2.28	1.92	1.94	1.72
20	4.32	2.92	3.98	3.42	2.30	10.18	4.64	3.43	2.08	1.84	1.94	1.63
21	3.96	2.86	3.91	7.98	3.26	6.72	7.38	3.15	2.12	1.79	1.91	1.54
22	3.84	2.78	3.94	12.06	6.29	5.69	6.40	3.00	3.17	1.76	1.89	1.43
23	3.69	2.75	4.00	14.94	5.59	4.98	5.51	2.95	2.83	1.73	2.01	1.33
24	4.48	2.65	3.91	15.08	4.98	4.66	4.60	2.95	2.36	2.28	1.98	1.19
25	3.78	4.40	3.86	10.80	4.41	4.39	4.00	2.85	2.21	2.35	1.93	1.24
26	3.42	12.58	3.80	6.60	4.52	4.26	3.94	2.93	2.16	2.10	1.85	1.82
27	3.16	10.99	3.81	5.28	4.70	4.04	3.85	2.76	2.04	1.91	1.80	1.33
28	3.03	8.14	3.91	4.81	4.38	3.93	3.74	2.55	1.99	1.76	1.65	2.47
29	2.65	5.74	4.02	4.39	4.03	3.83	3.62	2.36	1.92	1.58	1.57	1.60
30	2.10	5.30	3.92	4.02	.....	3.73	3.52	2.31	1.88	1.47	1.57	1.82
31	1.93	.....	3.91	3.66	.....	3.62	.....	2.23	.....	1.44	1.68	.....

NOTE.—Stage-discharge relation probably affected by ice Dec. 15, 1919, to Jan. 11, 1920. No gage readings Jan. 4–6, 1920, on account of ice.

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 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, 1920.

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 Garfield Stambaugh to February 4, 1919, and by Charles Ferguson after that date. 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 half a mile above and 300 feet below gage. Bed of stream sandy. Remains of cofferdams 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 stage recorded during the year ending September 30, 1919, 29.2 feet at 6 p. m. January 3; minimum mean gage height, 1.3 feet October 16–22.

Maximum stage recorded during the year ending September 30, 1920, 34.5 feet at 6 p. m. January 23; minimum stage, 2.6 feet October 8 and August 4–6.

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

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.—Stage-discharge relation may change during high water; affected by ice during parts of December, 1919, January and February, 1920. Gage read to tenths once daily.

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

No discharge measurements have been made at this station since March 20, 1917.

Daily gage height, in feet, of Levisa Fork at Thelma, Ky., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1.9	13.0	2.5	16.4	4.4	8.5	7.8	5.6	6.2	5.2	3.4	2.8
2	1.9	10.0	2.5	28.1	4.1	7.1	7.6	6.1	5.4	5.1	3.2	2.7
3	1.8	5.0	2.6	29.2	3.8	6.2	6.4	6.6	3.9	5.0	3.2	2.6
4	1.8	4.0	2.5	14.5	3.5	4.7	5.9	6.8	3.3	4.9	3.4	2.6
5	1.7	3.5	2.4	10.5	3.7	4.5	5.6	6.9	3.1	4.6	3.6	2.5
6	1.7	3.4	2.3	10.1	3.6	4.8	5.2	6.2	2.7	4.3	3.1	2.5
7	1.7	3.2	2.3	9.2	3.5	10.9	4.7	5.5	2.6	3.8	2.9	2.5
8	1.6	2.9	2.4	8.5	3.4	9.5	4.4	5.8	2.4	3.1	2.8	2.4
9	1.6	2.8	2.5	8.5	3.3	9.9	4.2	5.9	2.3	3.9	2.8	2.4
10	1.5	2.7	2.5	8.3	3.3	8.2	3.9	7.3	3.0	4.9	2.7	2.9
11	1.5	2.3	2.5	7.5	3.2	6.3	3.8	7.6	3.3	5.6	2.6	2.8
12	1.5	2.2	3.2	5.8	3.1	6.1	4.5	7.4	3.6	5.8	2.6	2.8
13	1.5	2.1	4.9	5.5	3.1	5.5	8.7	7.2	3.4	4.4	2.4	2.7
14	1.4	2.0	4.7	5.2	3.6	4.3	8.4	5.8	3.1	4.1	2.4	2.6
15	1.4	1.9	15.5	5.2	3.9	4.2	8.1	5.4	2.8	3.8	2.6	2.6
16	1.3	1.9	16.1	5.6	4.2	4.1	7.9	5.1	2.6	3.1	3.8	2.3
17	1.3	1.9	8.5	5.8	3.9	4.8	7.7	4.8	2.4	5.5	3.8	2.3
18	1.3	2.0	7.5	7.3	3.7	5.1	7.4	4.2	2.6	7.4	3.7	3.4
19	1.3	2.1	6.8	12.8	3.6	5.0	7.1	4.1	2.8	6.4	3.6	3.6
20	1.3	2.0	4.7	11.7	3.5	4.9	6.8	7.6	3.0	4.4	3.9	3.6
21	1.3	2.0	4.2	8.7	3.7	4.6	6.4	9.5	3.3	3.6	3.6	3.7
22	1.3	2.0	3.7	7.9	3.8	4.2	6.1	10.4	3.6	3.0	3.5	3.6
23	3.1	2.0	6.7	7.9	4.8	3.6	5.9	12.6	3.7	2.9	3.4	3.8
24	2.5	2.0	6.8	11.9	6.4	3.4	5.8	9.1	4.3	2.8	3.3	3.8
25	2.5	1.9	5.2	10.3	7.3	3.8	5.6	7.5	5.4	2.8	3.3	3.8
26	2.4	1.9	5.9	9.6	8.5	3.6	5.5	7.9	5.9	2.7	3.2	3.7
27	2.4	2.0	5.1	8.9	12.5	5.1	5.9	.....	6.2	2.6	3.0	3.7
28	2.4	2.0	3.8	7.7	10.7	22.1	6.2	7.8	5.8	2.6	3.4	3.5
29	2.5	2.2	3.6	5.5	.....	14.9	6.1	7.4	5.1	2.6	3.2	3.2
30	3.5	2.5	3.5	4.8	.....	11.8	5.8	7.1	4.6	2.8	3.1	3.1
31	15.4	.....	4.3	4.7	.....	7.8	.....	6.6	.....	3.2	3.0	.....
1919–20.												
1	3.1	14.5	4.8	3.4	5.3	7.2	6.1	5.4	3.3	5.4	3.2	3.3
2	3.0	24.8	4.4	3.3	4.9	6.3	12.3	5.2	3.3	4.6	2.9	3.2
3	2.9	18.0	3.8	3.4	4.5	5.4	18.3	5.1	3.4	4.4	2.7	3.1
4	2.9	10.7	3.5	3.6	11.3	4.9	24.3	4.9	3.6	5.6	2.6	3.3
5	2.8	8.5	4.1	4.0	10.1	4.6	19.2	4.8	4.4	6.7	2.6	3.4
6	2.8	7.4	12.5	4.2	9.5	4.8	14.7	4.6	7.6	5.6	2.6	3.2
7	2.7	4.3	24.7	4.1	7.3	5.3	12.3	4.7	8.3	4.4	3.2	3.2
8	2.6	3.4	18.5	5.6	6.4	7.4	11.8	5.6	6.3	4.3	3.9	3.3
9	2.8	3.3	14.1	7.3	8.4	8.8	10.2	7.0	5.2	4.3	3.9	3.4
10	2.9	3.2	9.8	6.2	8.3	9.1	9.1	6.6	7.4	4.8	4.3	3.5
11	3.2	3.3	7.0	5.9	8.0	8.4	8.9	6.4	5.1	4.2	4.4	3.7
12	5.7	3.2	5.9	4.9	7.7	7.3	9.9	5.2	4.9	4.1	4.3	4.8
13	4.6	3.3	7.5	5.3	6.6	9.9	9.4	5.3	3.9	3.9	4.2	11.4
14	5.2	3.6	20.1	5.1	5.8	24.0	9.2	6.4	3.6	3.8	4.3	7.3
15	6.2	3.4	15.7	5.1	5.2	18.2	8.8	6.2	3.2	3.7	4.9	6.9
16	10.8	3.8	11.3	4.8	4.6	11.8	7.1	6.0	3.3	3.7	5.9	6.4
17	9.7	3.6	9.1	4.7	3.3	14.4	6.8	5.5	3.8	3.6	5.4	5.6
18	8.6	3.5	7.3	4.6	3.4	18.2	6.3	4.8	3.7	3.4	5.3	4.6
19	5.5	3.5	6.8	4.3	4.2	25.8	6.0	4.2	3.5	4.3	5.1	3.9
20	5.6	3.4	6.1	4.8	4.2	19.4	6.8	4.2	3.4	5.6	4.3	3.9
21	4.5	3.3	5.9	11.8	4.4	14.3	6.9	3.9	3.6	4.3	4.2	3.7
22	3.2	3.2	5.7	28.3	4.8	11.1	6.6	4.6	3.7	3.4	4.5	3.4
23	3.1	2.9	5.3	34.5	6.9	9.8	6.0	4.7	3.8	4.5	4.4	3.1
24	3.5	3.2	5.0	34.1	8.3	7.3	5.7	4.8	4.6	5.6	4.3	3.0
25	3.7	5.8	4.3	26.0	10.4	5.2	5.5	5.8	3.9	4.3	4.2	2.9
26	9.8	8.4	3.9	22.3	11.3	4.9	6.7	5.9	3.8	5.4	3.8	2.8
27	5.4	8.8	3.8	19.5	9.8	4.7	7.3	5.7	3.7	6.7	3.6	2.8
28	4.5	8.9	3.7	11.2	8.9	4.5	7.0	5.5	3.5	5.6	3.6	2.7
29	5.7	7.8	3.6	7.8	8.8	4.4	6.3	5.3	3.4	3.4	3.7	2.9
30	4.5	6.4	3.5	6.7	.....	4.1	5.9	5.9	3.4	3.4	3.6	2.9
31	3.5	.....	3.5	5.6	.....	3.8	.....	3.6	.....	3.3	3.4	.....

NOTE.—Stage-discharge relation probably affected by ice about Dec. 20, 1919, to Jan. 22, 1920, and Feb. 4-27, 1920. No gage reading May 27, 1919.

TUG FORK AT KERMIT, W. VA.

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

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

RECORDS AVAILABLE.—June 1, 1915, to September 30, 1920.

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 38–48 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.

EXTREMES OF STAGE.—Maximum stage recorded during the year ending September 30, 1919, 26.4 feet January 2; minimum stage, 1.49 feet September 9.

Maximum stage recorded during the year ending September 30, 1920, 29.5 feet at 7 a. m. January 23; minimum stage 1.36 feet October 4.

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

ACCURACY.—Stage-discharge relation practically permanent; probably affected by ice during parts of December, 1919, and January and February, 1920. Gage read to half-tenths twice daily.

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

No discharge measurements have been made at this station since May 24, 1917.

Daily gage height, in feet, of Tug Fork at Kermit, W. Va., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	2.20	10.00	3.70	9.00	4.30	8.08	9.70	4.95	3.90	3.08	2.48	2.25
2	2.15	6.80	3.55	26.40	4.00	7.00	8.80	7.25	3.60	3.05	3.20	2.50
3	2.10	5.30	3.40	23.30	4.20	6.40	7.60	7.50	3.35	2.78	3.90	2.80
4	2.00	4.50	3.35	12.30	4.18	5.80	6.65	6.80	3.15	2.55	4.25	2.00
5	1.95	4.10	3.30	9.00	4.15	5.45	6.10	6.08	3.02	2.40	3.38	1.90
6	1.90	3.80	3.20	8.00	4.15	7.00	5.70	5.42	2.90	2.25	2.90	1.75
7	1.85	3.55	3.10	6.70	3.95	8.88	5.38	4.48	2.75	2.30	2.65	1.65
8	1.82	3.40	2.95	6.50	3.80	7.76	5.12	4.70	2.70	2.28	2.80	1.60
9	1.78	3.20	2.90	6.70	3.90	7.90	5.00	4.85	2.90	2.15	3.10	1.49
10	1.75	3.10	2.95	6.38	3.68	8.00	4.75	4.95	2.80	2.45	2.40	.....
11	1.70	3.00	3.10	5.75	3.68	7.50	4.70	8.68	2.75	2.70	2.30	1.55
12	1.70	2.90	4.70	5.50	3.70	6.70	7.85	7.20	2.74	2.85	2.62	1.92
13	1.70	2.80	5.92	5.20	3.68	6.00	7.60	5.46	2.62	2.82	2.80	1.80
14	1.68	2.70	4.40	5.10	3.85	5.50	6.75	5.30	2.78	2.48	2.60	1.60
15	1.68	2.70	11.70	5.48	3.95	5.30	6.10	5.40	2.65	5.25	2.55	.....
16	1.65	2.65	11.20	6.08	4.10	4.92	6.75	5.54	2.55	4.00	2.40	1.80
17	1.65	2.65	7.80	6.30	4.10	4.68	5.85	5.50	2.38	7.40	3.30	1.79
18	1.65	2.75	6.10	6.95	3.95	4.80	5.50	5.68	3.38	7.50	3.03	1.60
19	1.65	3.00	5.15	12.50	3.95	4.88	5.20	5.60	5.10	5.10	2.95	1.50
20	1.70	3.08	4.60	10.40	3.85	4.90	5.02	5.65	4.10	5.32	2.68	1.60
21	1.95	3.10	4.25	8.40	4.10	4.82	4.85	12.60	3.28	5.40	2.50	1.90
22	2.10	3.10	4.45	7.00	4.40	4.68	4.60	9.10	2.70	4.95	2.25	1.80
23	2.45	3.05	7.30	6.20	5.25	4.40	4.78	7.20	2.65	4.70	2.15	2.00
24	2.60	3.00	7.60	11.20	5.85	4.25	5.48	6.10	2.65	3.85	2.00	2.00
25	2.40	3.00	6.90	11.30	6.60	4.12	7.00	8.40	2.80	3.32	1.90	2.10
26	2.35	2.95	6.00	9.15	9.35	4.00	6.80	8.00	4.30	3.00	1.82	2.00
27	2.30	2.90	5.15	8.50	12.10	4.10	6.10	6.90	4.23	2.75	1.72	2.20
28	4.18	2.90	4.65	6.55	9.60	17.50	5.50	5.50	3.95	2.60	1.70	2.15
29	3.50	3.20	4.35	5.78	.....	12.00	5.20	5.50	5.60	2.50	1.66	1.82
30	3.60	3.60	4.02	5.30	.....	8.70	4.92	4.90	4.42	2.40	1.65	1.70
31	12.90	.....	3.90	4.90	.....	8.42	.....	4.35	.....	2.35	1.70	.....

Daily gage height, in feet, of Tug Fork at Kermit, W. Va., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	1.60	5.18	5.00	3.50	6.00	6.32	5.15	5.38	3.20	2.95	1.90	3.50
2	1.58	20.90	4.60	3.50	5.32	5.50	10.10	5.00	3.05	3.00	1.95	3.50
3	1.85	13.70	4.50	3.75	5.02	5.75	16.70	4.88	2.85	3.75	1.85	3.65
4	1.36	8.60	4.20	4.00	5.03	6.00	11.30	4.70	2.91	3.70	1.90	2.50
5	1.60	6.50	4.00	3.95	5.00	6.50	9.38	4.48	7.60	4.80	1.90	2.80
6	1.70	5.40	4.10	3.90	4.95	8.55	8.65	4.22	12.00	2.96	2.10	3.06
7	3.60	4.75	26.70	4.10	7.00	8.75	8.70	4.05	8.60	2.78	2.50	1.95
8	2.92	4.30	19.00	4.55	6.30	6.80	9.95	4.70	5.43	2.85	1.95	1.80
9	2.70	4.05	11.60	15.50	6.10	6.00	9.70	5.90	4.80	2.90	2.30	1.95
10	2.50	3.80	8.40	10.30	5.41	5.88	8.32	8.05	4.60	2.90	2.30	2.01
11	2.40	3.60	9.90	7.65	5.25	5.45	7.10	6.85	4.20	2.78	4.80	2.00
12	2.88	3.70	8.80	5.15	6.58	5.30	7.11	5.98	3.80	2.72	3.10	2.25
13	5.35	3.60	7.55	5.50	6.65	10.50	6.30	5.52	3.65	2.57	2.10	2.00
14	6.05	3.40	13.10	5.20	6.90	20.00	6.02	5.50	3.42	2.50	2.90	2.20
15	5.92	3.30	12.60	5.00	7.30	12.00	5.70	5.11	3.25	2.65	2.75	2.50
16	7.58	3.90	10.10	4.60	6.68	9.78	5.40	5.00	3.40	2.42	2.90	2.65
17	8.20	3.80	8.30	4.70	5.85	13.70	5.38	4.62	3.18	2.40	3.00	2.55
18	7.10	3.70	7.00	4.90	5.15	12.30	5.00	4.60	3.30	2.20	3.65	2.48
19	5.73	3.60	6.75	4.60	5.92	18.00	4.82	4.35	3.25	2.25	2.95	1.75
20	4.60	3.50	6.65	4.37	5.01	20.10	4.60	4.35	4.01	2.30	4.60	2.10
21	3.88	3.10	6.50	4.60	5.15	13.50	5.42	4.62	4.25	2.40	5.50	1.95
22	3.50	3.10	6.40	21.90	7.90	12.00	6.25	4.65	5.85	2.10	4.60	1.95
23	3.30	3.15	5.40	29.50	13.00	10.96	6.20	4.50	5.40	2.25	4.05	1.90
24	4.70	3.10	5.30	28.50	11.50	7.50	6.08	4.00	4.80	2.10	3.55	2.10
25	10.00	3.05	5.15	23.00	10.30	6.80	5.50	4.35	4.50	2.53	2.90	2.00
26	7.90	3.00	4.90	14.00	8.90	6.30	5.10	4.30	4.50	2.46	2.00	1.98
27	7.00	6.10	4.60	8.90	7.52	6.01	5.52	5.20	3.00	2.50	2.95	2.10
28	4.85	5.65	4.25	7.65	6.60	5.40	6.48	4.80	2.96	2.65	3.05	2.30
29	4.20	5.32	4.00	6.50	6.40	5.15	6.14	4.16	2.80	2.34	2.95	2.20
30	3.77	5.40	3.70	6.50	.....	5.10	5.85	4.30	2.60	1.95	2.80	2.10
31	3.50	.....	3.40	6.00	.....	5.00	.....	4.00	.....	1.93	2.80	.....

NOTE.—Stage-discharge relation probably affected by ice about Dec. 18, 1919, to Jan. 9, 1920, and Jan. 29 to Feb. 24, 1920. No gage readings, Sept. 10 and 15, 1919.

BLAINE CREEK AT YATESVILLE, KY.

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

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

RECORDS AVAILABLE.—June 1, 1915, to September 30, 1920.

GAGE.—Vertical staff gage in two sections attached to elm tree on right bank 50 feet above bridge; read by Gipsey Blankenship to December 31, 1919, and by Lucille Blankenship after that date.

DISCHARGE MEASUREMENTS.—Made from board walk constructed on inside of bridge near top of siding, or by wading.

CHANNEL AND CONTROL.—Stream curved above and straight below bridge. Right bank subject to overflow at high stages. Stream bed compact sand and gravel. Control composed of bedrock extending half way across stream, sand and gravel rest of way; probably permanent.

EXTREMES OF STAGE.—Maximum stage recorded during the year ending September 30, 1919, 16.2 feet at 6 a. m. January 2; minimum stage recorded, 0.80 foot at 6 a. m. July 12 and 15.

Maximum stage recorded during the year ending September 30, 1920, 18.2 feet at 6 a. m. January 9; minimum stage 1.1 feet at 6 a. m. October 11.

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

ACCURACY.—Stage-discharge relation probably permanent; not affected by ice. Gage read to tenths twice daily.

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

No discharge measurements have been made at this station since April 26, 1917.

Daily gage height, in feet, of Blaine Creek at Yatesville, Ky., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	1.1	2.5	1.4	10.2	2.6	3.8	2.5	2.5	1.8	1.3	2.3	1.4
2	1.2	2.0	1.4	16.2	2.5	3.6	2.4	3.0	1.7	1.3	1.8	1.4
3	1.15	1.8	1.4	7.6	2.4	3.4	2.3	2.8	1.6	1.2	1.6	1.4
4	1.1	1.7	1.45	4.6	2.5	3.2	2.8	2.6	1.5	1.1	1.5	1.3
5	1.1	1.6	1.45	3.8	2.5	3.4	2.7	2.5	1.5	1.0	1.4	1.3
6	1.1	1.5	1.4	3.8	2.4	6.9	2.5	2.4	1.5	.9	1.4	1.3
7	1.0	1.6	1.3	3.7	2.4	5.3	2.4	2.6	1.6	1.7	1.2	1.2
8	1.0	1.5	1.3	3.6	2.5	5.0	2.4	4.5	2.4	1.4	1.1	1.2
9	1.0	1.5	1.35	3.6	2.5	7.1	2.5	6.6	2.3	1.2	1.1	1.2
10	1.1	1.5	1.5	3.5	2.3	6.4	2.4	13.3	2.0	1.0	1.1	1.5
11	1.15	1.4	1.6	3.4	2.3	4.9	2.6	7.7	1.8	.9	1.0	1.4
12	1.3	1.4	2.0	3.3	2.2	4.0	2.5	5.2	1.7	.8	1.0	1.4
13	1.2	1.4	2.0	3.0	2.4	3.6	3.8	4.0	1.5	.9	1.0	1.3
14	1.25	1.3	1.9	2.9	2.8	3.1	3.3	3.8	1.4	.9	.9	1.3
15	1.2	1.3	3.6	3.0	2.6	3.4	3.0	3.4	1.8	.8	.9	1.2
16	1.2	1.3	3.0	3.0	2.8	3.0	3.2	3.1	1.6	1.0	.9	1.2
17	1.25	1.4	2.5	3.0	2.7	2.9	3.7	2.9	1.8	1.0	.9	1.1
18	1.25	1.4	2.1	2.9	2.6	3.0	3.2	2.6	1.6	.9	1.0	1.1
19	1.2	1.4	2.0	3.0	2.6	2.9	3.1	2.4	1.4	.9	1.2	1.0
20	1.3	1.5	1.9	3.0	2.5	2.8	3.0	2.5	1.3	1.9	1.2	1.0
21	1.35	1.5	1.9	3.0	2.6	2.7	2.6	5.9	1.2	1.7	1.1	1.4
22	1.4	1.55	2.0	2.9	2.7	2.6	2.5	4.0	1.2	1.4	2.0	1.5
23	1.4	1.55	3.8	2.8	3.0	2.5	2.6	3.6	1.2	1.3	2.0	1.8
24	1.45	1.5	4.0	3.6	3.0	2.4	3.3	3.3	1.5	1.1	1.9	1.9
25	1.5	1.5	3.8	4.7	3.0	2.3	3.0	8.0	1.9	1.1	1.7	1.8
26	1.45	1.45	3.5	3.8	4.6	2.3	2.6	5.6	2.0	.9	1.6	1.5
27	1.4	1.4	2.7	3.4	4.4	2.4	2.5	4.2	2.3	.9	1.5	1.4
28	1.4	1.4	2.4	3.4	4.2	4.9	2.4	3.4	2.4	.9	1.5	1.4
29	1.4	1.5	2.2	3.2	.....	3.6	2.6	3.2	1.7	1.0	1.4	1.3
30	1.8	1.5	2.1	2.9	.....	3.2	2.5	2.7	1.4	1.3	1.3	1.3
31	4.0	.....	2.1	2.8	.....	2.8	.....	2.0	.....	1.6	1.5	.....
1919-20.												
1	1.3	7.0	4.8	2.5	3.2	3.3	2.5	3.4	1.8	1.8	1.9	1.8
2	1.2	15.9	4.0	2.3	3.0	3.4	4.9	3.1	1.7	2.0	1.8	2.0
3	1.2	6.1	3.2	2.4	3.0	3.4	4.5	3.0	6.0	1.9	1.7	1.8
4	1.2	4.3	2.9	2.5	2.9	3.5	5.3	3.0	3.3	1.9	1.6	1.6
5	1.2	4.0	2.7	2.4	2.9	5.7	6.9	2.6	6.9	1.8	1.6	1.6
6	1.3	3.6	4.0	2.6	2.8	4.7	4.9	2.6	4.8	.....	1.6	1.7
7	1.3	3.0	17.3	2.7	2.6	3.9	5.8	2.5	3.7	.....	1.5	1.6
8	1.2	3.0	14.3	3.1	2.5	4.0	5.5	3.2	3.1	.....	1.9	1.7
9	1.2	2.8	6.3	18.2	2.6	3.4	5.0	3.0	2.6	2.6	1.9	1.7
10	1.2	2.6	6.5	17.0	2.4	3.4	4.9	2.9	4.9	2.2	2.0	2.0
11	1.1	2.8	4.9	7.2	2.7	3.2	3.5	2.7	4.5	2.1	1.8	1.8
12	3.0	3.0	4.5	4.3	2.6	3.1	3.2	3.2	4.0	2.2	1.7	1.7
13	3.8	2.8	6.1	3.9	2.9	4.2	3.5	3.6	3.5	2.1	1.7	1.6
14	2.3	2.6	13.0	3.6	2.7	3.8	3.2	3.8	3.0	2.1	1.6	1.5
15	3.9	2.4	7.0	3.3	2.6	3.4	3.0	3.6	2.8	2.0	1.5	1.5
16	3.5	2.4	5.2	3.3	2.6	6.1	2.9	2.8	2.6	1.9	1.6	1.6
17	6.3	2.3	5.0	3.5	2.5	9.5	3.0	2.6	2.5	1.9	1.8	1.6
18	3.6	2.3	4.8	3.2	2.8	6.5	2.9	2.5	2.4	1.8	2.0	1.6
19	2.9	2.2	4.0	3.2	2.7	12.0	3.1	2.6	2.2	1.9	2.0	1.5
20	2.4	2.1	3.5	3.1	2.6	14.5	5.0	2.5	2.2	1.8	1.9	1.5
21	2.2	2.0	3.2	3.5	2.7	5.0	12.1	2.4	2.9	1.8	1.8	1.4
22	2.3	2.0	3.1	12.0	6.9	4.5	6.1	2.3	4.0	1.7	1.7	1.4
23	2.8	2.1	3.0	14.2	5.7	4.0	4.5	2.1	5.3	1.7	1.6	1.5
24	3.4	2.0	2.8	13.0	5.0	3.6	3.7	2.1	3.1	1.6	1.5	1.5
25	3.3	2.0	2.8	8.5	4.4	3.4	3.4	4.1	2.7	1.8	1.5	1.6
26	4.5	6.8	2.7	5.4	3.8	3.4	3.2	2.8	2.4	1.6	1.6	1.6
27	6.5	13.6	2.5	4.2	3.4	3.2	4.0	2.6	2.3	1.7	1.5	1.7
28	4.6	6.5	2.5	4.1	3.3	3.0	5.5	2.3	2.2	1.7	1.6	1.6
29	3.8	5.0	2.4	4.7	3.4	2.9	3.6	2.1	2.0	1.6	1.6	1.6
30	3.0	5.5	2.4	4.6	.....	2.7	3.5	2.0	1.9	1.6	1.7	1.5
31	2.4	.....	2.3	4.4	.....	2.6	.....	1.8	.....	1.7	1.8	.....

NOTE.—Gage not read July 6-8, 1920.

SCIOTO RIVER BASIN.

SCIOTO RIVER AT WAVERLY, OHIO.

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

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

RECORDS AVAILABLE.—March 23, 1916, to May 15, 1920, when station was discontinued.

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 above 12 feet the river spreads over the bottom lands, but all water passes under the bridge.

EXTREMES OF STAGE.—Maximum stage during the year ending September 30, 1919, 17.81 feet March 19; minimum stage, 1.02 feet at 8 a. m. September 22.

Maximum stage recorded for the period from October 1, 1919, to May 15, 1920, 22.75 feet at 3.15 p. m. April 21; minimum stage, 1.06 feet at 9.20 a. m. October 5.

1916–1920: Maximum stage recorded, 22.75 feet April 21, 1920; minimum stage, 0.77 foot at 7 a. m. August 26, 1918.

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

ACCURACY.—Stage-discharge relation probably permanent but no current-meter measurements have been made since October 18, 1916, to check the rating curve; ice effect during parts of December, 1919, January and February, 1920. Gage read to hundredths twice daily.

COOPERATION.—Gage-height record furnished by United States Engineer Corps.

Daily gage height, in feet, of Scioto River at Waverly, Ohio, for the period Oct. 1, 1918, to May, 15, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	1.55	1.98	2.37	5.08	3.15	3.76	4.22	4.22	4.39	2.97	4.34	1.62
2	1.37	1.75	2.47	7.22	2.94	3.53	3.92	5.35	4.27	2.54	3.44	1.52
3	1.32	1.67	2.46	11.82	2.77	3.41	3.72	4.98	4.67	2.51	2.64	1.44
4	1.34	1.81	2.43	10.76	2.81	3.21	3.52	4.98	2.94	.....	2.56	1.45
5	1.31	1.59	2.33	9.02	2.85	3.66	3.60	4.50	2.81	2.37	2.47	1.38
6	1.18	1.33	2.17	5.47	2.72	4.36	3.45	4.05	2.67	2.12	2.47	1.37
7	1.12	1.33	2.06	4.57	2.58	4.13	3.42	3.40	2.66	1.95	2.82	.....
8	1.15	.....	2.07	3.84	2.52	3.96	3.42	3.32	2.58	1.90	3.20	1.36
9	1.45	.....	2.18	3.67	2.43	4.76	3.30	4.40	2.52	1.83	3.29	1.36
10	1.86	.....	5.84	3.87	2.42	7.89	4.00	13.20	2.53	1.72	2.73	1.27
11	1.81	.....	6.87	.....	2.33	6.93	4.32	12.72	2.44	1.57	2.70	1.36
12	1.63	.....	6.82	.....	2.29	5.77	5.28	10.77	2.31	1.48	2.61	.....
13	1.57	.....	6.47	3.09	2.40	5.26	5.40	6.90	2.25	3.59	3.01	.....
14	1.50	.....	8.62	3.11	2.65	4.53	4.90	6.10	2.28	4.64	2.96	.....
15	1.40	.....	11.28	3.12	2.98	4.23	4.42	6.60	2.42	4.54	4.28	1.27
16	1.37	.....	10.17	3.09	2.95	6.46	4.35	5.55	2.82	4.19	4.40	1.25
17	1.40	.....	9.02	2.90	2.80	12.95	5.75	4.62	3.13	4.09	3.63	1.10
18	1.37	.....	6.10	2.96	2.92	16.01	7.60	4.62	3.37	3.77	3.70	1.07
19	1.31	.....	5.42	2.88	2.84	17.36	7.55	4.68	3.39	3.61	3.20	1.09
20	.....	.....	4.57	2.92	2.80	15.86	6.60	5.30	3.31	3.00	2.14	1.13
21	1.24	.....	3.72	2.73	2.76	12.97	5.38	5.25	3.13	2.58	2.11	1.07
22	1.25	.....	5.02	2.81	2.53	7.35	4.82	7.65	3.03	4.59	2.01	1.04
23	1.22	.....	6.74	2.74	2.58	6.85	4.38	6.52	2.83	6.37	1.89	2.55
24	1.22	2.63	6.82	4.26	3.31	6.00	4.15	6.08	2.50	5.21	1.95	2.21
25	1.20	2.37	7.77	4.53	3.59	5.40	3.88	7.35	2.21	3.61	1.89	1.52
26	1.21	2.22	7.02	4.39	3.51	4.90	3.60	9.45	2.21	3.00	1.80	1.48
27	1.23	2.03	6.62	4.23	3.20	4.72	3.50	7.95	4.24	2.70	1.56	1.41
28	1.31	2.10	6.72	4.01	3.03	4.75	3.40	5.50	4.31	2.38	1.51	1.40
29	1.40	2.28	5.82	3.63	.....	4.70	3.42	4.95	3.89	2.17	1.52	1.39
30	1.78	2.12	4.12	3.41	.....	.....	3.88	4.68	3.34	1.94	1.74	1.34
31	2.01	.....	4.37	3.22	.....	4.52	.....	4.14	.....	2.89	1.74	.....

Daily gage height, in feet, of Scioto River at Waverly, Ohio, for the period Oct. 1, 1918, to May, 15, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	1.29	12.95	11.78	3.18	.....	3.68	4.10	5.93	.....	.....	.....	.....
2	1.24	16.47	10.32	3.24	.....	3.48	3.85	5.67	.....	.....	.....	.....
3	1.13	13.62	7.37	3.18	.....	3.71	3.73	5.30	.....	.....	.....	.....
4	1.17	11.54	6.22	2.86	7.36	4.58	4.15	5.10	.....	.....	.....	.....
5	1.09	8.22	5.57	2.66	7.48	11.37	4.35	4.77	.....	.....	.....	.....
6	1.29	6.12	5.62	2.81	6.68	10.15	4.30	4.50	.....	.....	.....	.....
7	1.42	5.59	12.55	2.81	6.11	7.75	3.87	4.57	.....	.....	.....	.....
8	1.36	5.45	10.92	3.06	5.66	6.35	3.27	.....	.....	.....	.....	.....
9	1.23	4.87	10.95	14.11	5.18	6.00	3.77	4.13	.....	.....	.....	.....
10	1.26	4.45	11.53	7.16	6.36	5.45	3.50	5.65	.....	.....	.....	.....
11	1.26	4.57	9.29	5.61	7.58	6.60	3.27	9.96	.....	.....	.....	.....
12	.....	5.09	5.92	4.38	7.38	9.07	3.30	14.70	.....	.....	.....	.....
13	1.83	5.62	10.82	4.04	6.96	13.25	4.00	12.85	.....	.....	.....	.....
14	2.32	4.97	15.87	3.68	6.34	13.19	4.33	11.36	.....	.....	.....	.....
15	2.98	4.87	11.52	3.46	5.41	11.12	4.47	8.93	.....	.....	.....	.....
16	4.63	4.47	7.77	3.29	4.84	10.03	4.87	.....	.....	.....	.....	.....
17	7.58	3.82	5.77	3.08	4.56	15.55	6.90	.....	.....	.....	.....	.....
18	4.75	3.59	5.07	3.14	4.24	14.00	13.37	.....	.....	.....	.....	.....
19	3.22	3.35	4.62	3.01	4.24	13.80	13.20	.....	.....	.....	.....	.....
20	2.81	3.12	.....	7.01	4.71	13.60	16.80	.....	.....	.....	.....	.....
21	2.25	2.98	.....	6.16	6.41	10.60	21.40	.....	.....	.....	.....	.....
22	2.20	2.97	4.22	5.61	8.81	7.80	21.46	.....	.....	.....	.....	.....
23	2.24	.....	3.95	6.91	8.28	6.75	20.57	.....	.....	.....	.....	.....
24	2.09	2.97	3.92	6.06	8.11	6.93	18.55	.....	.....	.....	.....	.....
25	2.27	4.47	3.75	.....	7.28	6.67	14.25	.....	.....	.....	.....	.....
26	2.38	12.58	3.49	.....	5.61	6.15	10.20	.....	.....	.....	.....	.....
27	4.12	18.12	3.21	.....	5.34	4.87	8.60	.....	.....	.....	.....	.....
28	4.52	19.17	3.28	.....	4.26	4.50	7.30	.....	.....	.....	.....	.....
29	4.95	16.82	3.34	.....	3.94	4.25	6.77	.....	.....	.....	.....	.....
30	5.77	14.27	3.17	.....	.....	4.43	6.25	.....	.....	.....	.....	.....
31	7.87	.....	3.22	.....	.....	4.23	.....	.....	.....	.....	.....	.....

NOTE.—Stage-discharge relation probably affected by ice Dec. 16, 1919, to Feb. 25, 1920. No gage readings Nov. 8–23, 1918; Jan. 11, 12, July 4, Sept. 7, 12–14, Oct. 12, Nov. 23, Dec. 20, 21, 1919; Jan. 25 to Feb. 3 and May 8, 1920.

LITTLE MIAMI RIVER BASIN.

LITTLE MIAMI RIVER AT MIAMIVILLE, OHIO.

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

DRAINAGE AREA.—1,200 square miles.

RECORDS AVAILABLE.—June 21, 1915, to May 14, 1920, when station was discontinued.

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

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

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

EXTREMES OF STAGE.—Maximum stage recorded during the year ending September 30, 1919, 11.35 feet at 4 p. m. January 1; minimum stage, 1.23 feet at 6.30 a. m. September 16.

Maximum stage recorded during the period October 1, 1919, to May 14, 1920, 17.61 feet at 6 a. m. April 21; minimum stage, 1.40 feet at 6 a. m. October 2 and 4.

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

ACCURACY.—Stage-discharge relation probably permanent; probably affected by ice during parts of January, December, 1919, and January and February, 1920. Gage read to hundredths twice daily.

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

No discharge measurements were made at this station during 1919 or 1920.

Daily gage height, in feet, of Little Miami River at Miamiville, Ohio, for the period Oct. 1, 1918, to May 14, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	1.90	2.77	2.77	9.50	2.61	3.03	3.08	3.58	2.57	2.28	2.05	1.71
2	1.93	2.49	2.64	6.95	2.54	2.65	3.00	3.45	2.52	2.16	2.52	1.65
3	1.87	2.27	2.55	4.85	2.50	2.60	2.92	3.04	2.45	2.11	2.07	1.55
4	1.83	2.18	2.50	3.65	2.53	2.55	2.93	2.83	2.36	1.81	2.10	1.57
5	1.83	2.16	2.43	3.60	2.48	3.25	2.86	2.66	2.32	1.83	1.88	1.46
6	1.88	2.10	2.35	3.30	2.38	3.25	2.74	2.59	2.26	1.81	1.76	1.54
7	1.89	1.98	2.27	3.12	2.35	2.90	2.73	2.60	2.25	2.02	1.84	1.52
8	1.83	1.98	2.06	3.00	2.31	2.87	2.76	2.91	2.31	1.86	1.91	1.63
9	1.86	1.96	2.88	2.21	2.27	5.42	2.67	5.79	2.33	1.81	1.68	1.35
10	1.89	1.86	5.35	2.67	2.22	4.29	3.31	6.99	2.25	1.95	1.72	1.52
11	1.90	1.98	4.80	2.76	2.18	3.72	5.04	5.19	2.36	1.81	1.54	1.54
12	1.87	1.97	3.80	2.63	2.17	3.35	4.09	4.46	2.23	1.78	1.61	1.58
13	1.77	1.92	8.05	2.56	2.40	3.08	3.46	3.94	2.25	1.98	1.66	1.29
14	1.87	1.88	7.30	2.60	3.05	2.96	3.21	3.59	2.24	2.17	1.66	1.52
15	1.86	1.86	6.00	2.69	2.96	3.65	3.11	3.39	3.45	3.70	1.72	1.41
16	1.82	1.90	4.75	2.59	2.83	7.82	4.79	3.19	3.65	3.71	1.75	1.25
17	1.86	1.94	4.17	2.60	2.64	13.38	4.66	3.13	6.73	3.09	1.81	1.44
18	1.65	2.29	3.65	2.56	2.56	8.39	4.22	3.13	4.35	2.62	1.79	1.33
19	1.67	3.14	3.45	2.55	2.47	6.02	4.29	3.12	2.85	2.26	1.73	1.45
20	1.72	3.08	3.31	2.56	2.43	4.86	3.32	3.66	2.50	2.38	1.67	1.41
21	1.72	2.88	3.13	2.44	2.63	4.32	3.24	3.44	2.33	3.23	1.65	1.41
22	1.84	2.69	3.65	2.53	2.87	3.94	3.09	3.23	2.19	2.61	1.65	1.71
23	1.88	2.54	4.35	3.62	2.96	3.62	3.03	3.24	2.17	2.30	1.78	2.12
24	1.93	2.38	5.25	4.25	2.79	3.44	3.00	5.04	2.14	2.22	1.70	2.06
25	1.83	2.32	4.75	3.85	2.67	3.25	2.86	4.49	2.38	1.97	1.77	1.63
26	1.82	2.25	3.95	3.39	2.64	3.18	2.69	3.82	3.68	1.87	1.71	1.59
27	1.99	2.18	3.55	3.14	2.55	5.84	2.61	3.44	4.38	1.74	1.74	1.59
28	3.49	3.53	3.31	3.00	2.55	4.69	2.65	3.12	3.06	1.61	1.60	1.54
29	2.89	3.55	3.18	2.89	.....	3.79	2.63	2.91	2.63	1.78	1.71	1.47
30	2.53	3.12	3.10	2.78	.....	3.46	2.66	2.78	2.37	1.78	1.70	1.38
31	3.17	.....	3.29	2.67	.....	3.26	.....	2.67	.....	1.81	1.62	.....
1919-20.												
1	1.57	8.72	4.97	2.55	3.17	2.43	2.64	3.17	.....	.....	.....	.....
2	1.42	7.17	3.97	2.54	3.73	2.42	2.63	3.08	.....	.....	.....	.....
3	1.54	5.24	3.52	2.27	6.21	2.40	2.55	2.99	.....	.....	.....	.....
4	1.42	4.32	3.40	2.11	5.51	3.02	2.50	2.86	.....	.....	.....	.....
5	1.52	3.64	3.22	2.09	4.13	6.39	2.71	2.83	.....	.....	.....	.....
6	1.71	3.28	3.22	2.17	4.29	4.51	2.60	2.76	.....	.....	.....	.....
7	1.65	3.42	7.80	2.30	3.51	4.41	2.65	2.70	.....	.....	.....	.....
8	1.63	3.40	5.02	10.27	3.20	3.03	3.00	2.65	.....	.....	.....	.....
9	1.65	3.24	5.67	5.92	3.19	2.92	2.89	2.57	.....	.....	.....	.....
10	1.70	3.14	5.17	4.22	5.83	2.94	2.74	2.52	.....	.....	.....	.....
11	1.67	5.37	4.04	3.27	4.91	4.16	2.64	2.55	.....	.....	.....	.....
12	1.74	4.32	3.54	2.87	4.23	9.21	2.65	6.68	.....	.....	.....	.....
13	1.85	3.57	10.24	2.66	3.71	6.11	3.49	7.41	.....	.....	.....	.....
14	1.82	3.23	5.57	2.78	3.26	5.11	3.53	5.31	.....	.....	.....	.....
15	1.90	2.95	4.27	2.58	3.19	4.26	3.19	.....	.....	.....	.....	.....
16	2.92	2.89	3.64	2.68	2.61	8.81	3.16	.....	.....	.....	.....	.....
17	3.01	2.76	3.40	3.18	2.69	7.26	7.21	.....	.....	.....	.....	.....
18	2.36	2.69	3.09	2.53	2.71	5.06	5.16	.....	.....	.....	.....	.....
19	1.76	2.57	2.77	2.55	2.66	8.16	4.96	.....	.....	.....	.....	.....
20	1.93	2.51	2.82	2.76	2.60	5.76	11.11	.....	.....	.....	.....	.....
21	1.88	2.41	2.80	7.86	6.26	4.51	16.41	.....	.....	.....	.....	.....
22	1.74	2.33	2.80	4.01	6.11	4.09	9.96	.....	.....	.....	.....	.....
23	1.72	2.38	2.72	3.66	4.61	3.76	5.76	.....	.....	.....	.....	.....
24	1.70	2.47	2.68	3.51	3.76	3.53	4.96	.....	.....	.....	.....	.....
25	1.69	2.66	2.66	3.21	3.61	3.27	4.26	.....	.....	.....	.....	.....
26	3.87	9.10	2.59	3.11	3.66	3.19	3.86	.....	.....	.....	.....	.....
27	7.27	7.37	2.54	4.01	3.15	3.11	3.61	.....	.....	.....	.....	.....
28	5.37	5.37	2.44	4.06	2.72	2.95	3.51	.....	.....	.....	.....	.....
29	3.72	6.67	2.58	3.16	2.59	2.97	3.46	.....	.....	.....	.....	.....
30	3.40	6.87	2.50	3.40	.....	2.83	3.22	.....	.....	.....	.....	.....
31	9.22	.....	2.43	4.81	.....	2.69	.....	.....	.....	.....	.....	.....

NOTE.—Stage-discharge relation may be slightly affected by ice Jan. 1-10, 1919, and probably affected by ice during most of the period from Dec. 15, 1919, to March 1, 1920.

LITTLE MIAMI RIVER AT PLAINVILLE, OHIO.

LOCATION.—At steel highway bridge half a mile above Pennsylvania Railroad station at Plainville, Hamilton County.

DRAINAGE AREA.—1,680 square miles.

RECORDS AVAILABLE.—July 10, 1914, to September 30, 1915, and August 18, 1918, to June 5, 1920, when station was discontinued.

GAGE.—Chain gage attached to downstream side of bridge; read by Harry Gastvich.

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

CHANNEL AND CONTROL.—Bed composed of heavy gravel and rock covered with layer of mud. Control is at a riffle about 600 feet below gage.

EXTREMES OF STAGE.—Maximum stage recorded during the year ending September 30, 1919, 17.20 feet at 7.05 a. m. March 17; minimum stage, 5.40 feet September 10–11 and 15–23.

Maximum stage recorded during the period October 1, 1919, to June 5, 1920, 16.2 feet at 6.40 a. m. November 27; minimum stage, 5.40 feet at 6.30 a. m. October 1 and 2.

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

ACCURACY.—Rating curve not developed; stage-discharge relation slightly affected by ice January, 1919, and probably affected during parts of December, 1919, and January and February, 1920. Gage read to tenths twice daily.

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

No discharge measurements were made at this station during the years ending September 30, 1919 and 1920.

Daily gage height, in feet, of Little Miami River at Plainville Ohio, for the period Oct. 1, 1918, to June 5, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	5.6	5.85	7.05	.....	6.8	7.0	7.1	.....	7.15	6.3	5.85	6.25
2	5.6	6.4	6.85	.....	6.8	6.9	7.1	.....	7.1	6.25	5.95	6.1
3	5.55	6.25	6.7	.....	6.7	6.8	7.1	.....	7.0	6.1	6.15	6.1
4	5.5	6.0	6.65	.....	6.9	6.8	7.1	7.2	7.0	6.05	6.3	6.0
5	5.5	6.0	6.6	11.05	6.8	8.0	7.1	7.2	6.7	5.75	6.4	6.0
6	5.6	6.0	6.5	13.4	6.8	9.55	7.1	7.1	6.5	7.1	6.4	6.0
7	5.7	6.0	6.45	14.1	6.7	8.8	7.0	7.25	6.3	6.65	6.5	5.9
8	5.6	6.0	6.4	13.45	6.7	7.9	7.0	7.8	6.3	6.7	6.15	5.65
9	5.6	5.9	6.75	10.4	6.6	10.2	7.2	10.5	6.4	6.75	5.95	5.45
10	5.5	5.9	10.25	9.0	6.6	9.4	7.9	10.5	6.4	6.85	5.8	5.4
11	5.5	5.9	10.05	7.0	6.6	8.65	9.9	9.9	6.3	6.9	5.8	5.4
12	5.6	5.9	9.7	7.0	6.6	7.9	9.2	9.1	6.3	6.85	5.8	5.45
13	5.6	5.85	12.65	6.9	6.6	7.45	9.0	8.6	6.2	6.8	5.8	5.5
14	5.6	5.8	13.55	6.9	6.85	7.15	8.6	8.4	6.2	7.0	5.9	5.5
15	5.6	5.8	.....	6.9	7.35	7.1	8.2	8.2	6.3	6.95	5.8	5.4
16	5.6	5.8	.....	6.8	7.2	10.45	9.9	8.0	7.2	7.95	5.75	5.4
17	5.6	6.35	.....	6.8	7.0	17.05	9.05	7.8	11.4	7.2	5.7	5.4
18	5.7	7.2	.....	6.6	6.85	14.2	8.45	7.6	10.25	7.0	5.6	5.4
19	5.7	7.5	.....	6.6	6.75	12.65	8.05	7.5	7.65	6.7	5.6	5.4
20	5.7	7.6	.....	6.6	6.7	8.85	7.6	7.5	6.75	6.6	5.6	5.4
21	5.6	7.25	.....	6.5	6.7	7.6	7.6	7.85	6.7	6.7	5.6	5.4
22	5.7	6.9	.....	6.5	6.7	7.35	7.8	8.25	6.75	6.6	5.6	5.4
23	5.7	6.7	.....	8.8	6.7	7.3	7.8	8.45	7.45	6.35	5.6	5.4
24	5.7	6.6	.....	8.0	6.7	7.2	7.3	10.65	7.35	6.2	5.6	5.6
25	5.6	6.6	.....	7.5	6.8	7.15	7.15	10.0	6.2	6.2	5.6	5.6
26	5.6	6.5	.....	7.4	7.0	8.7	7.0	9.7	6.4	6.2	5.65	5.5
27	5.6	6.05	.....	7.3	7.1	10.5	.....	9.2	6.4	6.0	5.6	5.45
28	6.9	8.0	.....	7.2	7.1	8.1	.....	7.95	6.3	6.0	5.55	5.45
29	7.35	8.45	.....	6.9	.....	7.55	.....	7.6	6.35	5.9	6.4	5.45
30	6.9	7.5	.....	6.9	.....	7.3	.....	7.3	6.2	6.0	6.35	5.4
31	7.15	.....	.....	6.9	.....	7.1	.....	7.2	.....	5.85	6.3	.....

Daily gage height, in feet, of Little Miami River at Plainville, Ohio, for the period Oct. 1, 1918, to June 5, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	5.4	11.8	13.5	6.45	8.0	6.5	7.85	9.3	6.5			
2	5.45	14.1	12.6	6.4	7.5	6.45	8.35	8.1	6.55			
3	5.5	13.4	11.1	6.5	7.4	6.3	8.25	7.65	6.65			
4	5.5	12.4	10.05	6.55	7.45	6.35	7.85	7.5	6.7			
5	5.5	12.0	9.9	6.5	7.7	6.5	8.1	7.2	6.7			
6	5.6	11.4	9.5	6.6	7.7	6.6	8.5	7.15				
7	5.6	10.15	10.45	7.0	7.6	6.7	8.4	7.0				
8	5.6	9.8	10.75	7.15	7.4	6.6	8.2	6.9				
9	5.55	8.9	10.65	7.4	7.5	6.6	7.95	6.7				
10	5.5	8.4	10.1	7.4	7.5	6.7	7.65	6.6				
11	5.65	8.2	9.85	6.9	7.3	8.1	7.85	6.6				
12	5.85	7.95	9.3	6.7	7.25	10.2	9.1	7.65				
13	5.9	7.65	11.45	6.7	7.1	9.0	10.55	9.45				
14	5.9	7.35	10.95	6.55	7.05	8.4	12.05	7.9				
15	6.0	7.0	10.85	6.4	7.0	8.35	11.15	7.45				
16	6.0	6.8	10.5	6.4	6.9	8.6	10.1	7.1				
17	6.2	6.7	9.45	6.3	6.85	8.9	9.75	7.0				
18	6.8	6.7	8.1	6.3	6.7	8.9	9.2	7.35				
19	7.1	6.6	7.5	6.3	6.7	12.25	9.0	7.9				
20	7.1	6.6	7.15	6.5	6.7	13.55	9.65	8.2				
21	6.7	6.7	7.05	6.6	6.7	11 9	12.3	7.95				
22	6.8	6.65	6.9	7.0	6.7	11.2	12.9	7.5				
23	6.7	6.5	6.9	11.6	6.8	10.5	11.9	7.25				
24	6.9	6.65	6.9	14.55	6.6	9.9	11.8	7.1				
25	7.2	7.3	6.8	13.1	6.5	9.1	10.2	7.0				
26	7.2	9.45	6.7	11.9	6.45	8.95	10.05	6.9				
27	8.45	16.05	6.6	10.8	6.45	8.35	10.2	6.7				
28	9.0	14.9	6.6	10.4	6.45	8.2	10.0	6.65				
29	9.1	14.1	6.6	9.5	6.4	8.2	9.75	6.6				
30	8.7	13.65	6.55	9.05	.....	8.1	9.45	6.6				
31	10.6	.....	6.4	8.4	.....	8.0	.....	6.5				

NOTE.—Stage-discharge relation may be slightly affected by ice Jan. 1–10, 1919, and probably affected by ice during most of the period from Dec. 15, 1919, to Mar. 1, 1920. Gage not read Dec. 15, 1918, to Jan 4, 1919, and Apr. 27 to May 3, 1919.

EAST FORK OF LITTLE MIAMI RIVER AT PERINTOWN, OHIO.

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

DRAINAGE AREA.— 459 square miles.

RECORDS AVAILABLE.—May 7, 1915, to May 13, 1920, when station was discontinued.

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 STAGE.—Maximum stage recorded during the year ending September 30, 1919, 17.98 feet at 6.30 a. m. March 17; minimum stage, −0.17 foot September 9–14.

Maximum stage recorded during the period October 1, 1919, to May 13, 1920, 19.77 feet at 6.30 p. m. April 20; minimum stage, 0.01 foot October 5.

1915–1920: Maximum stage recorded, 19.77 feet at 6.30 p. m. April 20, 1920; minimum stage, −0.18 foot October 3–6, 1917.

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

ACCURACY.—Stage-discharge relation probably permanent; affected by ice during parts of January, 1919, and December, January, and February, 1920. Gage read to hundredths twice daily.

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

No discharge measurements were made at this station since January 5, 1917.

Daily gage height, in feet, of East Fork of Little Miami River at Perintown, Ohio, for the period Oct. 1, 1918, to May 13, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	0.13	1.29	1.46	11.38	1.12	2.45	1.68	3.05	0.98	0.92	1.04	−0.11
2	.09	1.01	1.22	7.83	1.02	2.26	1.47	2.73	.89	.73	.70	−.13
3	.07	.91	.99	3.13	1.00	1.73	1.39	2.03	.81	.58	.41	−.13
4	.05	.80	.87	1.87	1.04	1.59	1.32	1.53	.73	.47	.38	−.13
5	.03	.69	.78	1.43	1.00	4.28	1.25	1.38	.68	1.69	.38	−.13
6	.02	.57	.70	1.39	.98	3.96	1.20	1.27	.65	1.15	.36	−.13
7	.00	.47	.62	1.37	.95	2.46	1.12	1.19	.67	.81	.25	−.13
8	.00	.43	.58	1.30	.88	2.08	1.06	1.29	.67	.70	.20	−.15
9	.00	.39	3.69	1.22	.81	7.18	1.07	7.88	.70	.58	.16	−.17
10	−.02	.37	7.48	1.12	.79	4.43	3.05	10.28	.76	.44	.12	−.17
11	−.02	.35	5.93	1.08	.78	3.20	6.63	4.83	.65	.32	.11	−.17
12	.02	.31	4.08	1.07	.81	2.19	3.38	3.18	.62	.24	.11	−.17
13	.06	.28	10.33	1.07	.86	1.87	2.27	2.50	.60	.23	.09	−.17
14	.04	.28	10.98	1.17	1.54	1.70	1.92	2.06	.57	.24	.07	−.17
15	.01	.27	5.63	1.29	2.41	2.79	1.84	1.87	.57	1.51	.05	−.16
16	.00	.25	3.38	1.32	2.10	9.03	3.23	1.64	.54	2.77	.02	−.15
17	−.02	1.18	2.58	1.24	1.81	15.68	3.78	1.65	.61	2.22	.01	−.15
18	−.02	2.21	2.10	1.18	1.81	7.68	2.54	1.46	1.70	1.62	.01	−.13
19	−.02	2.54	1.69	1.19	1.62	4.03	2.05	1.39	1.60	1.29	−.02	−.13
20	.05	1.65	1.69	1.20	1.46	3.09	1.75	2.34	1.39	1.11	−.03	−.13
21	.26	1.55	1.76	1.22	1.51	2.41	1.52	2.18	1.17	.92	.00	−.01
22	.28	1.41	2.48	1.23	2.39	2.10	1.38	1.95	1.04	.71	.01	.38
23	.27	1.27	4.13	3.62	2.73	1.87	1.33	1.76	.91	.59	−.01	.83
24	.29	1.10	4.33	4.73	2.64	1.71	1.27	5.88	.74	.50	.00	.39
25	.29	.96	4.73	2.88	2.66	1.59	1.20	4.55	.70	.35	−.01	.10
26	.28	.89	3.78	2.15	2.59	1.56	1.12	2.53	.89	.27	−.03	−.01
27	.31	.85	2.33	1.88	1.95	5.03	1.05	1.89	2.27	.24	−.03	−.03
28	1.63	4.03	1.88	1.65	1.88	3.19	1.01	1.60	1.72	.22	−.06	−.03
29	1.84	3.38	1.58	1.49	.....	2.25	.98	1.35	1.49	.20	−.07	−.02
30	1.62	2.04	1.39	1.34	.....	1.98	1.05	1.22	1.18	.18	−.10	.01
31	1.54	.....	1.37	1.23	.....	1.90	.....	1.09	.....	.82	−.11	.....
1919-20.												
1	.08	12.12	3.37	1.13	1.95	1.37	1.16	2.27	.....	.....	.....	.....
2	.12	8.47	2.71	1.08	1.90	1.20	1.12	2.28	.....	.....	.....	.....
3	.08	3.99	2.00	.97	1.92	1.12	1.12	2.33	.....	.....	.....	.....
4	.03	2.72	1.78	.94	3.72	2.81	1.16	2.37	.....	.....	.....	.....
5	.01	2.08	1.66	.92	3.27	7.52	1.20	2.35	.....	.....	.....	.....
6	1.54	1.73	2.62	.94	2.45	4.42	1.63	2.27	.....	.....	.....	.....
7	1.19	1.62	9.72	1.17	1.93	1.89	1.90	1.87	.....	.....	.....	.....
8	.93	1.74	6.37	11.52	2.46	1.56	2.07	1.45	.....	.....	.....	.....
9	.67	1.91	8.87	10.22	2.33	1.50	2.16	1.27	.....	.....	.....	.....
10	.56	1.85	5.32	4.13	2.17	1.55	2.14	1.26	.....	.....	.....	.....
11	1.49	4.77	3.18	2.52	2.10	6.12	2.12	1.28	.....	.....	.....	.....
12	1.41	3.67	2.43	2.19	1.94	10.07	2.27	7.44	.....	.....	.....	.....
13	1.33	2.38	14.44	1.85	1.75	5.87	2.57	11.06	.....	.....	.....	.....
14	1.71	1.84	9.22	1.70	1.56	3.18	3.32	.....	.....	.....	.....	.....
15	4.06	1.57	4.92	1.62	1.52	3.02	2.87	.....	.....	.....	.....	.....
16	8.97	1.36	2.07	2.77	1.49	9.37	1.92	.....	.....	.....	.....	.....
17	5.62	1.24	1.84	3.42	1.28	.....	4.22	.....	.....	.....	.....	.....
18	3.32	1.16	1.70	2.64	1.38	.....	3.65	.....	.....	.....	.....	.....
19	1.60	1.12	1.60	2.02	1.44	.....	3.47	.....	.....	.....	.....	.....
20	1.24	1.07	1.51	1.53	1.44	.....	15.37	.....	.....	.....	.....	.....
21	1.08	1.01	1.42	5.12	8.17	.....	15.37	.....	.....	.....	.....	.....
22	.92	.96	1.35	4.82	6.77	.....	5.57	.....	.....	.....	.....	.....
23	.77	.95	1.28	6.47	3.97	.....	3.80	.....	.....	.....	.....	.....
24	.69	1.13	1.22	4.62	3.32	.....	2.90	.....	.....	.....	.....	.....
25	.63	1.95	1.14	2.27	2.19	.....	2.88	.....	.....	.....	.....	.....
26	.87	15.17	1.05	2.28	1.76	.....	2.75	.....	.....	.....	.....	.....
27	6.72	11.37	.98	4.07	1.65	.....	2.33	.....	.....	.....	.....	.....
28	8.72	4.87	.99	4.57	1.50	1.35	2.26	.....	.....	.....	.....	.....
29	5.22	6.07	1.05	2.41	1.44	1.34	2.30	.....	.....	.....	.....	.....
30	2.45	6.72	1.09	1.86	.....	1.36	2.29	.....	.....	.....	.....	.....
31	4.29	.....	1.13	2.14	.....	1.22	.....	.....	.....	.....	.....	.....

NOTE.—Stage-discharge relation may be slightly affected by ice Jan. 4–25, 1919, and during parts of the period Dec. 16, 1919, to Mar. 12, 1920. Gage not read Mar. 17–27, 1920.

LICKING RIVER BASIN.

LICKING RIVER AT FARMERS, KY.

LOCATION.—100 feet below Chesapeake & Ohio Railway bridge and 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 June 30, 1920, when station was discontinued.

GAGE.—Combination vertical staff and slope gage on east bank of river; read by Miss Margaret Carter and Miss M. G. Thompson.

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 the year ending September 30, 1919, 24.6 feet at 7 a. m. January 2; minimum stage, 1.30 feet October 5 and 9. Maximum stage recorded during the period October 1, 1919, to June 30, 1920, 26.0 feet at 4 p. m. December 7; minimum stage, 1.5 feet at 8 a. m. October 12. 1915–1920: Maximum stage recorded, 26.0 feet at 4 p. m. December 7, 1919; minimum stage, 1.1 feet August 17 and 18, 1917.

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

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; affected by ice during parts of December, 1919, and January and February, 1920. Gage read to half-tenths twice daily; not checked since August 4, 1917.

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

No discharge measurements were made at this station during 1919 and 1920.

Daily gage height, in feet, of Licking River at Farmers, Ky., for the period Oct. 1, 1918, to June 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1.48	3.42	1.68	19.50	3.28	5.50	4.38	4.75	4.05	2.55	2.25	1.65
2	1.42	3.50	1.62	24.30	3.30	5.20	4.02	7.80	3.60	2.40	2.05	1.95
3	1.35	3.38	1.58	21.70	2.88	4.70	3.50	4.60	3.20	2.15	2.05	2.05
4	1.35	2.30	1.65	18.65	2.90	4.35	3.25	4.88	3.25	1.85	2.35	1.65
5	1.30	2.22	1.78	10.20	3.00	4.80	3.18	4.35	2.95	2.40	2.30	1.95
6	1.32	2.15	1.90	5.60	2.85	8.60	4.32	4.42	2.85	2.25	2.15	1.75
7	1.42	2.05	2.05	4.55	2.58	8.40	3.80	5.20	2.75	2.15	1.85	1.85
8	1.38	1.98	1.98	4.35	2.55	6.75	3.35	7.55	2.75	2.05	2.05	1.70
9	1.30	1.88	2.15	4.15	2.48	11.90	3.35	15.25	3.30	2.30	2.35	1.65
10	1.35	1.80	2.28	4.12	2.55	9.50	3.62	21.50	2.75	2.90	1.85	1.60
11	1.45	1.72	2.60	3.88	2.48	7.65	3.92	16.80	2.70	2.25	1.75	1.55
12	1.48	1.62	2.45	3.60	2.40	5.72	4.15	9.65	2.60	2.05	1.85	1.50
13	1.42	1.58	2.62	3.45	2.35	4.70	4.85	6.30	2.45	2.10	1.55	1.55
14	1.42	1.65	3.25	3.52	2.80	4.18	4.40	5.90	2.15	1.95	1.60	1.50
15	1.48	1.70	5.95	3.48	3.00	3.88	4.05	6.45	2.55	1.95	3.55	1.40
16	1.48	1.78	4.60	3.60	3.05	4.28	4.38	5.40	2.30	2.10	3.00	1.5
17	1.48	1.82	3.98	3.75	3.25	4.10	5.22	4.80	2.35	1.75	2.05	1.55
18	1.52	1.98	3.88	3.58	3.38	3.95	4.65	4.50	2.25	2.15	1.85	1.55
19	1.55	2.30	3.62	3.68	3.30	3.85	4.40	4.50	2.25	1.75	2.05	1.70
20	1.52	2.52	3.10	5.22	3.42	3.80	3.88	4.35	2.15	2.05	1.90	1.40
21	1.58	2.58	3.22	4.50	3.68	3.78	3.72	7.85	2.05	1.85	2.15	2.75
22	1.52	2.38	3.35	3.68	3.95	3.68	3.60	8.20	2.05	1.85	2.50	2.05
23	1.52	2.30	5.32	3.90	3.92	3.38	3.50	6.40	2.15	1.65	2.45	2.90
24	1.50	2.18	5.45	7.30	4.28	3.26	3.68	6.50	2.15	2.20	2.10	2.75
25	1.55	2.10	5.62	7.60	5.12	3.20	3.70	12.55	2.50	2.15	2.00	2.95
26	1.60	1.98	5.60	5.98	5.22	3.10	3.50	9.15	3.60	2.00	1.85	2.75
27	1.62	1.92	4.60	4.75	5.32	3.30	3.48	6.85	3.80	2.00	1.85	2.35
28	1.72	1.88	3.40	4.48	5.45	4.10	3.52	6.20	2.90	1.90	2.15	1.85
29	1.82	1.78	3.05	3.98	.....	4.50	3.42	5.75	2.30	1.95	1.75	1.85
30	2.10	1.70	2.90	3.58	.....	4.75	3.55	4.70	2.30	2.25	2.70	1.80
31	2.70	.....	2.90	3.35	.....	4.65	.....	.....	.....	2.10	2.25	.....

Daily gage height, in feet, of Licking River at Farmers, Ky., for the period Oct. 1, 1918, to June 30, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	1.80	11.15	5.10	3.30	4.45	4.05	4.00	4.80	2.85			
2	1.75	22.75	4.85	3.25	4.30	4.15	6.55	4.55	2.90			
3	1.85	21.05	4.65	3.00	3.85	4.40	8.00	4.25	6.20			
4	1.65	19.00	3.75	2.75	3.75	4.55	9.50	3.80	4.60			
5	1.75	13.35	3.60	2.85	3.95	5.80	14.65	3.62	12.20			
6	1.65	5.35	6.60	2.95	3.85	5.25	11.50	3.45	8.55			
7	1.75	4.30	25.50	3.20	3.60	4.85	10.95	3.40	6.75			
8	1.85	3.70	23.30	9.30	3.55	4.45	10.65	5.95	4.75			
9	1.90	3.75	23.15	23.30	3.35	4.20	8.30	5.75	4.20			
10	1.85	3.90	22.25	24.45	3.40	4.35	6.30	4.85	3.60			
11	1.95	3.80	16.85	22.50	3.50	4.45	5.45	4.25	3.10			
12	1.55	3.90	9.00	19.10	3.45	5.35	4.75	4.05	4.35			
13	7.60	3.95	13.90	8.40	3.60	5.65	4.70	4.25	3.80			
14	5.85	3.65	21.95	6.00	3.55	5.60	4.65	4.15	3.20			
15	6.20	3.55	20.80	4.60	3.55	5.75	4.30	3.80	2.95			
16	6.55	3.45	18.45	4.20	3.25	6.20	3.95	3.55	2.75			
17	9.45	3.05	9.80	4.25	3.10	16.15	3.80	3.45	2.65			
18	8.15	3.05	7.20	4.35	3.00	11.75	4.40	3.20	2.55			
19	4.95	2.85	6.00	3.95	3.15	19.40	4.85	3.20	2.45			
20	3.85	2.75	4.90	4.10	3.35	21.30	12.00	3.10	2.45			
21	3.25	2.55	4.65	5.20	3.80	18.85	21.75	3.10	2.75			
22	3.00	2.55	4.45	15.45	8.85	13.45	15.75	3.00	3.65			
23	2.75	2.45	4.25	19.80	11.45	7.65	8.10	2.95	4.00			
24	2.90	2.35	5.05	23.80	9.40	5.35	5.65	2.95	3.25			
25	3.10	2.45	3.75	22.60	7.05	5.25	4.75	3.60	2.75			
26	3.20	14.20	3.55	18.15	5.15	4.65	5.00	3.55	2.55			
27	5.00	22.40	3.45	13.05	4.70	4.25	6.80	3.40	2.25			
28	4.45	19.30	3.45	10.95	4.45	4.05	7.80	3.15	2.00			
29	3.65	10.10	3.25	6.15	4.10	3.95	6.10	2.80	1.85			
30	3.10	7.05	3.40	4.85	.....	3.65	5.30	2.60	2.10			
31	2.75	.....	3.40	4.60	.....	3.45	.....	2.60	.....			

NOTE.—Stage-discharge relation probably affected by ice from about Dec. 19, 1919, to Jan. 9, 1920, Jan. 15-22 and Feb. 1-24, 1920. Gage not read May 31, 1919.

LICKING RIVER AT CATAWBA, KY.

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

DRAINAGE AREA.—3,300 square miles.

RECORDS AVAILABLE.—July 14, 1916, to July 5, 1920, when station was discontinued.

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 STAGE.—Maximum stage recorded during the year ending September 30, 1919, 30.90 feet at 6 p. m. January 2; minimum stage, 0.60 foot October 16.

Maximum stage recorded during the period October 1, 1919, to July 5, 1920, 36.90 feet at 6 p. m. April 21; minimum stage, 1.00 foot October 6.

1916-1920: Maximum stage, 36.90 feet at 6 p. m. April 21, 1920; minimum stage, 0.60 foot October 16, 1919.

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

ACCURACY.—Stage-discharge relation probably permanent; affected by ice during parts of December, 1919, and January and February, 1920. Gage read to hundredths twice daily. Gage has not been checked since August 2, 1917.

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

No discharge measurements were made at this station during 1919 and 1920.

Daily gage height, in feet, of Licking River at Catawba, Ky., for the period Oct. 1, 1918, to July 5, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	0.80	2.95	3.65	18.70	4.25	7.15	4.50	3.90	4.32	4.20	1.10	1.02
2	.80	2.80	3.20	30.35	4.00	7.30	4.40	5.68	3.90	3.68	1.05	1.00
3	.85	3.20	2.95	30.10	3.88	7.20	4.25	7.75	3.58	3.20	1.00	1.00
4	.85	3.15	2.70	23.65	3.62	6.10	4.05	6.55	3.28	2.85	1.00	.98
5	.80	2.82	2.55	20.05	3.60	8.35	3.80	5.00	3.05	2.85	.95	.92
6	.80	2.45	2.48	17.55	3.45	10.15	3.68	4.50	2.85	2.42	1.15	.90
7	.75	2.18	2.38	11.15	3.38	11.00	3.58	4.48	2.72	2.05	1.18	.88
8	.72	2.05	2.32	6.15	3.20	9.72	3.52	5.28	2.70	1.88	1.22	.85
9	.70	1.90	2.38	5.20	3.08	15.65	3.75	11.60	2.75	1.75	1.40	1.10
10	.70	1.85	6.00	4.95	2.95	15.12	5.25	21.85	2.45	4.60	1.30	1.10
11	.70	1.72	8.90	4.75	2.88	12.15	12.45	20.60	2.38	4.52	1.22	1.10
12	.70	1.70	7.20	4.60	2.80	9.22	11.00	18.68	2.60	4.15	1.12	1.10
13	.68	1.65	10.05	4.28	3.25	7.90	8.60	15.20	3.62	3.48	1.08	1.10
14	.65	1.60	10.25	4.18	4.35	6.65	6.25	9.85	3.38	2.88	1.05	1.02
15	.62	1.48	11.95	4.20	4.55	6.35	5.58	6.88	3.62	2.68	1.00	1.00
16	.60	1.40	10.70	4.20	4.42	6.95	5.25	6.60	4.78	2.50	1.00	.98
17	.62	2.25	8.28	4.22	4.35	19.25	5.08	6.75	3.55	2.22	1.02	.92
18	.65	7.30	6.15	4.35	4.40	10.75	5.30	6.02	2.52	2.02	1.00	.88
19	.65	7.02	5.25	4.38	4.40	7.95	5.32	5.38	2.22	1.98	.98	.85
20	.72	5.55	4.50	4.28	4.40	6.68	4.75	7.45	2.08	2.15	.95	.80
21	.75	4.90	4.05	4.38	4.95	5.95	4.32	6.48	2.05	2.35	.95	.80
22	.75	4.50	4.55	4.72	5.88	5.40	4.05	6.10	2.68	1.98	.98	1.85
23	.75	5.08	5.58	6.00	5.98	4.98	3.92	8.15	2.90	1.65	1.00	1.35
24	.80	3.52	8.30	8.80	5.75	4.68	4.38	10.40	2.68	1.40	1.02	1.05
25	.80	3.15	8.15	9.55	5.52	4.38	4.38	7.92	3.30	1.38	1.18	.90
26	.85	2.85	7.15	8.85	6.10	4.20	4.28	9.45	8.15	1.30	1.08	1.00
27	1.20	2.65	6.55	7.60	6.90	5.50	3.95	10.10	9.85	1.25	1.42	1.65
28	2.92	3.50	5.70	6.25	6.82	4.55	3.70	7.78	7.80	1.10	1.45	1.85
29	4.15	4.70	4.80	5.35	.....	4.40	3.55	6.15	5.85	1.15	1.28	1.65
30	2.85	4.28	4.25	4.80	.....	4.62	3.52	5.38	4.80	1.15	1.25	1.50
31	2.82	.....	4.25	4.55	.....	4.70	.....	4.82	.....	1.12	1.10	.....
1919–20.												
1	1.35	17.18	13.65	4.35	6.60	5.62	4.80	7.40	4.12	2.18	.....	.....
2	1.20	30.20	9.05	4.15	6.20	5.52	5.48	6.65	3.62	2.02	.....	.....
3	1.15	29.52	7.70	6.00	6.00	5.38	7.50	6.12	5.78	2.20	.....	.....
4	1.10	22.08	6.75	6.80	6.95	5.68	8.80	5.75	8.35	2.88	.....	.....
5	1.08	17.62	5.82	6.10	6.80	10.55	9.28	5.42	10.45	2.82	.....	.....
6	1.00	14.70	8.90	6.55	6.22	9.82	10.40	5.10	9.75	.....	.....	.....
7	1.55	10.95	30.25	6.40	5.85	9.40	10.98	4.65	9.35	.....	.....	.....
8	1.58	6.80	31.20	13.00	5.55	7.60	10.92	4.60	7.60	.....	.....	.....
9	1.45	5.60	30.00	31.95	5.35	6.52	10.45	4.78	6.38	.....	.....	.....
10	1.35	5.08	30.10	30.20	6.42	6.02	9.12	6.10	5.22	.....	.....	.....
11	1.42	6.85	25.48	24.25	6.45	7.90	7.45	5.62	4.52	.....	.....	.....
12	1.85	6.35	20.80	20.80	6.00	16.80	6.65	9.80	4.10	.....	.....	.....
13	3.40	6.15	25.85	19.00	5.72	14.15	6.40	10.65	3.72	.....	.....	.....
14	5.50	5.98	25.90	14.90	5.40	11.08	6.05	6.82	5.25	.....	.....	.....
15	12.75	5.40	21.95	9.25	5.10	9.00	5.80	5.90	4.58	.....	.....	.....
16	10.05	5.00	17.70	6.25	4.82	14.62	5.48	5.28	3.65	.....	.....	.....
17	8.15	4.60	15.10	7.30	4.55	21.30	5.35	4.80	3.25	.....	.....	.....
18	8.08	4.35	13.05	6.80	4.55	17.20	5.10	4.55	2.95	.....	.....	.....
19	8.20	4.15	9.75	6.38	4.65	24.35	6.60	7.60	2.68	.....	.....	.....
20	7.02	4.00	7.12	6.30	4.55	24.15	28.20	8.55	2.58	.....	.....	.....
21	5.55	3.52	6.48	9.65	5.82	19.82	36.70	6.10	2.52	.....	.....	.....
22	4.72	3.32	5.85	14.60	9.20	16.60	33.00	5.20	2.50	.....	.....	.....
23	4.62	3.42	5.50	21.70	10.90	14.10	23.30	4.80	3.05	.....	.....	.....
24	4.60	3.38	5.38	28.70	10.90	10.75	16.10	4.52	3.80	.....	.....	.....
25	4.48	6.68	5.32	25.00	10.30	7.55	9.90	5.58	4.08	.....	.....	.....
26	4.80	24.28	4.90	18.90	8.82	6.65	7.25	5.60	3.62	.....	.....	.....
27	10.75	32.55	4.75	16.50	7.25	6.10	9.30	5.20	3.28	.....	.....	.....
28	9.50	28.75	4.60	16.05	6.48	5.68	12.28	4.65	2.92	.....	.....	.....
29	8.02	21.75	4.48	12.45	5.90	5.40	10.30	4.25	2.58	.....	.....	.....
30	7.72	19.40	4.42	8.52	.....	5.15	8.80	3.92	2.28	.....	.....	.....
31	7.78	.....	4.40	7.35	.....	4.88	.....	4.05	.....	.....	.....	.....

NOTE.—Stage-discharge relation probably affected by ice Dec. 20, 1919, to Jan. 9, 1920, Jan. 15–21 and Feb. 1–22, 1920.

SOUTH FORK OF LICKING RIVER AT HAYES, KY.

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

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

RECORDS AVAILABLE.—July 7, 1916, to July 6, 1920, when station was discontinued.

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 the year ending September 30, 1919, 13.70 feet January 2; minimum stage, 0.02 foot at 6 p. m. September 20. Maximum stage recorded during the period October 1, 1919, to July 6, 1920, 17.05 feet at 6 a. m. April 21; minimum stage, 0.04 foot at 6 p. m. October 1.

1916–1920: Maximum stage, 17.05 feet at 6 a. m. April 21, 1920; minimum stage, 0.02 foot at 6 p. m. September 20, 1919.

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

ACCURACY.—Stage-discharge relation probably permanent, except as affected by ice during parts of December, 1919, and January and February, 1920. Rating curve not fully developed. Gage read to hundredths twice daily. As gage has not been checked since August 2, 1917, readings may be too large owing to elongation of gage chain.

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

No discharge measurements were made at this station during 1919 and 1920.

Daily gage height, in feet, of South Fork of Licking River at Hayes, Ky., for the period Oct. 1, 1918, to July 6, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	0.37	1.94	2.08	9.26	2.04	3.48	1.81	1.50	1.92	2.06	0.52	0.13
2	.33	1.65	1.91	13.70	1.91	2.83	1.72	2.38	1.77	1.76	.44	.12
3	.34	1.52	1.71	11.85	1.83	3.01	1.67	2.45	1.63	1.52	.40	.11
4	.32	1.41	1.58	5.95	1.75	2.64	1.61	2.06	1.51	1.36	.38	.10
5	.31	1.26	1.49	3.95	1.70	4.45	1.56	1.77	1.41	1.65	.38	.12
6	.29	1.14	1.39	3.28	1.66	4.30	1.50	1.58	1.31	1.12	.37	.10
7	.26	1.07	1.33	3.03	1.59	4.52	1.45	1.48	1.27	1.01	.49	.10
8	.23	1.01	1.28	2.80	1.51	3.72	1.43	1.48	1.27	.93	.44	.10
9	.27	.97	1.26	2.49	1.43	6.60	1.42	4.92	1.36	.92	.34	.08
10	.26	.92	3.82	2.43	1.39	6.78	2.76	9.85	1.21	2.25	.32	.08
11	.26	.88	5.40	2.17	1.35	4.82	5.65	7.20	1.27	3.92	.34	.15
12	.23	.86	3.34	2.02	1.33	3.92	5.75	5.12	1.38	2.50	.28	.11
13	.21	.84	5.90	1.93	1.51	3.41	3.98	4.00	1.22	1.91	.27	.10
14	.20	.79	5.55	1.89	2.06	3.13	3.11	3.40	2.38	1.51	.31	.08
15	.17	.79	5.88	1.90	1.88	3.05	2.68	3.05	1.78	1.28	.31	.07
16	.31	.76	5.38	1.91	1.87	3.61	2.81	2.81	3.77	1.13	.33	.07
17	.31	1.28	3.90	1.96	1.77	9.94	2.58	2.98	2.34	1.09	.33	.05
18	.27	4.25	3.20	1.99	1.77	5.78	2.29	2.93	1.62	.97	.29	.0
19	.28	4.45	2.77	2.02	1.68	4.48	2.10	2.69	1.29	.92	.27	.04
20	.38	3.34	2.49	2.03	1.63	3.78	1.92	3.44	1.16	.87	.27	.03
21	.33	2.82	2.28	2.03	1.88	3.36	1.78	3.55	1.29	.82	.29	.04
22	.31	2.46	2.71	1.94	2.35	2.98	1.70	3.24	1.13	.76	.26	.67
23	.31	2.16	2.59	3.36	2.64	2.70	1.67	3.68	1.42	.70	.34	.48
24	.29	1.94	3.98	3.60	2.55	2.50	2.32	5.25	1.58	.68	.33	.36
25	.23	1.73	4.02	4.42	2.43	2.34	2.24	3.80	2.03	.65	.28	.26
26	.68	1.59	3.75	3.65	2.64	2.22	1.88	3.32	3.65	.68	.21	.19
27	.81	1.47	3.20	3.12	3.50	3.60	1.63	3.43	4.98	.69	.17	.15
28	2.00	2.50	2.75	2.77	3.18	2.65	1.50	2.92	4.32	.63	.14	.12
29	2.22	2.20	2.49	2.52	.....	2.28	1.42	2.57	3.16	.54	.12	.10
30	1.92	2.43	2.28	2.32	.....	2.12	1.41	2.33	2.49	.61	.15	.08
31	1.91	.....	2.16	2.17	.....	1.96	.....	2.12	.....	.58	.13	.....

Daily gage height, in feet, of South Fork of Licking River, at Hayes, Ky., for the period Oct. 1, 1918, to July 6, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	0.06	9.25	4.58	1.64	2.76	2.35	1.91	2.93	1.41	0.89	.....	.....
2	.09	14.82	3.72	1.57	2.60	2.22	1.99	2.66	1.42	.77	.....	.....
3	.11	12.90	3.33	1.42	2.61	2.14	2.69	2.47	2.00	.71	.....	.....
4	.11	6.55	2.97	1.57	3.50	2.14	3.30	2.34	3.12	.61	.....	.....
5	.09	4.30	2.66	1.77	3.50	4.50	3.34	2.16	5.70	.57	.....	.....
6	.11	3.52	5.07	1.65	3.05	4.40	3.33	2.05	3.98	.81	.....	.....
7	.12	3.15	14.62	1.63	2.80	3.60	3.10	1.93	3.15	.....	.....	.....
8	.15	2.80	13.64	7.60	2.65	2.95	3.60	1.80	2.64	.....	.....	.....
9	.23	2.49	10.51	14.95	2.48	2.64	3.38	1.75	2.37	.....	.....	.....
10	.25	2.36	10.55	12.40	3.10	2.52	2.92	1.73	2.17	.....	.....	.....
11	.31	3.33	6.80	5.65	2.81	3.75	2.61	1.80	1.87	.....	.....	.....
12	.46	2.88	4.75	4.25	2.67	8.22	2.39	3.56	1.64	.....	.....	.....
13	.91	2.68	10.18	3.60	2.53	5.90	2.40	3.55	1.50	.....	.....	.....
14	2.34	2.50	10.57	3.18	2.37	4.70	2.52	2.72	2.92	.....	.....	.....
15	6.40	2.31	7.78	2.89	2.24	3.82	2.33	2.26	1.76	.....	.....	.....
16	4.60	2.15	4.90	2.85	3.03	7.48	2.13	1.92	1.34	.....	.....	.....
17	4.20	1.99	4.02	3.20	3.04	9.25	2.14	1.73	1.21	.....	.....	.....
18	3.55	1.86	3.58	3.23	2.10	6.65	2.03	1.62	1.11	.....	.....	.....
19	3.09	1.68	3.17	2.84	2.03	10.74	2.18	2.90	1.03	.....	.....	.....
20	2.41	1.61	2.86	2.64	2.03	10.14	15.38	4.28	1.05	.....	.....	.....
21	2.07	1.53	2.59	4.60	2.90	6.25	16.58	3.03	1.07	.....	.....	.....
22	2.01	1.47	2.35	7.32	3.85	4.40	12.92	2.52	1.11	.....	.....	.....
23	1.68	1.43	2.24	10.02	4.78	3.68	6.42	2.21	1.16	.....	.....	.....
24	1.55	1.42	2.12	11.84	4.08	3.25	4.22	2.01	1.11	.....	.....	.....
25	1.96	2.68	2.09	8.18	3.52	2.94	3.46	2.13	1.15	.....	.....	.....
26	2.30	12.48	1.99	5.08	3.13	2.72	3.06	2.09	1.20	.....	.....	.....
27	6.10	14.62	1.85	4.35	2.78	2.52	4.26	1.97	1.14	.....	.....	.....
28	4.75	10.90	1.87	4.22	2.53	2.33	5.48	1.72	1.06	.....	.....	.....
29	3.72	5.78	1.74	3.55	2.41	2.17	3.90	1.56	.95	.....	.....	.....
30	3.34	5.70	1.63	3.18	.....	2.07	3.21	1.48	.89	.....	.....	.....
31	4.00	.....	1.73	3.03	.....	1.95	.....	1.53	.....	.....	.....	.....

NOTE.—Stage-discharge relation probably affected by ice Dec. 18, 1919, to Jan. 9, 1920; Jan. 16–22, and Feb. 1–24, 1920.

MIAMI RIVER BASIN.

MIAMI RIVER AT VENICE, OHIO.

LOCATION.—400 feet downstream from boundary line between Hamilton and [illegible] counties, at single-span highway bridge three-fourths mile southeast of Venice, Butler County. Indian Creek enters from right 1.4 miles above station.

DRAINAGE AREA.—3,790 square miles (measured by United States Engineer Corps).

RECORDS AVAILABLE.—June 14, 1915, to June 30, 1920, when station was discontinued.

GAGE.—Chain gage fastened to downstream side of bridge; read by H. B. [illegible].

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—The control for medium stages is the remains of an old milldam 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 STAGE.—Maximum stage recorded during the year ending September 30, 1919, 22.81 feet at 5.30 p. m. March 17; minimum stage, 1.41 feet at 6 p. m., September 16.

Maximum stage recorded during the period October 1, 1919, to June 30, 1920, 24.65 feet at 6 p. m. April 21; minimum stage, 1.40 feet at 6 a. m. October 3, 4.

1915–1920: Maximum stage recorded, 24.65 feet at 6 p. m. April 21, 1920; minimum stage, 1.31 feet September 5, 1916.

The highest known stage corresponds to about 38 feet on the gage during the flood of 1913.

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 affected by ice during parts of December, 1919, January and February, 1920. Gage read to hundredths twice daily.

COOPERATION.—Gage-height record furnished by United States Engineer Corps.

No discharge measurements were made at this station during 1919 and 1920.

Daily gage height, in feet, of Miami River at Venice, Ohio, for the period Oct. 1, 1918, to June 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	2.50	2.54	3.60	9.19	3.00	2.83	5.60	4.26	3.38	2.28	3.60	1.78
2	2.41	2.39	3.46	9.90	2.90	2.77	5.31	4.78	3.30	2.24	2.94	1.76
3	2.36	2.26	3.24	7.60	2.88	2.82	5.06	4.60	3.26	2.19	2.64	1.69
4	2.32	2.20	2.98	5.64	2.98	2.76	4.94	4.30	3.18	2.12	2.42	1.69
5	2.30	.....	2.88	4.44	2.88	2.77	4.80	4.06	3.08	1.98	2.39	1.71
6	2.24	2.14	2.78	4.54	2.80	2.76	4.62	3.90	3.01	1.95	2.29	1.76
7	2.52	2.12	2.66	4.41	2.75	2.69	4.50	3.86	3.01	2.02	2.20	1.69
8	2.90	2.12	2.56	4.20	2.68	2.62	4.38	4.16	3.02	1.99	2.18	1.58
9	2.81	2.21	2.96	3.96	2.60	5.70	4.30	8.24	2.98	1.96	2.14	1.79
10	2.63	2.14	4.76	3.71	2.61	7.20	5.36	10.04	3.24	2.02	2.10	1.72
11	2.54	2.12	5.15	3.55	2.56	6.64	7.39	8.39	3.08	2.46	2.04	1.68
12	2.40	2.08	5.75	3.43	2.56	5.51	6.76	7.08	2.99	2.15	1.93	1.62
13	2.26	2.07	8.35	3.46	2.62	4.90	5.64	6.06	2.92	2.52	1.86	1.54
14	2.19	2.06	9.27	3.41	2.96	4.49	5.12	5.48	3.03	3.39	1.90	1.48
15	2.15	2.06	9.83	3.22	3.12	6.12	5.00	5.12	3.35	4.90	1.92	1.47
16	2.10	2.06	8.66	3.18	3.09	17.20	10.20	4.78	2.90	3.40	1.98	1.42
17	2.10	2.07	7.30	3.17	2.95	22.04	12.28	5.00	2.84	3.45	2.28	1.42
18	2.10	2.15	6.21	3.14	2.82	21.18	10.29	5.34	2.78	2.80	2.07	1.42
19	2.10	2.47	5.40	3.08	2.70	16.84	8.46	4.94	2.62	2.58	1.94	1.42
20	2.13	3.06	4.84	3.03	2.62	12.29	7.32	5.15	2.56	2.58	1.89	1.42
21	2.12	3.56	4.54	3.00	2.68	9.72	6.42	5.10	2.50	6.18	1.98	1.43
22	2.10	3.37	5.54	2.96	2.75	8.36	5.72	5.10	2.49	5.80	2.62	1.50
23	2.08	3.12	6.03	3.24	2.86	7.34	5.38	4.88	2.69	5.28	2.07	1.79
24	2.11	2.88	6.48	4.02	2.88	6.76	5.15	5.58	2.69	4.46	1.93	1.72
25	2.10	2.76	6.60	4.20	3.02	6.15	5.00	6.32	2.62	3.40	4.10	1.64
26	2.08	2.60	6.36	4.32	3.03	5.86	4.70	5.95	3.12	2.88	2.38	1.56
27	2.10	2.53	5.47	4.21	2.88	10.22	4.41	5.22	3.32	2.45	2.14	1.50
28	2.17	3.42	4.80	3.82	2.87	8.77	4.32	4.85	2.74	2.31	1.94	1.46
29	2.52	4.44	4.26	3.50	.....	7.36	4.25	4.22	2.54	2.42	1.83	1.44
30	2.70	4.12	4.09	3.35	.....	6.49	4.12	3.90	2.38	2.48	1.77	1.46
31	2.74	.....	4.04	3.14	.....	5.94	.....	3.56	.....	2.52	1.76	.....
1919–20.												
1	1.45	10.45	10.75	3.00	3.68	3.82	4.25	6.18	3.50	.....	.....	.....
2	1.41	12.65	8.10	2.80	4.05	3.85	4.08	5.82	3.25	.....	.....	.....
3	1.41	10.49	6.25	2.40	8.02	4.22	4.00	5.50	4.30	.....	.....	.....
4	1.45	6.95	5.38	2.44	6.60	5.95	3.92	5.28	4.08	.....	.....	.....
5	1.48	5.80	4.92	2.46	5.25	9.10	4.08	5.08	3.82	.....	.....	.....
6	1.46	5.68	4.87	2.42	5.10	9.62	4.22	4.92	3.55	.....	.....	.....
7	1.49	5.85	8.12	2.45	4.85	6.75	4.18	4.88	3.55	.....	.....	.....
8	1.55	5.90	6.42	6.32	4.32	5.68	4.00	4.75	3.48	.....	.....	.....
9	1.72	5.78	6.70	4.52	4.35	4.85	3.85	4.60	3.38	.....	.....	.....
10	1.75	5.25	6.28	3.50	8.05	4.62	3.72	4.55	3.18	.....	.....	.....
11	2.02	6.30	5.25	2.90	8.35	5.25	3.62	4.52	3.15	.....	.....	.....
12	2.27	6.45	4.88	2.70	7.85	12.55	3.55	8.22	3.12	.....	.....	.....
13	2.20	5.60	8.78	2.58	6.92	11.92	4.75	8.62	3.20	.....	.....	.....
14	2.22	4.90	6.58	2.45	6.30	8.50	4.90	8.15	4.12	.....	.....	.....
15	2.30	4.52	5.40	2.45	5.12	7.05	4.70	7.40	3.95	.....	.....	.....
16	2.38	4.15	4.60	2.65	4.38	12.22	4.45	5.98	3.62	.....	.....	.....
17	2.32	4.00	4.00	2.58	3.70	11.82	13.28	5.40	3.40	.....	.....	.....
18	2.15	3.80	3.82	2.48	3.68	8.90	13.50	5.15	3.38	.....	.....	.....
19	1.98	3.50	3.25	2.45	3.90	9.80	10.95	5.02	3.30	.....	.....	.....
20	1.82	3.42	2.88	2.90	4.12	7.88	17.78	4.88	3.38	.....	.....	.....
21	1.88	3.34	2.80	5.90	6.68	7.10	24.45	4.78	3.45	.....	.....	.....
22	1.83	3.30	3.05	4.00	8.45	6.68	23.72	4.88	3.34	.....	.....	.....
23	1.78	3.28	3.14	3.65	8.90	5.60	17.80	4.70	3.18	.....	.....	.....
24	1.80	3.40	3 10	3.28	8.10	5.08	13.05	4.78	3.35	.....	.....	.....
25	1.80	3.55	3.08	2.90	6.02	4.98	9.98	4.55	4.35	.....	.....	.....
26	1.88	6.60	3.05	2.85	5.20	4.82	8.75	4.38	3.80	.....	.....	.....
27	5.00	7.40	3.00	3.40	4.60	4.55	7.88	4.18	3.25	.....	.....	.....
28	6.25	6.70	3.03	4.62	4.08	4.42	7.28	3.98	3.30	.....	.....	.....
29	6.55	8.95	2.90	3.65	3.88	4.30	6.68	3.78	3.18	.....	.....	.....
30	6.62	12.72	2.92	4.02	.....	4.72	6.35	3.70	3.32	.....	.....	.....
31	8.05	.....	2.98	5.00	.....	4.55	.....	3.62	.....	.....	.....	.....

NOTE.—Stage-discharge relation probably affected by ice during part of the time during the period Dec. 17, 1919, to Feb. 24, 1920. Gage not read Nov. 5, 1918.

WHITEWATER RIVER AT BROOKVILLE, IND.

LOCATION.—At two-span steel highway bridge three-fourths mile south of Brookville, Franklin County, and 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 May 15, 1920, when station was discontinued.

GAGE.—Chain gage fastened to downstream side of bridge; read by Mrs. H. Koerner, Raymond Logan, and Alvin Grimme.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Control about 500 feet below gage is probably permanent.

EXTREMES OF STAGE.—Maximum stage recorded during the year ending September 30, 1919, 15.95 feet at 7 a. m. March 17; minimum stage, 0.77 foot at 5 p. m. September 18.

Maximum stage recorded during the period October 1, 1919, to May 15, 1920, 18.93 feet at 5.30 p. m. April 20; minimum stage, 0.91 foot at 5. p. m. October 3 and 7 a. m. October 4.

1915–1920: Maximum stage, 18.93 feet at 5.30 p. m. April 20, 1920; minimum stage, 0.77 foot at 5 p. m. September 18, 1919.

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 affected by ice during parts of December, 1919, and January and February, 1920. Gage read to hundredths twice daily.

COOPERATION.—Gage-height record furnished by United States Engineer Corps.

No discharge measurements were made at this station during 1919 and 1920.

Daily gage height, in feet, of Whitewater River at Brookville, Ind., for the period Oct. 1, 1918, to May 15, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1.37	1.44	1.85	5.43	1.80	2.02	2.71	2.88	2.13	1.67	2.01	1.08
2	1.33	1.35	1.78	4.15	1.73	1.91	2.64	2.65	2.07	1.45	1.59	1.05
3	1.32	1.35	1.70	3.10	1.74	1.83	2.62	2.48	2.16	1.42	1.32	1.07
4	1.30	1.35	1.65	2.50	1.78	1.85	2.56	2.27	1.99	1.33	1.22	1.04
5	1 31	1.26	1.57	2.27	1.69	1.90	2.47	2.17	1.95	1.15	1.26	1.05
6	1.25	1.25	1.51	2.29	1.67	1.89	2.37	2.17	1.91	1.35	1.45	1.03
7	1.31	1.27	1.57	2.20	1.65	1.79	2.29	2.14	1.77	1.78	1.41	1.01
8	1.30	1.23	1.47	2.20	1.66	1.77	2.29	2.20	1.79	1.33	1.30	.98
9	1.25	1.35	1.76	2.06	1.65	4.65	2.24	4.41	2.31	1.22	1.24	1.06
10	1.28	1.31	2.67	1.87	1.56	3.90	2.76	4.48	1.98	1.96	1.19	1.00
11	1.23	1.26	2.79	1.82	1.57	3.09	2.62	3.61	1.75	1.41	1.17	1.24
12	1.30	1.25	2.65	1.91	1.58	2.86	2.38	3.11	1.74	1.30	1.14	1.06
13	1.22	1.29	5.87	1.89	1.69	2.66	2.28	2.93	1.84	1.22	1.08	1.03
14	1.20	1.25	4.85	1.99	1.88	2.52	2.25	2.79	1.75	1.12	1.14	.98
15	1.25	1.22	4.43	1.98	1.90	4.15	2.31	2.70	1.77	1.20	1.21	.93
16	1.20	1.25	3.35	1.85	1.88	12.21	7.53	2.63	1.83	1.55	1.16	.88
17	1.23	1.25	2.99	1.85	1.78	14.75	4.95	2.64	2.12	1.27	1.21	.96
18	1.21	2.02	2.75	1.86	1.74	7.65	4.05	2.57	1.96	1.16	1.19	.83
19	1.25	1.90	2.59	1.84	1.66	5.03	3.47	2.60	1.76	1.24	1.10	.89
20	1.32	1.98	2.48	1.83	1.70	4.37	3.16	2.32	1.68	1.26	1.08	.99
21	1.44	1.89	2.39	1.80	1.80	3.65	2.82	3.06	1.62	1.69	1.21	1.12
22	1.33	1.76	2.94	1.87	1.86	3.40	2.66	2.82	2.61	1.54	1.23	1.40
23	1.31	1.83	3.14	1.97	1.95	2.72	2.59	2.77	2.75	1.28	1.09	1.19
24	1.35	1.66	3.59	2.74	1.88	2.49	2.64	3.12	2.81	1.18	1.08	1.06
25	1.39	1.61	3.20	2.54	1.92	2.75	2.38	3.23	2.82	1.19	1.26	.92
26	1.40	1.52	3.05	2.38	1.83	2.92	2.29	2.94	2.72	1.19	1.19	.94
27	1.35	1.49	2.83	2.16	1.77	4.25	2.25	2.67	2.65	1.17	1.15	.97
28	1.69	1.71	2.60	2.06	1.80	3.68	2.25	2.44	2.59	1.07	1.10	.99
29	1.66	2.15	2.43	1.98	.....	3.17	2.32	2.31	2.51	1.15	1.12	.95
30	1.45	1.90	2.35	1.92	.....	3.02	2.27	2.24	2.22	1.14	1.09	.93
31	1.51	.....	2.37	1.86	.....	2.86	.....	2.21	.....	2.17	1.13	.....

Daily gage height, in feet, of Whitewater River at Brookville, Ind., for the period Oct. 1, 1918, to May 15, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	1.12	7.05	3.95	1.92	2.29	2.01	2.56	2.75				
2	1.00	6.37	3.22	1.78	2.46	1.93	2.36	2.64				
3	.98	4.07	3.00	1.45	3.27	1.89	2.18	2.57				
4	.99	3.41	2.59	1.43	3.58	2.36	2.96	2.51				
5	1.04	3.04	2.57	1.39	3.52	3.98	2.83	2.45				
6	1.03	2.65	3.81	1.34	2.72	2.71	2.35	2.39				
7	1.20	3.21	4.37	1.57	2.45	2.35	2.60	2.33				
8	1.22	3.31	3.38	2.36	2.32	2.24	2.74	2.27				
9	1.17	2.75	3.22	2.26	2.67	2.09	2.47	2.21				
10	1.31	2.54	2.83	1.96	3.63	2.35	2.29	2.17				
11	1.99	4.45	2.30	1.89	4.33	4.18	2.18	2.13				
12	1.68	2.77	2.47	1.72	3.98	8.36	2.71	4.58				
13	1.59	2.34	4.29	1.73	3.12	4.93	3.46	5.20				
14	1.45	2.47	2.94	1.77	3.24	3.56	2.94	3.80				
15	1.34	2.43	2.32	1.74	2.71	3.83	2.66	3.40				
16	1.39	2.32	2.34	1.84	2.51	8.38	3.80					
17	1.43	2.21	2.18	2.10	2.32	5.28	6.40					
18	1.36	2.18	2.21	1.91	2.33	4.48	5.03					
19	1.25	2.13	2.14	1.75	2.27	5.48	6.50					
20	1.25	2.07	1.93	1.89	3.28	3.83	14.56					
21	1.28	2.02	1.95	2.90	5.26	3.44	13.40					
22	1.23	2.00	2.07	2.14	4.68	3.36	7.06					
23	1.19	1.96	1.99	2.14	4.10	3.21	4.88					
24	1.22	1.96	1.99	2.48	3.06	2.92	4.06					
25	1.21	2.13	1.81	1.93	2.82	2.77	3.63					
26	2.42	3.57	1.87	1.97	2.42	2.75	3.44					
27	5.62	3.45	1.88	2.14	2.26	2.68	3.29					
28	3.97	3.05	1.90	2.93	2.22	2.71	3.17					
29	3.29	6.12	1.89	2.32	2.11	2.64	3.02					
30	3.01	7.02	1.81	2.92		2.52	2.89					
31	4.59		1.83	2.95		2.34						

NOTE.—Stage-discharge relation probably affected by ice during part of the period Dec. 15, 1919, to Feb. 23, 1920.

KENTUCKY RIVER BASIN.

DIX RIVER NEAR BURGIN, KY.

LOCATION.—At covered wooden highway bridge on Burgin and Buena Vista pike, 3¼ miles due east of Burgin, Mercer County. Kennedys mill is a quarter of a mile above station.

DRAINAGE AREA.—395 square miles (86 per cent measured on topographic maps and 14 per cent on United States Geological Survey map of Kentucky; scale, 1:500.000).

RECORDS AVAILABLE.—July 2, 1910, to July 16, 1911; October 1, 1911, to September 30, 1920.

GAGE.—Staff gage attached to right upstream wing wall of bridge near face of abutment; read by Frank Martin. 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 ending September 30, 1919, 24.0 feet at 5 p. m., January 1 (discharge, 21,000 second-feet); minimum stage recorded, 2.65 feet September 10, 13, 15, 18, and 20 (discharge, 1.2 second-feet).

Maximum stage recorded during year ending September 30, 1920, 27.0 feet at 6 a. m. January 9 (discharge, 24,900 second-feet); minimum stage, 2.70 feet September 30 (discharge, 1.5 second-feet).

1910–1920: Maximum stage recorded, 29.0 feet about 3 a. m., January 22, 1917 (discharge, 27,500 second-feet); minimum stage 2.60 feet at 6 a. m., June 19, 1918 (discharge, 0.8 second-foot).

ICE.—Ice forms only during severe winters.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice during 1918–19 or 1919–20. Rating curve well defined up to 455 second-feet and fairly well defined between 455 and 12,000 second-feet; above 12,000 second-feet, curve is an extension. Gage read twice daily to quarter-tenths. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

The following discharge measurement was made by W. R. King:
May 11, 1920: Gage height, 6.07 feet; discharge, 750 second-feet.

Daily discharge, in second-feet, of Dix River, near Burgin, Ky., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.
1918–19.												
1	3.6	60	54	16,800	222	735	211	155	268	60	9.4	2.6
2	3.6	124	54	16,800	190	825	180	735	200	49	18	2.6
3	3.6	100	49	4,940	160	568	170	389	160	38	7.4	2.0
4	3.6	66	42	1,530	151	491	133	256	151	27	6.0	2.6
5	3.6	44	40	925	151	421	133	256	160	23	42	2.0
6	3.6	36	40	649	133	2,090	133	151	133	23	62	2.6
7	3.6	29	31	455	116	1,530	116	100	108	22	222	2.6
8	3.6	20	31	455	108	925	133	116	82	8.2	151	2.0
9	3.6	20	29	568	108	3,900	116	2,950	280	22	97	2.0
10	3.6	17	33	455	100	2,340	222	5,600	421	11	70	1.2
11	3.6	16	49	374	97	1,340	2,090	1,940	233	11	44	1.5
12	3.6	11	151	280	85	1,150	1,870	735	124	14	33	1.5
13	3.6	9.4	292	256	82	359	691	780	389	22	25	1.2
14	3.6	7.4	421	233	85	529	455	491	233	17	22	1.5
15	3.6	6.0	2,420	268	82	455	345	389	133	20	20	1.2
16	3.6	2.6	875	331	124	455	280	305	100	20	38	1.5
17	3.6	3.6	608	305	108	875	374	256	72	17	49	1.5
18	3.6	4,000	331	305	85	975	305	180	62	12	33	1.2
19	2.6	608	268	331	92	780	222	280	58	17	18	1.5
20	3.6	280	200	318	97	529	190	190	38	17	14	1.2
21	4.5	200	211	280	100	421	170	151	31	27	11	1.5
22	9.4	170	233	256	151	359	151	421	22	40	23	2.0
23	7.4	133	735	256	268	305	142	280	36	29	31	2.6
24	7.4	92	780	1,530	345	233	116	491	116	17	36	9.4
25	14	72	568	1,030	305	200	116	1,940	256	12	31	11
26	14	65	691	691	925	211	100	2,420	292	14	17	17
27	11	55	491	529	735	222	100	1,030	190	6.8	11	20
28	17	47	345	405	568	825	95	691	151	7.4	9.4	8.2
29	22	38	233	345	.....	529	90	421	116	7.4	6.0	7.4
30	23	51	200	331	.....	292	88	389	82	6.0	7.4	6.0
31	36	.....	389	245	.....	305	.....	292	.....	4.5	3.6	.....
1919–20.												
1	7.4	6,750	1,530	233	438	374	649	529	305	7.4	40	70
2	7.4	8,780	925	211	374	345	3,130	529	649	4.5	40	58
3	7.4	2,770	691	268	331	374	1,870	491	405	2.6	40	44
4	7.4	1,400	491	190	345	925	2,340	421	1,800	405	54	36
5	11	691	374	116	1,090	3,130	3,800	305	3,700	280	190	27
6	11	455	1,030	133	1,030	1,600	1,800	222	5,600	256	72	14
7	11	345	11,600	142	735	780	1,660	491	1,150	222	190	6.0
8	11	280	5,050	2,500	780	491	1,270	6,270	568	180	268	6.8
9	11	244	5,490	23,000	491	455	875	2,340	389	133	491	78
10	11	211	6,990	10,900	568	421	691	1,150	305	100	421	116
11	11	190	3,310	3,130	568	491	491	649	211	78	305	60
12	31	233	1,530	1,460	491	735	438	455	133	54	280	142
13	108	280	3,700	1,030	455	1,090	529	1,600	133	54	529	170
14	345	211	8,520	825	389	925	529	1,800	133	190	455	170
15	256	160	3,040	649	345	735	359	691	116	421	608	151
16	2,590	142	1,600	529	280	825	305	529	100	292	1,270	133
17	2,020	133	925	491	292	3,310	280	389	78	233	1,090	108
18	735	116	825	455	305	1,660	280	529	66	190	875	85
19	331	92	735	374	359	10,900	222	735	54	318	649	75
20	211	78	649	331	389	6,150	318	975	49	421	529	54
21	151	70	529	2,090	421	3,310	7,480	529	54	244	491	47
22	151	58	455	9,430	6,510	1,210	2,500	421	47	142	491	29
23	116	42	389	9,560	2,590	825	1,600	318	40	124	455	17
24	116	31	331	7,480	1,530	529	691	280	49	82	359	18
25	116	25	305	4,400	925	491	491	268	40	60	244	16
26	151	10,600	280	1,800	735	421	735	233	42	54	170	7.4
27	133	9,170	233	1,150	529	211	1,660	233	44	44	133	6.0
28	116	2,860	233	975	438	170	1,030	180	42	40	100	3.6
29	100	1,530	233	735	421	116	735	170	27	40	97	3.6
30	72	2,500	256	568	.....	82	568	124	11	40	88	1.5
31	54	.....	233	529	.....	54	.....	170	.....	40	78	.....

NOTE.—Gage readings in error Nov. 26, 27, 1918, and Apr. 27–29, 1919; discharge estimated.

Monthly discharge of Dix River near Burgin, Ky., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 395 square miles.]

Month.	Discharge in second-feet.				Run off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	36	2.6	7.64	0.019	0.02
November	4,000	2.6	213	.539	.60
December	2,420	29	351	.889	1.02
January	16,800	233	1,690	4.28	4.93
February	925	82	206	.522	.54
March	3,900	200	812	2.06	2.38
April	2,090	11	318	.805	.90
May	5,600	100	799	2.02	2.33
June	421	22	157	.397	.44
July	60	4.5	20.0	.051	.06
August	222	3.6	37.7	.095	.11
September	20	1.2	4.04	.010	.01
The year	16,800	1.2	388	.982	13.34
1919–20.					
October	2,590	7.4	258	.654	.75
November	10,600	25	1,680	4.25	4.74
December	11,600	233	2,020	5.12	5.90
January	23,000	116	2,760	6.99	8.06
February	6,510	280	833	2.11	2.28
March	10,900	54	1,390	3.52	4.06
April	7,480	222	1,310	3.32	3.70
May	6,270	124	775	1.96	2.26
June	5,600	11	545	1.38	1.54
July	421	2.6	153	.387	.45
August	1,270	40	358	.906	1.04
September	170	1.5	58.4	.148	.17
The year	23,000	1.5	1,010	2.56	34.95

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, 1920.

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 boulders and bedrock; probably permanent. Control short distance below gage composed of solid rock and boulders; permanent.

EXTREMES OF STAGE.—Maximum stage recorded during the year ending September 30, 1919, 11.6 feet at 7 a. m. January 2; minimum stage, 0.2 foot October 1–23 and September 3–30.

Maximum stage recorded during the year ending September 30, 1920, 15.0 feet at 6 p. m. December 7; minimum stage, 0.2 foot October 1–15.

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

ACCURACY.—Stage-discharge relation probably permanent; not affected by ice during 1919 or 1920. Gage read to tenths twice daily. Records fair. Daily discharge not published because no discharge measurements have been made since July 31, 1917.

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

Daily gage height, in feet, of Elkhorn Creek at Forks of Elkhorn, Ky., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	0.2	1.05	1.0	7.7	1.4	1.7	1.4	1.2	1.0	1.1	0.6	0.4
2	.2	1.0	1.0	11.4	1.4	1.4	1.4	1.2	1.0	1.0	.6	.3
3	.2	.9	1.0	7.3	1.4	1.4	1.4	1.2	1.0	1.0	.6	.2
4	.2	.7	1.0	5.5	1.4	1.5	1.2	1.2	1.0	1.0	.6	.2
5	.2	.6	1.0	3.6	1.4	1.9	1.2	1.2	1.0	1.0	.6	.2
6	.2	.6	1.0	2.9	1.4	1.9	1.2	1.2	1.0	1.0	.6	.2
7	.2	.6	1.0	2.5	1.2	2.7	1.2	1.2	1.3	1.0	.6	.2
8	.2	.6	1.0	2.4	1.2	3.75	1.3	1.6	1.4	1.0	.6	.2
9	.2	.6	1.0	2.3	1.2	4.75	1.7	3.8	1.2	1.0	.6	.2
10	.2	.6	1.0	2.0	1.2	5.8	2.7	6.4	1.2	1.0	.6	.2
11	.2	.6	2.7	2.0	1.2	4.6	4.5	5.4	1.0	1.0	.6	.2
12	.2	.6	3.0	2.0	1.2	3.4	4.9	4.6	1.1	1.0	.6	.2
13	.2	.6	2.9	1.9	1.2	2.9	4.3	4.1	1.3	1.0	.6	.2
14	.2	.6	3.4	1.5	1.2	2.5	3.8	3.4	1.0	1.0	.6	.2
15	.2	.6	3.9	1.2	1.2	2.4	3.1	2.7	1.0	1.0	.6	.2
16	.2	.6	3.7	1.2	1.2	4.5	2.6	2.3	1.0	1.0	.6	.2
17	.2	.6	3.3	1.2	1.2	7.6	2.6	2.0	1.0	1.0	.6	.2
18	.2	.8	2.9	1.2	1.2	6.8	2.6	2.0	1.0	1.0	.6	.2
19	.2	1.9	2.5	1.2	1.2	5.7	2.6	2.4	1.0	1.0	.6	.2
20	.2	1.7	2.1	1.2	1.2	4.6	2.4	2.9	1.0	1.0	.6	.2
21	.2	1.2	2.0	1.2	1.2	2.9	2.3	2.8	1.0	1.0	.6	.2
22	.2	1.2	2.0	1.2	1.2	2.2	2.2	2.8	1.0	.9	.6	.2
23	.2	1.0	2.2	1.2	1.2	1.8	2.2	2.8	1.0	.8	.6	.2
24	.3	1.0	2.7	1.5	1.2	1.8	2.2	3.0	1.0	.8	.6	.2
25	.4	1.0	3.1	1.6	1.5	1.8	2.1	3.0	1.0	.6	.6	.2
26	.4	1.0	2.9	1.6	1.9	1.7	1.8	3.0	1.2	.6	.6	.2
27	.4	1.0	2.5	1.6	1.75	1.6	1.8	2.9	1.2	.6	.6	.2
28	.6	1.0	2.1	1.4	1.65	1.6	1.8	2.5	1.2	.6	.5	.2
29	.9	1.0	1.8	1.4	.....	1.6	1.7	2.1	1.2	.6	.4	.2
30	1.3	1.0	1.7	1.4	.....	1.6	1.4	1.7	1.2	.6	.4	.2
31	1.25	.....	2.1	1.4	.....	1.5	.....	1.3	.....	.6	.4	.....
1919–20.												
1	.2	7.6	3.5	1.2	2.0	1.4	2.9	2.4	1.8	.6	.4	2.8
2	.2	13.4	3.1	1.2	1.9	1.4	2.8	2.4	1.8	.6	.4	2.6
3	.2	9.1	2.6	1.2	1.8	1.4	2.8	2.4	1.5	.6	.4	2.6
4	.2	6.1	2.6	1.2	1.8	1.4	3.2	2.4	1.1	.6	.4	2.6
5	.2	4.7	2.6	1.2	1.7	1.4	3.6	2.4	.8	.6	.4	2.6
6	.4	3.5	5.5	1.3	1.6	1.4	3.1	2.4	.8	.6	.4	2.6
7	.4	2.9	12.5	2.0	1.6	1.4	2.7	2.4	.8	.6	.4	2.6
8	.4	2.5	12.0	4.1	1.6	1.4	2.6	2.4	.8	.6	1.0	2.6
9	.4	2.4	8.2	5.9	1.5	1.4	2.6	2.2	.8	.6	2.4	2.6
10	.4	2.6	6.7	9.3	1.4	1.8	2.6	2.2	.8	.6	3.8	2.6
11	.4	2.9	5.1	12.0	1.4	4.4	2.6	2.0	.8	.4	5.4	2.6
12	.4	2.2	4.4	10.6	1.4	5.7	2.7	1.8	.8	.4	6.8	3.4
13	.4	2.0	6.5	5.9	1.4	4.7	3.0	1.8	.8	.4	8.0	4.0
14	5.2	2.0	8.5	3.5	1.4	3.7	3.0	1.7	.8	.4	9.2	5.6
15	5.5	2.0	5.5	2.9	1.4	3.0	2.8	1.6	.8	.4	9.3	6.7
16	4.4	2.0	4.7	2.5	1.4	4.6	2.6	1.6	.8	.4	8.4	5.7
17	3.9	1.8	4.2	2.1	1.4	6.8	2.6	1.7	.8	.4	7.5	4.6
18	3.4	1.6	4.0	2.0	1.4	6.0	2.7	2.1	.8	.4	6.4	3.9
19	2.9	1.6	3.9	2.0	1.4	5.3	4.0	1.9	.8	.4	5.5	2.7
20	2.5	1.6	3.5	2.0	1.4	4.8	8.2	1.6	.8	.4	4.5	2.6
21	2.1	1.6	3.1	4.2	1.4	4.0	8.2	1.4	.8	.4	4.2	2.6
22	1.7	1.6	2.7	8.2	1.4	3.3	7.6	1.4	.8	.4	5.4	2.6
23	1.4	1.6	2.3	10.5	1.4	3.0	6.8	1.4	.8	.4	5.6	2.6
24	1.4	1.6	2.0	9.0	1.4	3.0	6.1	1.4	.8	.4	4.4	2.6
25	1.4	4.0	2.0	7.0	1.4	3.0	5.7	1.4	.8	.4	3.8	2.6
26	1.6	8.0	1.5	5.7	1.4	3.0	5.1	1.4	.8	.4	3.8	2.6
27	2.8	10.4	1.4	4.6	1.4	3.0	4.5	1.4	.8	.4	3.4	2.6
28	4.6	6.7	1.4	3.9	1.4	3.0	3.9	1.4	.8	.4	3.3	2.6
29	3.0	5.4	1.3	3.2	1.4	3.0	3.3	1.4	.8	.4	3.2	2.6
30	3.4	4.3	1.2	2.6	.....	2.9	2.7	1.4	.8	.4	3.2	2.6
31	4.6	.....	1.2	2.1	.....	2.5	.....	1.7	.....	.4	3.2	.....

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, 1920.

GAGE.—Vertical staff attached to upstream side of first pier from left abutment of bridge; read by Elphia Connelly and Anna Shepherd.

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.

EXTREMES OF STAGE.—Maximum stage recorded during the year ending September 30, 1919, 18.0 feet at 7 a. m. March 17; minimum stage, 0.2 foot October 10–19 and September 2–30.

Maximum stage recorded during the year ending September 30, 1920, 20.5 feet at 5 p. m. April 20; minimum stage, 0.2 foot October 1–10 and July 13.

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 the winters 1918–19 and 1919–20. Gage read twice daily to tenths. Daily discharge not published because no discharge measurements have been made since June 21, 1918. Records fair.

COOPERATION.—Gage-height record furnished by United States Engineer Corps.

Daily gage height, in feet, of Eagle Creek near Glencoe, Ky., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	0.5	2.0	2.1	11.2	1.9	2.5	2.4	2.8	2.1	2.5	0.5	0.3
2	.5	2.0	1.85	10.15	1.8	2.9	2.3	3.9	2.0	2.45	.5	.2
3	.5	1.95	1.55	3.9	1.8	2.45	2.3	2.9	1.9	2.4	.5	.2
4	.5	1.7	1.45	2.8	1.8	2.3	2.2	2.35	1.8	1.9	.4	.2
5	.5	1.35	1.35	2.45	1.8	4.65	2.2	2.15	1.7	1.35	.4	.2
6	.5	1.3	1.3	2.2	1.7	5.65	2.1	2.05	1.6	1.05	.4	.2
7	.5	1.2	1.15	2.1	1.7	3.3	2.0	2.0	1.55	.9	.4	.2
8	.4	1.05	1.1	2.0	1.6	2.75	2.0	2.0	1.6	.9	.3	.2
9	.3	1.0	1.25	1.9	1.6	8.45	2.05	8.4	2.15	.9	.3	.2
10	.2	1.0	7.05	1.9	1.5	4.5	2.05	8.8	1.95	6.6	.3	.2
11	.2	.95	6.35	1.8	1.5	3.15	6.0	4.75	1.75	2.2	.3	.2
12	.2	.9	4.3	1.7	1.5	2.85	3.8	3.4	1.7	1.65	.3	.2
13	.2	.8	8.75	1.6	1.5	2.65	2.7	2.9	1.6	1.45	.3	.2
14	.2	.8	7.5	1.85	1.5	2.6	2.45	2.95	1.5	1.25	.3	.2
15	.2	.8	6.25	1.95	1.5	2.6	2.3	2.75	1.4	1.25	.3	.2
16	.2	.8	3.6	2.0	1.8	4.1	2.85	2.55	2.5	2.1	.3	.2
17	.2	.8	2.75	2.0	2.15	16.6	3.4	2.5	1.95	1.2	.3	.2
18	.2	4.75	2.45	2.0	2.1	7.2	2.85	2.7	2.3	1.0	.3	.2
19	.2	3.5	2.25	2.0	2.3	4.0	2.7	2.55	1.75	.9	.3	.2
20	.5	2.8	2.05	1.9	2.3	3.2	2.45	3.85	1.65	.9	.3	.2
21	.6	2.5	2.0	1.8	2.35	2.95	2.25	3.75	1.45	.9	.3	.2
22	.5	1.9	2.6	1.8	3.25	2.65	2.1	2.75	1.2	.8	.3	.2
23	.5	1.8	3.2	3.95	2.95	2.5	2.1	2.65	2.5	.8	.3	.2
24	.65	1.65	5.25	5.45	2.6	2.45	2.85	8.35	2.05	.8	.3	.2
25	.6	1.5	5.3	3.45	2.5	2.4	2.95	4.85	3.9	.7	.3	.2
26	.95	1.35	3.3	2.8	2.5	2.4	2.3	3.2	7.25	.7	.3	.2
27	1.5	1.3	3.6	2.45	2.8	8.3	2.15	2.85	4.75	.7	.3	.2
28	2.6	2.55	2.4	2.25	2.5	4.3	2.0	2.65	3.4	.6	.3	.2
29	3.65	3.8	2.2	2.2	.....	3.05	2.0	2.45	2.9	.5	.3	.2
30	2.7	2.7	2.05	2.1	.....	2.75	2.7	2.25	2.55	.5	.3	.2
31	2.1	.....	2.1	2.0	.....	2.55	.....	2.2	.....	.5	.3	.....

Daily gage height, in feet, of Eagle Creek near Glencoe, Ky., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	0.2	9.9	3.65	1.7	2.7	2.4	2.0	2.35	1.8	1.2	0.8	2.8
2	.2	12.1	2.85	1.6	2.6	2.25	2.25	2.2	2.3	1.1	.8	2.55
3	.2	4.7	2.45	1.5	2.85	2.1	2.2	2.2	2.65	1.0	.8	2.45
4	.2	3.0	2.25	1.3	5.3	2.2	2.4	2.2	3.15	.9	.8	2.35
5	.2	2.55	2.15	1.3	4.85	6.1	4.55	2.1	3.5	.8	.65	6.15
6	.2	2.25	4.7	1.3	3.45	3.65	2.8	2.1	2.85	.8	.45	5.05
7	.2	2.8	13.5	1.55	2.95	2.7	2.65	2.0	2.4	.8	.4	3.45
8	.2	2.1	5.45	11.05	2.8	2.45	3.5	1.9	2.3	.7	3.95	2.95
9	.2	2.0	8.25	13.9	2.8	2.25	2.65	1.85	2.15	.6	3.1	3.25
10	.2	2.25	7.75	6.6	4.55	2.2	2.35	1.8	2.0	.45	2.5	3.05
11	.5	4.3	3.75	3.1	3.8	5.0	2.15	1.8	2.0	.3	5.2	2.75
12	1.55	3.45	3.0	2.6	3.15	13.1	2.5	5.15	1.45	.3	3.55	2.45
13	1.15	2.8	14.35	2.45	2.85	6.5	3.5	5.65	1.4	.2	5.95	3.75
14	2.2	2.4	8.25	2.25	2.7	3.65	2.75	3.4	4.8	.3	4.7	3.3
15	5.7	2.15	3.65	2.2	2.35	3.1	2.55	3.0	2.95	3.2	5.75	2.45
16	4.65	2.0	2.9	2.65	2.0	9.5	2.4	2.65	2.25	2.5	4.6	2.4
17	4.0	1.9	2.7	3.8	2.0	9.5	2.3	2.3	1.85	1.75	3.1	2.25
18	3.25	1.8	2.6	2.7	2.3	4.05	2.3	3.2	1.8	1.7	2.15	2.0
19	2.6	1.7	2.6	2.5	2.3	12.25	2.6	3.9	1.55	1.45	1.95	2.0
20	1.9	1.7	2.25	2.4	2.2	6.55	17.1	4.85	1.5	1.25	1.85	2.0
21	1.65	1.6	1.95	5.7	4.1	3.6	13.6	3.35	1.5	.95	2.9	2.0
22	2.1	1.5	1.65	5.8	4.0	3.05	6.3	2.7	1.5	.75	4.9	2.0
23	2.1	1.5	1.6	8.4	3.8	2.85	3.5	2.45	1.45	.55	3.95	2.0
24	1.6	1.5	1.6	9.25	3.5	2.65	2.9	2.4	1.4	.45	3.35	2.0
25	1.45	1.5	1.6	3.9	2.9	2.55	2.7	2.45	1.4	1.8	2.95	2.0
26	3.8	15.25	1.5	3.0	2.35	2.5	2.65	2.3	1.4	1.55	2.85	2.0
27	6.15	11.0	1.5	3.75	2.2	2.4	2.75	2.2	1.3	1.2	2.1	2.0
28	3.7	3.95	1.8	4.7	2.65	2.3	2.95	2.1	1.3	1.05	4.65	2.3
29	2.65	4.4	1.7	3.45	2.45	2.7	2.75	2.0	1.3	.95	4.25	3.45
30	2.7	5.35	1.7	2.9	.....	2.35	2.55	1.9	1.3	.85	4.4	2.6
31	5.0	.....	1.7	3.1	.....	2.2	.....	1.8	.....	.8	3.2	.....

GREEN RIVER BASIN.

GREEN RIVER AT MUNFORDVILLE, KY.

LOCATION.—At toll highway bridge at Munfordville, Hart County. Louisville & Nashville Railroad bridge is 1 mile below highway bridge.

DRAINAGE AREA.—1,790 square miles (measured on United States Geological Survey map of Kentucky; scale, 1:500,000).

RECORDS AVAILABLE.—February 27, 1915, to September 30, 1920.

GAGE.—Chain gage attached to upstream handrail of bridge; read by Chester Williams.

DISCHARGE MEASUREMENTS.—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 at high stages by foliage on the brush and trees in the flood plain.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 35.6 feet at 5.30 p. m. January 3 (discharge, 31,500 second-feet); minimum stage, 2.45 feet September 22 (discharge, 42 second-feet).

Maximum stage recorded during year ending September 30, 1920, 39.6 feet at 5.30 a. m. January 11 (discharge, 36,300 second-feet); minimum stage 2.54 feet October 1–3 (discharge, 56 second-feet).

1915–1920: Maximum stage recorded, 44.5 feet at 5.20 a. m. December 18, 1915 (discharge, 42,400 second-feet); minimum stage, that of September 22, 1919.

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 winters of 1918–19 and 1919–20. 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 Records good.

Discharge measurements of Green River at Munfordville, Ky., during the year ending Sept. 30, 1920.

[Made by W. R. King.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 18	3.34	528
Sept. 17	4.88	1,680

NOTE.—No discharge measurements were made at this station during the year ending Sept. 30, 1919.

Daily discharge, in second-feet, of Green River at Munfordville, Ky., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	90	1,420	552	6,440	1,420	3,820	3,080	1,880	2,620	712	238	163
2	82	1,200	536	20,200	1,120	2,920	2,250	1,880	2,400	638	1,350	275
3	82	1,050	429	30,600	1,050	2,780	1,950	1,800	2,180	638	520	230
4	82	825	389	28,400	975	2,320	1,500	1,650	1,950	498	468	163
5	82	638	389	16,300	975	2,620	1,420	1,880	1,650	421	342	98
6	80	568	389	4,950	862	6,120	1,280	2,020	1,280	413	750	92
7	85	460	389	2,920	825	8,140	1,200	2,700	638	536	1,420	381
8	85	381	389	2,920	788	8,740	1,200	3,680	1,200	750	1,420	750
9	85	381	389	2,700	750	9,540	1,420	13,600	1,280	600	1,280	568
10	80	320	389	2,320	750	10,300	2,180	23,300	1,420	468	712	230
11	80	290	389	2,020	712	8,570	4,880	22,200	1,280	584	568	72
12	80	245	788	1,950	675	4,050	7,300	18,400	1,350	482	381	62
13	82	245	938	1,650	675	2,920	6,960	7,550	862	350	275	47
14	88	245	1,500	1,420	712	2,850	4,280	3,980	825	350	260	56
15	90	245	4,720	1,420	712	2,620	3,220	3,220	825	335	245	64
16	90	245	5,250	1,420	750	3,980	4,420	2,700	750	335	150	60
17	90	245	4,280	1,420	750	11,300	4,350	3,080	675	275	146	60
18	100	3,150	2,620	1,500	750	13,800	4,420	3,600	638	260	146	60
19	750	5,250	1,880	2,180	675	9,920	3,300	3,300	568	260	146	60
20	528	4,120	1,350	2,100	712	5,880	2,780	3,600	568	584	146	47
21	862	1,650	1,280	1,950	975	4,200	2,020	3,080	520	638	146	44
22	536	1,280	2,480	1,800	1,720	3,380	1,580	2,850	490	675	146	42
23	445	975	3,750	3,300	2,320	2,700	1,280	2,850	712	825	146	68
24	268	862	4,200	4,500	2,400	2,250	1,200	3,300	788	600	146	141
25	413	675	4,050	5,250	3,300	1,720	1,120	4,880	788	335	105	230
26	788	638	3,600	4,720	6,200	1,880	975	11,700	712	189	78	114
27	788	592	2,850	3,220	6,620	3,520	938	12,100	1,580	182	102	71
28	750	584	2,100	2,550	6,280	6,700	900	7,040	862	176	150	58
29	1,500	750	1,720	2,020	.....	4,720	900	5,400	788	150	123	58
30	1,500	560	1,420	1,950	.....	3,820	1,420	3,820	788	141	100	58
31	1,050	.....	2,180	1,500	.....	3,750	.....	2,780	.....	141	123	.....
1919–20.												
1	58	7,120	11,400	482	2,780	3,750	6,780	6,120	2,780	230	196	600
2	56	8,480	7,890	460	3,080	3,450	11,200	6,440	3,150	208	552	520
3	56	19,600	4,200	452	3,980	3,300	14,400	5,560	4,420	110	825	452
4	56	15,900	3,380	552	4,350	4,720	13,000	3,380	6,280	92	202	389
5	65	6,780	2,620	552	4,650	5,320	12,600	2,400	7,800	208	170	373
6	92	3,000	4,120	788	5,180	5,180	9,630	1,950	6,960	512	389	482
7	90	2,480	5,560	3,600	4,650	4,200	7,040	2,250	5,720	712	238	405
8	141	2,020	7,380	8,740	3,680	3,600	5,640	4,350	4,580	712	1,050	358
9	100	1,720	17,200	21,500	3,080	3,150	4,420	9,340	3,680	592	2,180	268
10	98	1,580	20,000	29,600	2,920	2,920	3,750	8,140	2,250	482	1,800	675
11	136	1,350	16,300	35,400	2,620	3,680	2,920	5,560	1,580	468	1,420	1,280
12	141	2,180	13,500	20,600	2,780	3,820	2,700	7,040	1,350	373	975	5,020
13	2,100	1,880	11,400	11,700	3,300	4,950	2,480	6,780	900	282	1,280	12,000
14	2,180	1,580	17,500	5,640	3,000	7,040	2,180	4,950	638	358	7,380	10,000
15	2,480	1,280	21,600	5,250	2,700	6,200	1,880	3,680	568	750	8,060	4,720
16	3,080	1,050	22,800	4,280	2,250	5,320	1,720	2,550	490	788	5,800	3,220
17	4,650	975	21,600	3,600	2,180	5,180	1,720	3,000	536	592	4,280	1,950
18	6,780	825	16,600	3,680	2,020	6,200	1,650	3,820	712	475	3,600	1,650
19	4,880	675	9,160	3,750	1,880	8,320	1,500	3,680	389	389	2,550	1,200
20	4,050	638	5,480	5,560	3,220	14,300	3,150	3,680	381	328	1,500	638
21	2,780	638	3,520	9,080	6,620	21,500	15,300	3,520	429	305	1,580	421
22	1,120	638	3,150	17,900	9,250	16,400	17,900	3,680	638	290	2,320	638
23	1,350	638	2,850	22,000	15,900	6,360	14,700	3,820	520	290	1,880	536
24	1,280	638	2,180	23,800	13,800	4,650	9,080	3,450	437	245	1,500	490
25	1,200	638	1,880	20,900	11,000	3,380	5,020	2,850	397	189	1,280	421
26	1,120	11,500	1,420	16,400	6,440	2,620	6,620	2,480	365	215	975	421
27	1,120	21,500	1,280	13,800	3,520	2,020	11,500	2,100	335	230	1,050	421
28	825	24,100	1,200	10,000	2,700	2,250	8,740	1,280	305	150	1,420	373
29	568	21,800	1,120	6,870	3,150	2,100	5,640	975	260	132	1,120	600
30	505	14,700	675	5,560	.....	1,880	5,480	1,420	230	123	600	536
31	1,720	.....	560	3,820	.....	3,000	.....	2,180	.....	176	675	.....

Monthly discharge of Green River at Munfordville, Ky., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,790 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	1,500	80	378	0.211	0.24
November	5,250	245	1,000	.559	.62
December	5,250	389	1,860	1.04	1.20
January	30,600	1,420	5,410	3.02	3.48
February	6,620	675	1,660	.927	.97
March	13,800	1,720	5,220	2.92	3.37
April	7,300	900	2,520	1.41	1.57
May	23,300	1,650	5,990	3.35	3.86
June	2,620	490	1,100	.615	.69
July	825	141	437	.244	.28
August	1,420	78	398	.222	.26
September	750	42	147	.082	.09
The year	30,600	42	2,190	1.22	16.63
1919–20.					
October	6,780	56	1,450	.810	.93
November	24,100	638	5,930	3.31	3.69
December	22,800	560	8,370	4.68	5.40
January	35,400	452	10,200	5.70	6.57
February	15,900	1,880	4,710	2.63	2.84
March	21,500	1,880	5,510	3.08	3.55
April	17,900	1,500	7,010	3.92	4.37
May	9,340	975	3,950	2.21	2.55
June	7,800	230	1,970	1.10	1.23
July	788	92	355	.198	.23
August	8,060	170	1,900	1.06	1.22
September	12,000	268	1,700	.950	1.06
The year	35,400	56	4,420	2.47	33.64

WABASH RIVER BASIN.

VERMILION RIVER NEAR DANVILLE, ILL.

LOCATION.—In sec. 22, T. 19 N., R. 11 W., at Chicago & Eastern Illinois Railroad bridge 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, 1920.

GAGE.—Chain gage attached to downstream side of bridge; read by Sherman Osborn.

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 the year ending September 30, 1919, 15.32 feet at 5 p. m. March 18 (discharge, 9,360 second-feet); minimum stage, 1.89 feet September 16 and 17 (discharge, 6.7 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 19.7 feet April 21 (discharge, 13,600 second-feet); minimum stage, 1.96 feet September 25 (discharge, 8 second-feet).

1915–1920: Maximum stage recorded, 19.7 feet April 21, 1920 (discharge, 13,600 second-feet); minimum stage, 1.89 feet September 16 and 17, 1919 (discharge, 6.7 second-feet).

ACCURACY.—Stage-discharge relation changed during high water in May 1919, and during summer of 1920; affected by ice during part of January and February, 1920. Rating curves fairly well defined above 30 second-feet. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating tables. Shifting-control method used June 1 to September 30, 1920. Records fair except for very low stages for which they are poor.

Discharge measurements of Vermilion River near Danville, Ill., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Dec. 4	H. C. Beckman	3.88	602	Aug. 20	H. C. Beckman	2.24	38
1919.				1920.			
June 5	do	3.33	326	Apr. 21	H. J. Dean	19.73	13,600
Aug. 20	do	2.24	36	June 29	do	2.66	104

Daily discharge, in second-feet, of Vermilion River near Danville, Ill., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1				2,800	594	1,460	1,040	445	325	400	86	38
2				2,580	594	1,380	920	570	315	355	88	22
3			669	2,060	594	1,300	920	520	315	335	82	20
4			594	1,100	498	1,100	920	665	315	315	75	20
5			498	1,320	475	1,040	865	810	315	212	64	19
6			498	1,530	430	985	838	810	315	202	55	17
7			475	1,830	408	930	810	755	295	193	46	16
8			464	930	386	876	700	700	254	175	38	15
9			452	876	344	930	755	810	212	157	36	15
10			570	771	302	985	700	810	196	140	36	15
11			1,100	1,100	302	1,230	645	810	187	125	36	12
12			1,680	910	302	1,680	645	810	169	111	40	10
13			3,360	720	475	1,830	608	755	151	104	37	7.0
14			4,400	720	771	1,680	570	645	160	98	36	7.0
15			3,880	669	1,380	7,920	595	520	186	96	33	7.0
16			3,760	644	1,380	9,060	645	400	212	107	61	6.7
17			3,200	669	1,380	9,120	520	470	193	94	52	6.7
18			2,430	720	1,230	9,360	445	458	216	82	43	7.6
19			2,360	694	1,100	7,360	400	445	226	73	40	10
20			1,830	669	930	5,760	378	495	864	68	36	12
21			4,480	669	985	4,480	355	495	1,160	64	33	20
22			5,320	644	1,300	3,520	335	545	1,040	60	28	28
23			6,160	720	1,830	2,860	315	920	920	55	24	43
24			5,840	771	2,360	2,200	445	1,040	1,380	49	26	68
25			6,000	823	2,280	2,060	422	980	1,400	43	28	55
26			5,120	823	2,130	1,900	378	920	1,430	42	24	38
27			3,520	823	1,980	1,680	400	920	1,460	38	23	28
28			3,040	823	1,600	1,460	422	865	920	33	22	25
29			2,550	771		1,300	422	755	720	76	20	22
30			2,060	720		1,280	400	545	520	52	60	11
31			1,760	669		1,160		335		71	49	
1919-20.												
1	13	920	2,800	109	32	120	1,300	2,500	645	68	18	12
2	13	780	2,360	64	32	107	975	2,130	595	58	15	11
3	12	645	2,060	49	1,230	172	810	1,760	570	88	15	11
4	11	495	1,760		975	226	730	1,380	545	81	15	11
5	16	355	1,300		755	645	645	1,160	495	73	15	11
6	20	295	930		645	335	700	865	482	61	14	11
7	20	275	760		545	335	755	810	470	54	21	11
8	21	258	595		820	335	1,830	755	400	49	20	11
9	24	305	595	50	1,100	335	2,730	730	378	46	18	11
10	42	355	495		920	810	2,430	700	335	51	18	11
11	46	545	470		865	2,130	2,200	700	275	61	17	11
12	39	445	445		865	3,840	1,980	2,500	233	64	14	11
13	32	422	400		810	4,320	1,600	4,800	220	73	920	11
14	31	400	400		700	3,880	1,230	4,240	193	107	92	11
15	29	400	400			3,440	975	4,080	169	82	78	11
16	29	355	335		600	3,360	2,800	3,840	160	68	70	29
17	28	315	275			2,730	5,360	3,600	143	58	50	24
18	26	275	226			2,130	6,920	5,040	143	56	36	18
19	26	212	199		595	2,060	8,480	4,480	135	55	31	16
20	26	199	125	40	595	2,060	10,900	3,600	123	54	28	14
21	26	187	160		595	1,870	13,500	2,730	111	49	21	13
22	26	163	196		545	1,680	11,800	1,900	98	46	20	13
23	26	162	187		495	1,530	8,140	1,620	94	43	18	11
24	26	160	187		400	1,100	4,480	1,380	82	38	16	9
25	24	160	178		275	1,100	3,720	1,040	80	36	16	8
26	35	157	178	37	190	2,360	2,960	920	80	33	16	20
27	46	163	172	34	172	3,760	2,580	755	78	30	14	34
28	82	145	170	33	151	3,240	1,980	595	76	28	14	26
29	275	3,600	169	33	135	2,730	2,130	595	73	24	13	18
30	355	3,330	151	32		1,980	2,430	570	71	20	13	14
31	865		135	32		1,760		545		20	13	

NOTE.—Gage not read on Sundays; discharge interpolated. Discharge Jan. 4–25 and Feb. 15–18, 1920, estimated because of ice, from gage heights, observer's notes, and study of weather records. Gage readings for October and November, 1918, believed in error: discharge not published.

Monthly discharge of Vermilion River near Danville, Ill., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,280 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
December 3–31	6,160	452	2,690	2.10	2.19
January	2,800	644	1,020	.797	.92
February	2,360	302	1,010	.789	.82
March	9,360	876	2,900	2.27	2.62
April	1,040	315	594	.464	.52
May	1,040	335	678	.530	.61
June	1,460	151	546	.427	.48
July	400	33	130	102	.12
August	88	20	43.8	.034	.04
September	68	6.7	20.7	.016	.02
1919–20.					
October	865	11	73.8	.058	.07
November	3,600	145	549	.429	.48
December	2,800	125	607	.474	.55
January	109	32	45.9	.036	.04
February	1,230	32	581	.454	.49
March	4,320	107	1,820	1.42	1.64
April	13,500	645	3,640	2.84	3.17
May	5,040	545	2,010	1.57	1.81
June	645	71	252	.197	.22
July	107	20	54.0	.042	.05
August	920	13	54.2	042	.05
September	34	8	14.4	.011	.01
The year	13,500	8	806	.630	8.58

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, 450 feet downstream from Cincinnati, Hamilton & Dayton Railway bridge and 2½ miles upstream from mouth of Hickory Creek (North Fork).

DRAINAGE AREA.—1,540 square miles.

RECORDS AVAILABLE.—October 20, 1909, to December 31, 1912; August 24, 1914, to September 30, 1920.

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, Hamilton & Dayton Railway bridge, northwest of highway bridge; made by wading during low stages.

CHANNEL AND CONTROL.—Measuring section is at a pool; control is about 1,800 feet below gage; likely to shift.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 18.5 feet at 1 p. m. December 22 (discharge, 7,120 second-feet); minimum stage recorded, 1.93 feet September 18 and 19 (discharge, 50 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 18.2 feet November 2 (discharge, 6,500 second-feet); minimum stage, 1.87 feet October 4 (discharge, 46 second-feet).

1909–1920: Maximum stage recorded during periods of records, 21.2 feet June 6,. 1917 (discharge,14,000 second-feet); minimum stage, 1.1 feet September 5–9, 1914, and October 19, 1914 (discharge, 1.0 second-foot).

Flood of spring of 1908 reached a height of 22.5 feet on the present gage.

ACCURACY.—Stage-discharge relation changed during high water in March, 1919; not affected by ice during winter. Rating curve used October 1, 1918, to April 2, 1919, fairly well defined; curves used April 3 to September 30, 1919, and October 1, 1919, to September 30, 1920, fairly well defined between 75 and 5,000 second-feet; above 5,000 second-feet it is based on an extension of curve for main river channel and estimated overflow, which is considerable. 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 low stages in September, for which they are fair.

Discharge measurements of Embarrass River at Ste. Marie, Ill., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	Aug. 19	H. C. Beckman	*Feet.* 2.30	*Sec.-ft.* 83
Dec. 5	H. C. Beckman	5.11	669	1920.			
1919.				Apr. 19	H. J. Dean	8.69	1,760
May 20	do	4.67	536				

Daily discharge, in second-feet, of Embarrass River at Ste. Marie, Ill., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	304	1,190	1,010	3,810	692	1,390	1,010	1,820	625	6,130	218	200
2	285	1,160	920	4,060	642	1,190	920	1,560	625	4,740	174	70
3	285	1,010	842	2,740	593	1,070	860	800	525	2,180	218	70
4	266	817	742	2,220	642	980	860	675	500	1,700	165	70
5	247	742	667	1,560	692	920	830	2,780	575	1,390	156	65
6	247	642	593	1,560	593	868	775	3,340	575	1,190	148	60
7	220	569	545	1,640	545	717	725	1,560	450	1,040	165	60
8	202	521	521	1,560	545	642	700	1,320	625	920	156	56
9	194	1,010	452	1,500	521	792	675	3,660	430	800	156	56
10	186	2,380	1,040	1,220	498	2,180	650	3,540	390	725	148	53
11	186	1,320	1,670	1,040	452	1,820	600	1,860	350	650	132	56
12	177	1,250	1,900	950	452	1,420	500	1,320	311	600	131	53
13	177	1,160	2,700	950	545	1,320	450	1,130	273	550	148	50
14	169	1,010	6,400	920	1,100	1,100	475	950	273	475	132	50
15	169	842	7,000	842	2,820	2,100	475	800	236	450	132	50
16	161	817	7,120	842	3,620	5,040	550	750	236	430	115	50
17	153	742	5,880	792	2,020	6,680	500	725	218	370	99	50
18	145	692	4,740	717	1,780	6,580	475	650	218	350	91	50
19	138	667	3,620	692	1,530	6,220	450	575	218	350	83	50
20	138	642	2,900	692	1,390	5,440	430	550	675	311	83	50
21	130	617	5,650	667	1,600	4,680	390	650	475	500	254	56
22	130	569	7,120	1,460	1,640	4,160	390	1,160	1,010	273	200	65
23	130	521	7,000	1,600	3,260	3,460	370	1,820	4,920	273	76	70
24	211	498	7,000	2,700	3,220	2,620	370	2,260	5,960	236	292	123
25	247	498	6,580	1,530	2,180	2,140	350	2,340	6,680	236	76	123
26	642	430	6,040	1,460	1,940	1,740	350	1,460	7,000	236	70	83
27	950	521	5,300	1,070	1,640	1,530	330	1,460	7,120	200	70	70
28	1,700	521	4,360	920	1,530	1,390	311	1,320	6,220	191	70	56
29	2,300	1,860	3,660	842	.....	1,320	330	1,130	5,580	236	65	53
30	1,820	1,220	2,740	767	.....	1,190	350	890	6,220	182	65	53
31	1,670	.....	2,340	742	.....	1,100	.....	775	.....	254	330	.....

Daily discharge, in second-feet, of Embarrass River at Ste. Marie, Ill., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–26.												
1	52	6,210	6,120	440	1,410	625	1,230	1,100	1,880	181	94	63
2	48	6,500	5,720	420	1,440	575	1,100	2,940	1,500	181	94	63
3	48	6,500	4,480	400	2,700	525	1,710	2,300	1,010	172	87	63
4	46	6,040	2,940	400	2,740	2,500	1,650	1,710	825	172	87	59
5	48	4,080	2,420	400	1,620	3,930	4,130	985	750	172	80	59
6	48	2,980	1,740	380	1,230	2,540	3,430	850	725	190	80	55
7	48	3,300	2,900	380	1,070	1,260	2,220	775	600	190	80	55
8	48	3,880	2,940	360	930	1,040	1,810	725	575	190	80	59
9	48	2,500	1,650	360	930	902	1,530	675	500	190	118	74
10	48	3,480	1,200	340	1,590	875	1,380	625	460	190	80	63
11	52	4,940	930	340	1,740	1,740	1,560	600	440	208	80	74
12	55	3,780	825	360	985	4,760	1,560	1,260	420	262	74	63
13	52	3,060	750	320	958	5,480	2,180	5,340	400	208	74	63
14	52	2,100	825	320	800	5,130	1,620	5,880	400	163	244	59
15	48	1,740	902	320	930	3,780	1,200	5,480	360	154	217	74
16	52	1,470	850	300	775	3,730	1,120	3,980	340	154	750	360
17	52	1,320	675	300	750	4,700	1,100	5,480	320	145	300	775
18	48	1,150	902	300	675	2,780	1,040	6,040	280	500	127	380
19	48	1,070	850	280	480	3,880	1,710	5,480	280	360	102	226
20	48	958	800	280	575	4,480	4,640	5,200	280	380	80	172
21	48	875	725	280	4,280	3,220	5,130	4,480	280	360	80	118
22	48	775	600	280	5,640	2,260	4,820	3,980	262	199	244	110
23	48	750	480	480	6,300	1,740	4,180	3,060	244	190	154	102
24	48	700	440	500	4,820	1,710	4,080	2,980	244	190	118	87
25	48	675	420	480	2,500	4,180	3,880	3,480	244	181	102	74
26	958	650	420	440	1,290	5,720	2,580	2,180	244	145	80	74
27	3,830	575	400	380	930	6,040	1,890	1,740	244	145	74	74
28	5,200	480	400	320	775	4,180	1,560	1,380	226	127	74	87
29	6,040	1,740	675	340	675	3,060	1,380	1,150	208	118	74	181
30	6,120	5,340	575	440	.....	2,420	1,200	985	190	118	74	163
31	6,040	.....	480	985	.....	1,880	.....	902	.....	110	68	.....

Monthly discharge of Embarrass River at Ste. Marie, Ill., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,540 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	2,300	130	451	0.293	0.34
November	2,380	430	881	.572	.64
December	7,120	452	3,520	2.29	2.64
January	4,060	667	1,420	.922	1.06
February	3,620	452	1,380	.896	.93
March	6,680	642	2,380	1.55	1.79
April	1,010	311	548	.356	.40
May	3,660	550	1,470	.955	1.10
June	7,120	218	1,980	1.29	1.44
July	6,130	182	909	.590	.68
August	330	65	143	.093	.11
September	200	50	67.4	.044	.05
The year	7,120	50	1,270	.825	11.18
1919–20.					
October	6,120	46	949	.615	.71
November	6,500	480	2,650	1.72	1.92
December	6,120	400	1,480	.961	1.11
January	985	280	385	.250	.29
February	6,300	480	1,780	1.16	1.25
March	6,040	525	2,960	1.92	2.21
April	5,130	1,040	2,290	1.49	1.66
May	6,040	600	2,700	1.75	2.02
June	1,880	190	491	.319	.36
July	500	110	201	.131	.15
August	750	68	131	.085	.10
September	775	55	131	.085	.10
The year	6,500	46	1,340	.870	11.88

WEST BRANCH OF WHITE RIVER NEAR NOBLESVILLE, IND.

LOCATION.—In sec. 16, T. 19 N., R. 5 E. second principal meridian, at steel highway bridge known as Conners Bridge, 4½ miles northeast of Noblesville, Hamilton County.

DRAINAGE AREA.—900 square miles (measured on map of United States Geological Survey; edition of 1916; scale, 1:500,000).

RECORDS AVAILABLE.—May 13, 1915, to September 30, 1920.

GAGE.—Chain gage attached to upstream side of bridge; read by R. L. Fleming.

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

CHANNEL AND CONTROL.—Coarse sand and gravel, strewn with boulders; probably permanent; aquatic plants sometimes grow in channel during summer.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 13.13 feet March 17 (discharge, 14,900 second-feet); minimum stage, 1.14 feet September 17 (discharge, 92 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 10.2 feet April 17 (discharge, 9,600 second-feet); minimum stage, 1.30 feet October 1 and 2 (discharge, 120 second-feet).

1915–1920: Maximum stage recorded, 15.0 feet at 7 a. m. February 1, 1916 (discharge, 18,700 second-feet); minimum stage, 1.08 feet at 5 p. m. August 15, 1918 (discharge, 85 second-feet).

During flood of March, 1913, the water reached a stage of about 21.5 feet referred to present gage (discharge not known).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent, except when affected by ice. Rating curve well defined between 160 and 10,000 second-feet and fairly well defined beyond these limits. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except for periods of ice effect for which they are poor.

COOPERATION.—Gage-height record furnished by Noblesville Heat, Light, & Power Co., Noblesville, Ind.

Discharge measurements of West Branch of White River near Noblesville, Ind., during the year ending Sept. 30, 1919.

[Made by H. C. Beckman.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Mar. 19	9.04	7,690
20	6.84	4,540
21	5.62	3,100
Aug. 21	1.43	144

NOTE.—No discharge measurements were made at this station during the year ending Sept. 30, 1920.

Daily discharge, in second-feet, of West Branch of White River near Noblesville, Ind., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	129	213	292	1,630	433	368	800	800	149	259	389	120
2	129	185	292	2,860	389	368	745	1,200	138	243	172	149
3	129	172	259	1,720	389	368	690	920	800	228	149	139
4	129	149	228	1,050	389	368	745	800	860	213	149	129
5	129	160	213		368	368	745	2,260	555	199	213	160
6	129	149	213		348	348	745	1,990	635	199	259	120
7	129	149	199		329	329	690	1,280	505	199	213	120
8	129	149	185	1,000	310	505	608	920	505	199	185	120
9	129	199	199		310	1,540	555	1,050	456	185	185	112
10	129	259	368		292	2,260	555	2,260	389	185	185	120
11	129	228	1,810		275	2,080	555	2,260	389	228	149	112
12	129	199	1,720	1,810	292	1,370	456	1,540	745	185	129	112
13	120	199	2,660	690	310	1,050	480	1,050	860	275	129	112
14	129	185	6,090	456	433	2,460	480	411	920	555	138	105
15	129	172	6,540	480	389	6,090	555	580	480	433	138	105
16	120	160	3,850	389	389	10,800	690	860	433	259	138	98
17	120	172	2,460	368	348	14,900	2,760	800	411	275	149	98
18	120	243	1,900	368	348	12,800	2,360	690	433	213	149	105
19	112	389	1,450	348	310	7,640	1,720	690	456	213	172	105
20	138	555	1,370	348	310	4,330	1,200	690	505	185	138	105
21	138	505	3,740	348	329	3,080	1,050	745	480	172	129	160
22	138	433	7,000	368	348	1,990	860	690	920	243	129	608
23	138	368	4,830	860	555	1,810	745	690	1,050	259	120	275
24	138	310	3,300	1,050	635	1,540	690	800	1,050	213	129	185
25	172	275	3,360	1,050	555	1,200	635	1,280	980	185	213	129
26	199	243	3,080	800	505	1,050	608	1,200	980	329	275	120
27	172	228	2,080	690	456	1,200	530	920	800	149	185	120
28	310	228	1,630	690	389	1,280	608	860	389	138	185	129
29	433	228	1,370	608	.....	1,050	505	411	329	138	149	120
30	310	329	1,050	530	.....	1,120	480	185	329	275	138	120
31	213	.....	1,340	480	.....	1,200	.....	160	.....	389	120	.....
1919–20.												
1	120	6,090	3,300			411	530	1,280	368	800	213	172
2	120	7,320	1,810		1,000	480	505	980	368	860	213	160
3	199	5,790	1,280			920	505	800	368	2,260	243	160
4	185	3,080	1,050			1,540	505	608	348	1,810	243	160
5	185	2,260	860		2,660	3,080	480	608	329	2,170	228	172
6	160	1,810	800		2,460	2,660	456	608	310	1,900	199	172
7	149	1,810	800		1,280	800	456	608	310	2,260	185	160
8	138	1,900	800		920	800	456	580	292	2,760	185	160
9	160	1,540	745		920	690	480	505	275	2,460	172	172
10	310	1,200	635		2,560	1,450	480	505	275	2,170	172	160
11	980	1,200	690		1,990	2,560	480	1,450	259	1,900	172	149
12	1,050	1,200	580		2,560	2,860	505	2,660	259	2,170	199	149
13	860	1,050			2,660	3,520	480	2,360	243	3,080	213	149
14	635	920			2,760	2,260	608	1,540	329	3,630	213	149
15	411	800			1,370	2,360	800	1,050	1,200	3,190	199	149
16	329	690		440	1,450	2,660	1,990	1,280	1,630	2,360	228	149
17	292	690			2,260	4,450	9,600	1,540	1,630	1,200	228	138
18	243	608			3,740	3,520	9,260	1,990	1,280	920	228	138
19	213	530			3,300	2,660	7,320	1,720	920	1,120	228	138
20	185	505			1,370	1,720	9,090	1,450	860	920	199	129
21	199	480			1,720	1,720	9,600	920	1,200	635	172	129
22	199	456		530	1,720	1,370	9,090	800	1,540	505	160	129
23	213	433			1,720	920	5,790	745	1,720	433	160	129
24	213	433			1,720	745	3,080	690	1,810	389	160	129
25	213	456			1,450	745	2,080	608	1,370	348	160	138
26	310	456			1,050	745	1,370	555	800	310	160	160
27	530	368			800	690	1,120	505	608	243	160	243
28	5,500	243			480	690	1,120	411	389	243	149	228
29	8,280	456			411	580	1,450	368	329	228	149	213
30	4,700	2,170			.....	530	1,200	389	411	213	172	185
31	3,970	.....			.....	480	.....	389	.....	213	172	.....

NOTE.—Discharge interpolated Dec. 31, 1918, and Sept. 3, 1919; gage not read. Discharge Jan. 5–11 and Dec. 13–31, 1919, and Jan. 1 to Feb. 4, 1920, estimated on account of effect of ice. Braced figures show mean discharge for period included.

Monthly discharge of West Branch of White River near Noblesville, Ind., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 900 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	433	112	158	0.175	0.20
November	555	149	248	.275	.31
December	7,000	185	2,110	2.34	2.70
January	2,860	348	871	.968	1.12
February	635	275	383	.426	.44
March	14,900	329	2,800	3.11	3.58
April	2,760	456	828	.920	1.03
May	2,260	160	1,000	1.11	1.28
June	1,050	138	598	.664	.74
July	555	138	239	.266	.31
August	389	120	171	.190	.22
September	608	98	144	.160	.18
The year	14,900	98	803	.892	12.11
1919–20.					
October	8,280	120	1,010	1.12	1.29
November	7,320	243	1,560	1.73	1.93
December	3,300	.....	755	.839	.97
January	.....	.....	440	.489	.56
February	3,740	411	1,700	1.89	2.04
March	4,450	411	1,630	1.81	2.09
April	9,600	456	2,700	3.00	3.35
May	2,660	368	984	1.09	1.26
June	1,810	243	734	.816	.91
July	3,630	213	1,410	1.57	1.81
August	243	149	191	.212	.24
September	243	129	159	.177	.20
The year	9,600	120	1,100	1.22	16.65

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, 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, 1920.

GAGE.—Chain gage attached to bridge; read by W. S. 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 the year ending September 30, 1919, 21.71 feet at 7 a. m. December 15 (discharge determined from extension of rating curve, 5,890 second-feet); minimum stage, 1.90 feet September 15–21 (discharge, 7.0 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 21.4 feet October 31 and November 1 (discharge, 5,650 second-feet); minimum stage, 1.98 feet October 20 (discharge, 9 second-feet).

1914–1920: 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).

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

ACCURACY.—Stage-discharge relation practically permanent; affected by ice during December, 1919, and January, 1920. Rating curve well defined between 20 and 450 second-feet, fairly well defined below 20 second-feet, and between 450 and 3,500 second-feet, and poorly defined above 3,500 second-feet. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good for open-water periods, except for very high stages; poor for period of ice effect.

Discharge measurements of Little Wabash River at Wilcox, Ill., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*
Aug. 18	H. C. Beckman	2.30	21
18	do	2.30	21
1920.			
Apr. 18	H. J. Dean	6.88	524

Daily discharge, in second-feet, of Little Wabash River at Wilcox, Ill., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	98	452	1,660	791	232	333	280	564	548	4,420	46	12
2	89	268	881	1,840	208	361	244	1,280	863	3,160	35	12
3	80	196	405	1,920	184	333	220	1,140	597	1,400	118	11
4	71	156	293	1,220	172	220	196	548	361	420	76	9
5	71	128	232	1,220	244	256	196	468	308	268	60	10
6	63	118	196	468	184	256	220	1,180	375	208	56	10
7	60	103	172	390	184	244	232	2,070	436	184	46	9
8	52	94	150	347	172	232	208	2,070	333	150	43	9
9	52	108	139	347	134	293	184	1,970	256	184	32	9
10	52	94	134	256	123	719	156	2,860	244	196	43	9
11	46	1,180	917	220	118	1,840	144	2,740	184	139	46	10
12	46	1,220	1,120	184	98	2,000	134	150	134	113	41	9
13	43	719	2,120	184	108	1,480	128	773	103	98	35	8
14	43	319	4,070	172	172	917	118	390	89	89	32	8
15	43	232	5,890	150	737	665	113	293	76	89	26	7
16	41	196	5,570	156	1,580	2,530	123	244	89	76	24	7
17	41	184	5,410	172	1,920	3,940	144	220	67	67	22	7
18	39	196	4,910	156	1,420	4,700	144	220	63	63	19	7
19	38	232	4,560	161	683	4,700	144	232	232	60	20	7
20	39	280	4,000	161	484	4,630	113	220	94	56	21	7
21	37	256	3,640	156	548	4,420	103	172	84	52	26	7
22	37	184	4,140	156	1,040	4,070	89	220	333	56	24	12
23	36	184	4,700	701	1,970	2,940	84	468	2,100	43	18	11
24	36	150	4,980	2,070	2,780	1,260	80	1,420	3,580	42	18	9
25	43	128	4,350	2,660	2,780	516	76	1,020	4,210	46	18	67
26	46	113	4,490	1,840	2,140	405	76	845	4,700	43	20	80
27	18	103	4,350	935	989	665	71	1,060	5,810	32	16	56
28	232	208	3,880	580	500	719	67	1,420	5,570	29	15	31
29	548	405	2,290	420	.....	580	67	1,360	4,980	26	12	26
30	1,220	1,660	989	333	.....	405	84	737	4,700	28	14	21
31	1,010	.....	564	268	.....	319	.....	375	.....	56	12	.....

Daily discharge, in second-feet, of Little Wabash River at Wilcox, Ill., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	16	5,650	3,940	71	600	342	1,220	246	429	31	18	75
2	16	5,330	4,490		800	282	515	455	1,180	31	16	80
3	14	5,190	4,140		1,500	234	1,080	2,740	1,620	31	15	67
4	11	5,190	4,000		2,500	1,160	700	3,760	1,320	28	14	54
5	11	4,840	3,940		2,780	2,070	2,980	3,520	594	26	14	39
6	103	4,490	3,020		2,560	3,760	3,460	3,160	318	318	13	31
7	123	4,280	3,460		1,670	1,480	3,260	1,640	222	429	12	26
8	84	4,140	3,880		1,180	1,000	2,410	470	177	442	25	22
9	51	4,000	3,760	65	1,280	628	1,560	306	155	188	28	64
10	34	3,880	2,940		1,400	515	860	270	123	80	80	378
11	25	3,940	1,340		1,560	1,220	530	258	113	48	60	485
12	22	4,070	485		1,280	3,760	416	199	103	34	98	780
13	20	4,070	390		1,240	4,140	820	366	93	31	54	1,340
14	18	3,760			800	4,350	3,020	1,040	84	28	34	1,020
15	15	3,410			485	4,070	2,500	1,580	75	48	28	306
16	13	1,970	210		366	4,210	1,480	646	67	108	144	318
17	11	700			342	4,000	562	2,000	166	155	1,740	860
18	11	416			246	3,410	500	3,700	258	246	2,020	740
19	10	342		105	199	3,160	455	4,420	155	1,200	1,720	282
20	9	294			166	3,310	820	4,490	103	1,180	210	133
21	11	258			390	3,110	3,310	4,350	60	470	113	80
22	11	234			2,440	1,220	4,490	4,350	51	199	80	57
23	11	210			3,640	562	3,580	3,700	45	144	1,080	42
24	10	199	110		3,820	3,410	2,290	1,940	45	113	860	36
25	10	188		600	3,760	3,880	780	594	45	64	270	31
26	234	177			3,760	4,350	390	940	39	48	133	26
27	3,580	166	84	578	2,780	4,700	318	1,820	39	36	80	25
28	4,420	177	98	485	1,640	4,490	306	1,560	36	28	57	21
29	4,980	210	84	450	485	3,880	306	578	36	25	48	21
30	4,980	3,110	75	400	.....	3,410	270	318	34	22	42	26
31	5,650	.....	98	550	.....	3,110	.....	258	.....	20	54	.....

NOTE.—Discharge estimated Dec. 14–26, 1919, and Jan. 2–26, 1920, because of ice, from gage heights, observer's notes, and weather records. Braced figures show mean discharges for periods indicated.

Monthly discharge of Little Wabash River at Wilcox, Ill., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,130 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	1,220	18	141	0.125	0.14
November	1,660	94	329	.291	.32
December	5,890	134	2,620	2.32	2.68
January	2,660	150	666	.589	.68
February	2,780	98	782	.692	.72
March	4,700	220	1,510	1.34	1.54
April	280	67	141	.125	.14
May	2,860	150	927	.820	.95
June	5,810	63	1,380	1.22	1.36
July	4,420	26	384	.340	.39
August	118	12	33.4	.030	.03
September	80	7	16.6	.015	.02
The year	5,890	7	747	.661	8.97
1919–20.					
October	5,650	9	791	.700	.80
November	5,650	166	2,500	2.21	2.46
December	4,490	75	1,370	1.21	1.39
January	.....	.....	212	.188	.22
February	3,820	166	1,570	1.39	1.50
March	4,700	234	2,680	2.37	2.73
April	4,490	270	1,510	1.34	1.49
May	4,490	199	1,800	1.59	1.83
June	1,620	34	259	.229	.25
July	1,200	20	189	.167	.19
August	2,020	12	295	.261	.30
September	1,340	21	249	.220	.24
The year	5,650	9	1,120	.991	13.40

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 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, 1920.

GAGE.—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 the year ending September 30, 1919, 21.1 feet at 10 a. m. December 15 (discharge, 5,250 second-feet); minimum stage, 2.00 feet July 27 and 28 and September 8–10 and 15–17 (discharge, 0.7 second-foot).

Maximum stage recorded during the year ending September 30, 1920, 22.3 feet at 11 a. m. October 27 (discharge, 7,400 second-feet); minimum stage, 2.10 feet October 1 (discharge, 1 second-foot).

1908–1912 and 1914–1920: Maximum stage recorded, 23.1 feet August 22, 1915 (discharge, 9,350 second-feet, supersedes figure previously published); zero flow existed for 54 days in September to December, inclusive, of 1908.

A stage of 26.5 feet was recorded by gage reader during flood of March to April, 1913, day not given (discharge not determined).

DIVERSIONS.—About 30,000 gallons of water a day is pumped from river above gage into service tank of Southern Railway.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice during winter. Rating curve fairly well defined between 5 and 5,000 second-feet, and poorly defined beyond these limits. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Open-water records good except for extremely low and high stages; determinations greater than 6,000 second-feet subject to considerable error because of poor definition and flatness of rating curve; poor for winter.

Discharge measurements of Skillet Fork at Wayne City, Ill., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
1919. Aug. 16	H. C. Beckman	2.22	2.6
16	do	2.22	2.5
1920. Apr. 6	H. J. Dean	15.33	1,910

Daily discharge, in second-feet, of Skillet Fork at Wayne City, Ill., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1.....	5.0	39	267	405	95	106	62	920	327	59	31	11
2.....	5.0	34	125	800	41	80	43	1,720	170	33	10	5.8
3.....	5.0	22	59		36	66	37	1,180	170	26	9.6	3.8
4.....	4.8	16	56		30	59	31	291	385	18	8.2	1.9
5.....	3.8	15	28		28	52	30	140	1,040	15	3.2	1.5
6.....	3.2	10	22	85	21	52	38	267	664	14	3.2	1.3
7.....	3.2	9.0	19		13	44	37	275	260	11	1.9	1.3
8.....	5.4	9.0	14		9.0	32	31	309	114	9.0	18	.7
9.....	2.5	8.6	13		9.0	110	30	732	80	7.4	9.0	.7
10.....	2.5	11	12		9.0	480	22	2,080	44	5.0	4.5	.7
11.....	6.2	21	10		21	840	17	1,360	31	5.0	2.0	1.9
12.....	9.6	25	106		14	585	15	395	23	4.8	1.9	2.4
13.....	6.2	21	1,200		13	275	10	117	16	4.5	1.5	1.0
14.....	5.0	16	4,150		95	185	10	44	15	4.5	1.5	.9
15.....	5.0	30	5,250		230	177	9.0	22	15	9.0	1.3	.7
16.....	5.0	30	4,720	15	375	1,100	9.0	22	9.0	3.0	3.0	.7
17.....	4.8	38	4,250		318	3,520	31	36	8.2	2.8	52	.7
18.....	4.8	318	2,530		230	4,520	26	33	8.2	2.5	33	1.3
19.....	3.5	114	1,400		125	3,950	21	27	15	2.5	12	4.8
20.....	6.6	38	429		140	3,520	16	37	570	2.5	8.2	1.3
21.....	5.8	31	2,810		318	1,750	15	98	385	2.5	7.0	1.3
22.....	3.8	28	3,860		766	345	15	207	291	1.5	4.0	3.2
23.....	3.8	24	3,950	630	1,950	177	15	630	1,000	1.4	3.5	2.4
24.....	11	15	3,680	1,220	2,020	95	15	2,650	2,000	1.4	2.4	1.8
25.....	9.0	13	3,320	1,700	1,360	73	14	3,320	2,260	1.2	1.4	5.8
26.....	9.0	11	2,180	940	540	66	9.6	2,950	2,850	1.0	1.4	6.6
27.....	9.0	9.6	800	309	177	429	8.2	2,380	2,810	.7	1.3	3.2
28.....	24	52	417	192	110	375	9.6	2,900	2,730	.7	3.0	2.4
29.....	140	417	125	140	.....	245	16	2,730	1,560	3.5	2.4	1.9
30.....	132	283	106	110	.....	147	95	2,050	291	7.0	1.9	1.4
31.....	88	.....	106	98	.....	102	.....	630	.....	155	7.0	.....
1919-20.												
1.....	1	4,850	3,950	12	555	59	88	36	2,530	4	2	9
2.....	3	4,720	3,600		540	52	106	62	4,150	11	12	7
3.....	5	4,350	3,260		540	44	125	1,380	4,250	7	18	33
4.....	7	3,770	1,880		1,000	1,200	395	1,460	3,320	13	11	26
5.....	10	2,080	385		1,100	3,260	1,460	860	1,400	9	9	21
6.....	24	585	664		820	3,200	1,950	275	260	7	2	12
7.....	18	820	2,950		715	1,850	1,560	177	84	766	2	10
8.....	44	2,080	3,200	5	647	820	454	102	56	800	365	9
9.....	30	2,020	2,950		525	275	200	73	36	147	345	365
10.....	9	1,560	1,460		495	237	125	56	31	70	132	860
11.....	5	3,100	395		698	749	92	38	24	47	40	291
12.....	15	3,200	185		630	3,260	76	38	21	18	25	395
13.....	9	2,440	162		355	4,480	698	56	18	11	14	1,880
14.....	9	1,240	132		275	3,680	540	570	17	11	10	1,780
15.....	9	267	73		215	3,200	385	230	14	7	36	2,500
16.....	5	125	70	15	170	1,620	215	84	11	6	147	1,920
17.....	5	88	34	237	76	1,400	140	960	7	5	732	495
18.....	5	70	30	480	48	749	98	3,770	7	300	900	106
19.....	5	52	27	375	40	2,610	76	4,050	7	291	510	73
20.....	2	43	17	345	35	2,770	1,700	3,770	7	84	121	28
21.....	5	33	19	1,300	84	1,920	3,600	4,350	6	21	38	19
22.....	5	26	16	1,200	1,850	664	3,680	3,860	5	11	26	14
23.....	9	26	15	960	1,920	237	3,150	2,120	5	18	18	14
24.....	9	26	15	2,410	1,440	155	1,160	441	12	12	18	11
25.....	7	24	12	2,120	800	1,700	200	155	11	7	18	10
26.....	76	31	9	1,100	309	3,600	92	95	10	6	25	7
27.....	7,400	45	9	480	283	4,050	70	66	7	6	16	7
28.....	7,200	207	9	417	125	3,860	56	56	6	4	9	6
29.....	5,580	630	22	365	73	3,050	48	49	5	4	18	5
30.....	4,720	3,380	26	318	.....	840	40	34	4	4	15	4
31.....	4,480	.....	21	429	.....	215	.....	155	.....	3	10	.....

NOTE.—Stage-discharge relation affected by ice Jan. 3-22, 1919, Jan. 2-19 and Feb. 16-20, 1920; discharge estimated from gage-height record, observer's notes, and weather record. Braced figures indicate mean discharge for periods included.

Monthly discharge of Skillet Fork at Wayne City, Ill., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 481 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	140	2.5	17.2	0.036	0.04
November	417	8.6	56.9	.118	.13
December	5,250	10	1,480	3.08	3.55
January	1,700	.....	239	.497	.57
February	2,020	9.0	325	.676	.70
March	4,520	32	760	1.58	1.82
April	95	8.2	24.6	.051	.06
May	3,320	22	986	2.05	2.36
June	2,850	8.2	671	1.40	1.56
July	155	.7	13.4	.028	.03
August	52	1.3	8.07	.017	.02
September	11	.7	2.48	.0052	.01
The year	5,250	.7	385	.800	10.85
1919–20.					
October	7,400	1.0	958.0	1.99	2.29
November	4,850	24	1,400	2.91	3.26
December	3,950	9	826	1.72	1.98
January	2,410	.....	408	.848	.98
February	1,920	35	564	1.17	1.26
March	4,480	44	1,800	3.74	4.31
April	3,680	40	753	1.57	1.75
May	4,350	34	949	1.97	2.27
June	4,250	4	544	1.13	1.26
July	800	3	87.4	.182	.21
August	900	2	118	.245	.28
September	2,500	4	364	.757	.84
The year	7,400	1	731	1.52	20.69

CUMBERLAND RIVER BASIN.

CUMBERLAND RIVER AT CUMBERLAND FALLS, KY.

LOCATION.—At Cumberland Falls post office, Whitley County, 400 feet above falls, 13 miles from Cumberland Falls railroad station, McCreary County, on Cincinnati, New Orleans & Texas Pacific Railway.

DRAINAGE AREA.—2,040 square miles (measured on United States Geological Survey State maps; scale, 1:500,000).

RECORDS AVAILABLE.—August 15, 1907, to December 10, 1911; April 1, 1915, to September 30, 1920.

GAGE.—Staff, inclined and vertical, on right bank, 400 feet above brink of falls, installed April 3, 1915, and read by Alice L. Brunson. An inclined and vertical staff gage was installed in August, 1907, by Viele, Blackwell & Buck, on right bank about 300 feet above site of Survey gage, and used to December 10, 1911.

DISCHARGE MEASUREMENTS.—Made from cable about 600 feet above gage or by wading. 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 serves as control, there being a vertical drop of about 68 feet at low water.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 9.3 feet on January 2–3 (discharge, 37,200 second-feet); minimum stage 1.04 feet at 6 p. m. September 29 (discharge, 41 second-feet).

Maximum stage recorded during year ending September 30, 1920, 10.2 feet at 8 a. m. January 23 (discharge, 43,500 second-feet); minimum stage, 1.10 feet October 1–3 (discharge, 50 second-feet).

1907–1911; 1915–1920: Maximum stage recorded 12.5 feet on January 28, 1918 (discharge, 59,600 second-feet); minimum stage occurred in 1919.

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

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; not affected by ice during winters of 1918–19 and 1919–20. Rating curve well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

The following discharge measurement was made by W. R. King:
May 14, 1920: Gage height, 2.41 feet; discharge, 1,640 second-feet.

Daily discharge, in second-feet, of Cumberland River at Cumberland Falls, Ky., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	166	18,000	2,920	7,680	1,890	5,080	3,570	5,410	1,890	644	124	86
2	166	10,400	2,220	37,200	1,670	3,850	2,800	7,680	1,560	464	138	90
3	159	3,570	1,890	37,200	1,460	3,180	2,440	10,900	1,270	392	106	110
4	145	2,220	1,460	33,700	1,360	2,800	2,110	6,860	988	317	218	124
5	117	1,780	1,360	26,800	1,360	3,050	1,890	3,850	830	266	359	131
6	102	1,360	1,200	11,900	1,270	14,000	1,780	2,920	714	256	317	124
7	94	1,160	1,060	4,760	1,230	14,000	1,670	2,920	604	208	256	106
8	86	954	954	3,570	1,130	9,460	1,460	3,300	658	286	526	94
9	82	815	890	3,570	1,110	8,550	1,360	3,570	714	296	428	86
10	78	728	860	3,440	1,070	10,400	1,270	3,570	1,130	228	296	78
11	78	658	890	2,920	1,020	9,930	1,560	2,800	890	296	218	70
12	82	591	988	2,560	954	5,750	2,800	2,330	686	338	306	66
13	82	526	1,000	2,330	988	4,150	4,450	2,110	617	256	1,200	62
14	70	500	2,110	2,330	988	3,440	3,850	1,780	578	218	1,270	58
15	68	476	10,400	2,560	1,560	2,920	2,920	1,670	500	218	770	54
16	66	452	15,000	3,050	2,680	2,560	2,920	1,670	428	166	440	50
17	66	604	10,400	3,300	2,680	3,440	4,450	1,780	380	124	348	48
18	102	1,670	4,450	5,080	2,220	6,100	5,410	1,780	338	110	317	47
19	416	1,670	2,920	9,000	2,110	4,760	4,450	1,670	286	138	306	46
20	988	1,780	2,330	8,550	2,000	3,570	3,300	1,780	246	166	246	44
21	2,800	1,780	2,000	5,750	2,110	3,180	2,680	5,750	218	166	208	44
22	2,220	1,670	2,000	4,150	2,680	2,560	2,330	8,550	208	131	173	199
23	1,670	1,460	4,450	4,450	7,260	2,220	2,330	5,410	237	117	152	124
24	1,230	1,270	9,000	9,000	8,110	2,000	2,110	3,570	526	124	124	62
25	1,070	1,160	5,750	9,930	6,470	1,890	1,890	3,850	890	124	110	47
26	1,090	1,060	3,850	7,680	6,100	1,670	1,670	7,680	1,360	124	102	46
27	1,360	971	3,050	4,760	6,470	3,440	1,460	14,000	2,110	110	98	44
28	1,670	937	2,440	3,440	6,100	10,400	1,360	9,460	1,560	94	110	42
29	1,460	1,560	2,220	2,920	.....	11,900	2,000	4,760	1,230	86	117	41
30	4,150	3,180	1,890	2,440	.....	6,860	4,150	3,050	890	78	102	44
31	17,400	.....	1,780	2,110	.....	4,450	.....	2,560	.....	78	94	.....
1919–20.												
1	50	14,500	5,750	1,250	2,440	3,050	3,850	3,850	1,040	552	237	1,890
2	50	26,200	5,410	1,460	2,220	2,800	26,200	4,150	800	488	199	1,560
3	50	21,700	3,850	1,460	1,890	2,680	30,900	3,850	756	440	199	1,220
4	52	16,200	2,800	1,270	9,930	2,560	23,000	3,440	2,800	591	275	988
5	78	5,750	2,330	1,130	15,600	3,440	12,400	2,920	5,750	700	338	830
6	199	2,800	2,220	937	9,930	5,750	7,260	2,560	6,860	604	338	742
7	138	2,110	5,750	1,060	6,470	6,100	5,750	2,330	5,750	500	452	672
8	82	1,670	13,400	2,000	4,760	4,760	5,410	2,330	3,440	452	552	630
9	68	1,360	14,500	8,110	3,850	3,440	5,410	2,220	2,330	428	770	617
10	62	1,160	10,900	7,680	3,300	2,920	4,450	2,110	1,890	500	1,560	742
11	70	1,460	8,550	6,860	3,050	2,880	3,570	2,000	1,360	539	1,670	630
12	2,110	2,330	7,260	4,760	2,800	11,400	3,050	1,780	1,180	500	2,440	7,260
13	5,080	2,440	6,470	3,570	2,920	28,200	2,800	1,670	1,040	604	3,850	16,200
14	5,750	2,440	17,400	2,800	2,920	25,600	2,680	1,560	905	552	3,850	10,400
15	4,450	2,560	18,000	2,330	2,800	19,800	2,440	1,460	770	552	9,460	7,260
16	11,900	2,330	13,400	2,330	2,560	9,930	2,110	1,270	644	830	9,460	4,450
17	14,500	1,890	6,860	3,050	2,330	6,470	2,110	1,160	539	3,050	7,260	3,440
18	12,400	1,670	4,450	3,300	2,110	7,680	2,110	1,090	452	2,330	4,150	2,560
19	5,080	1,360	3,570	3,440	2,330	18,600	1,890	1,090	404	1,890	3,050	2,000
20	2,560	1,180	2,920	3,180	2,330	23,000	1,890	1,130	672	3,850	2,800	1,460
21	1,670	1,000	2,440	7,680	2,110	19,200	2,920	1,090	3,050	3,440	3,050	1,270
22	1,270	920	2,110	28,200	12,400	12,900	2,920	1,020	4,450	2,110	9,000	1,060
23	1,780	830	2,000	43,500	22,300	5,080	2,680	890	3,850	1,360	8,550	860
24	9,000	742	1,780	41,400	18,000	4,150	2,440	800	2,560	954	5,080	742
25	9,930	686	1,670	36,500	10,900	3,300	2,330	2,330	2,000	728	3,440	672
26	6,470	1,560	1,460	30,200	7,260	2,920	3,440	2,680	1,360	526	2,560	617
27	3,850	5,750	1,360	22,300	4,760	2,560	5,080	2,560	1,090	452	2,110	630
28	2,560	7,260	1,270	8,110	3,850	2,330	5,410	2,220	860	416	1,890	728
29	1,780	6,100	1,270	4,450	3,440	2,220	4,450	1,670	742	359	1,560	728
30	1,360	5,080	1,250	3,300	.....	2,110	3,570	1,360	630	317	1,270	728
31	1,160	.....	1,160	2,920	.....	1,890	.....	1,250	.....	275	1,270	.....

Monthly discharge of Cumberland River at Cumberland Falls, Ky., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 2,040 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	17,400	66	1,270	0.623	0.72
November	18,000	452	2,170	1.06	1.18
December	15,000	860	3,350	1.64	1.89
January	37,200	2,110	8,650	4.24	4.89
February	8,110	954	2,720	1.33	1.38
March	14,000	1,670	5,530	2.71	3.12
April	5,410	1,270	2,610	1.28	1.43
May	14,000	1,670	4,480	2.20	2.54
June	2,110	208	818	.401	.45
July	644	78	214	.105	.12
August	1,270	94	309	.151	.17
September	199	41	75.6	.037	.04
The year	37,200	41	2,700	1.32	17.93
1919–20.					
October	14,500	50	3,410	1.67	1.92
November	26,200	686	4,770	2.34	2.61
December	18,000	1,160	5,600	2.75	3.17
January	43,500	937	9,370	4.59	5.29
February	22,300	1,890	5,920	2.90	3.13
March	28,200	1,890	8,060	3.95	4.55
April	30,900	1,890	6,150	3.01	3.36
May	4,150	800	1,990	.975	1.12
June	6,860	404	2,000	.980	1.09
July	3,850	275	996	.488	.56
August	9,460	199	2,990	1.47	1.70
September	16,200	617	2,450	1.20	1.34
The year	43,500	50	4,470	2.19	29.84

CUMBERLAND RIVER AT BURNSIDE, KY.

LOCATION.—Below mouth of South Fork of Cumberland River at Burnside, Pulaski County.

DRAINAGE AREA.—4,890 square miles, including the South Fork (measured on United States Geological Survey State maps; scale, 1:500,000).

RECORDS AVAILABLE.—October 1, 1914, to September 30, 1920.

GAGE.—Vertical staff in two sections on piers of highway bridge across South Fork of Cumberland River about 700 feet above mouth; installed in July, 1914, by United States Weather Bureau. Sea-level elevation of zero, 589.53 feet (Smith Shoals Survey datum, United States Engineer Corps), or 591.20 feet (Coast and Geodetic Survey datum).

DISCHARGE MEASUREMENTS.—Flow of South Fork is measured from the highway bridge; the Cumberland above the South Fork is measured from the Cincinnati, New Orleans & Texas Pacific Railway bridge. Low-water measurements are made by wading above the bridges.

CHANNEL AND CONTROL.—Channel practically 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. Backwater from the dam extends above both bridges at Burnside.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 58.0 feet at 3 p. m. January 2 (discharge, roughly, 127,000 second-feet); minimum stage, 1.8 feet September 18–21 (discharge, 115 second-feet). Stage of 1.3 feet was recorded September 27–29 but was probably due to lowering of pool at dam No. 21.

Maximum stage recorded during year ending September 30, 1920, 50.2 feet January 24 (discharge, roughly, 107,000 second-feet); minimum stage, 1.9 feet October 2–5 (discharge, 175 second-feet). Stage of 1.6 feet was recorded on October 1 but was probably due to lowering of pool at dam No. 21.

1915–1920: Maximum stage recorded, 69.5 feet at 1 a. m. January 29, 1918 (discharge, roughly, 157,000 second-feet); minimum stage, 1.8 feet September 18–21, 1919. Lower stages were recorded during 1919 and were probably due to lowering of pool at dam No. 21.

The stage of January 29, 1918, is the maximum stage since December 15, 1884, the date of establishment of the United States Weather Bureau gage.

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

REGULATION.—No artificial regulation of the natural flow above the station.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice during winters of 1918–19 and 1919–20. Rating curve fairly well defined to 30,000 second-feet (gage height about 20 feet); above 30,000 second-feet curve is an extension. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. At low water stage-discharge relation may be affected by inflow between the gage and the dam owing to heavy local showers in the basins of the small intervening tributaries, or by lowering the pool at the dam. Records fair for discharge of less than 30,000 second-feet.

COOPERATION.—Records of stage furnished by the Weather Bureau.

The following discharge measurement was made by W. R. King:

May 11–12, 1920: Gage height, 6.80 feet; discharge, 6,540 second-feet.

Daily discharge, in second-feet, of Cumberland River at Burnside, Ky., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	465	31,200	5,460	25,700	4,760	12,200	8,400	14,500	4,650	1,660	550	465
2	465	20,700	4,880	116,000	4,420	9,900	6,740	18,500	3,840	1,320	1,200	385
3	465	12,000	3,960	116,000	3,730	8,250	5,680	18,300	3,270	1,080	1,200	385
4	465	6,140	3,380	74,300	3,500	6,870	4,880	15,400	2,810	855	745	310
5	310	4,650	2,920	45,200	3,500	6,260	4,540	10,200	2,350	745	645	310
6	465	3,500	2,580	30,300	3,380	14,800	4,300	7,400	2,000	745	1,320	310
7	310	2,700	2,350	14,500	3,160	33,900	3,960	7,130	1,780	645	3,500	310
8	310	2,350	2,240	9,000	2,810	22,800	3,500	7,260	1,660	745	2,120	310
9	310	1,890	2,000	8,400	2,810	18,900	3,380	13,600	3,040	745	745	310
10	310	1,890	1,890	8,250	2,810	27,600	3,270	22,000	3,500	1,080	745	310
11	310	1,890	1,890	7,260	2,700	22,200	4,080	18,500	2,920	970	550	310
12	550	1,780	3,040	5,920	2,470	16,300	6,500	11,800	2,350	855	745	240
13	550	1,780	3,160	5,800	2,470	11,500	8,550	7,960	2,350	855	745	240
14	550	1,660	3,270	5,570	2,470	8,700	8,400	6,140	2,240	745	1,080	240
15	385	1,540	11,800	5,570	2,810	7,680	6,870	5,340	2,120	645	1,890	240
16	385	1,540	23,700	5,680	3,960	7,000	5,920	4,760	1,890	645	1,320	240
17	310	1,890	20,100	6,260	4,650	6,380	7,540	4,300	1,540	645	970	175
18	465	5,340	12,700	9,150	4,300	20,700	11,700	4,420	1,200	550	745	115
19	310	8,700	7,400	20,700	3,960	19,100	10,200	4,300	1,080	600	745	115
20	1,430	7,000	5,460	20,100	3,730	12,700	8,100	4,190	1,080	645	645	115
21	4,300	5,680	4,650	15,400	3,960	9,450	6,260	6,500	970	550	550	115
22	6,140	4,650	5,110	11,000	4,880	7,680	5,220	12,700	970	465	465	240
23	4,300	4,190	7,960	8,400	10,100	6,380	5,000	13,200	850	465	550	465
24	3,270	3,500	13,700	22,400	16,100	5,800	4,880	11,500	850	385	385	645
25	2,000	3,160	14,800	26,500	13,900	5,000	4,300	11,200	1,660	310	310	550
26	2,120	2,810	11,500	18,900	15,200	4,420	3,620	28,300	3,500	310	310	350
27	2,700	2,350	8,550	14,100	15,900	4,420	3,380	22,400	2,920	310	310	250
28	2,810	2,350	6,740	9,900	14,100	14,500	3,160	20,500	3,040	310	310	200
29	3,380	2,700	5,680	7,820	.....	20,100	3,040	13,200	2,000	310	385	175
30	4,080	4,190	5,000	6,380	.....	15,700	5,000	7,960	2,000	1,080	465	175
31	19,700	.....	4,190	5,570	.....	11,000	.....	5,920	.....	1,080	550	.....

Daily discharge, in second-feet, of Cumberland River at Burnside, Ky., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	175	6,380	19,700	3,380	6,380	7,540	6,260	13,900	2,920	1,200	550	2,920
2	175	83,900	15,500	3,620	5,220	6,620	45,800	18,200	2,580	1,080	745	2,810
3	175	66,000	15,000	3,500	4,650	6,380	82,900	11,000	3,270	1,080	550	2,810
4	175	34,800	9,900	3,380	5,110	6,030	51,200	11,000	7,130	1,080	550	2,350
5	175	19,500	6,740	3,160	46,500	8,400	36,500	9,150	29,400	1,080	465	1,890
6	310	9,600	5,800	2,920	31,200	16,300	23,000	7,540	31,700	1,200	465	1,780
7	745	6,140	31,700	2,460	18,700	14,100	17,800	6,870	16,800	1,890	465	1,540
8	1,080	4,650	54,300	3,040	12,400	11,500	13,900	10,700	10,500	2,120	645	1,430
9	855	4,080	36,000	44,000	10,100	9,600	11,700	12,200	6,870	2,120	1,080	1,320
10	500	3,500	28,300	58,200	8,100	7,680	10,700	8,550	5,110	1,540	1,540	1,320
11	400	3,730	25,200	28,300	7,680	6,620	8,700	6,500	3,840	1,320	4,760	1,430
12	1,780	7,260	18,700	15,000	7,540	9,750	7,400	5,460	3,040	1,320	4,650	5,800
13	12,400	9,750	15,000	10,700	6,870	69,900	6,620	4,760	2,580	1,320	5,800	17,800
14	10,700	7,680	59,500	8,400	6,620	45,200	6,140	6,260	2,120	1,320	13,400	21,500
15	12,400	6,380	57,700	7,000	6,260	32,200	5,800	4,760	1,890	1,200	13,200	15,700
16	27,200	5,800	31,700	5,920	5,800	22,800	5,220	4,420	1,780	1,200	20,500	12,700
17	39,000	4,880	20,700	7,000	5,570	20,900	4,760	3,500	1,430	1,080	15,200	7,820
18	29,000	4,190	13,200	7,680	5,340	20,900	5,800	3,160	1,320	3,500	9,600	5,920
19	20,700	3,500	9,900	7,400	4,650	35,300	5,800	3,380	1,080	3,380	8,400	4,540
20	8,550	3,270	8,250	6,870	4,420	69,900	5,220	3,380	970	4,080	6,030	3,380
21	5,340	2,580	6,740	8,400	4,650	44,000	5,680	3,160	2,350	5,110	4,880	2,700
22	4,080	2,350	5,800	73,800	30,100	26,800	13,200	2,920	9,750	4,420	5,800	2,240
23	3,500	2,120	5,220	95,600	62,100	15,400	10,200	2,920	9,150	2,920	11,500	1,890
24	12,700	2,000	4,650	107,000	36,500	10,200	7,820	2,920	6,500	2,120	10,700	1,780
25	23,500	1,890	4,420	93,300	30,800	7,960	5,800	2,810	4,540	1,540	6,260	3,380
26	16,800	7,680	4,190	67,300	22,000	7,260	5,800	5,220	3,270	1,320	4,880	2,920
27	11,300	56,900	3,620	44,000	12,900	6,620	12,200	5,920	2,350	1,080	3,840	2,580
28	7,000	40,000	3,500	24,100	10,400	5,800	13,200	4,880	1,890	970	3,270	3,500
29	5,220	19,900	3,500	12,900	7,960	5,570	11,800	4,080	1,660	745	2,920	2,350
30	3,960	19,900	3,380	9,150	.....	5,460	9,450	3,270	1,320	550	2,350	2,120
31	3,270	.....	3,160	7,130	.....	4,880	.....	2,810	.....	550	1,890	.....

NOTE.—Pool at dam No. 21 lowered on June 23 and drained on Sept. 26, 1919. Discharge estimated June 23–24, July 18–19, Sept. 26 to Oct. 1, and Oct. 10–11, 1919, because of lowering of pool at dam No. 21 and apparently erroneous gage heights at Burnside, from study of gage heights at dam No. 21 and records for other stations in the basin.

Monthly discharge of Cumberland River at Burnside, Ky., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 4,890 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	19,700	310	2,060	0.421	0.49
November	31,200	1,540	5,190	1.06	1.18
December	23,700	1,890	6,840	1.40	1.61
January	116,000	5,570	22,100	4.52	5.21
February	16,100	2,470	5,800	1.19	1.24
March	33,900	4,420	12,800	2.62	3.02
April	11,700	3,040	5,680	1.16	1.29
May	28,300	4,190	11,600	2.37	2.73
June	4,650	850	2,210	.452	.50
July	1,660	310	721	.147	.17
August	3,500	310	864	.177	.20
September	645	115	287	.059	.07
The year	116,000	115	6,390	1.31	17.71
1919–20.					
October	39,000	175	8,490	1.74	2.01
November	83,900	1,890	15,000	3.07	3.42
December	59,500	3,160	17,100	3.50	4.04
January	107,000	2,460	25,000	5.11	5.89
February	62,100	4,420	14,700	3.01	3.25
March	69,900	4,880	18,300	3.74	4.31
April	82,900	4,760	15,200	3.11	3.47
May	13,900	2,810	6,150	1.26	1.45
June	31,700	970	5,970	1.22	1.36
July	5,110	550	1,790	.366	.42
August	20,500	465	5,380	1.10	1.27
September	21,500	1,320	4,740	.969	1.08
The year	107,000	175	11,500	2.35	31.97

22926—24—WSP 503——12

CUMBERLAND RIVER AT NASHVILLE, TENN.

LOCATION.—At foot of Broad Street, Nashville, Davidson County.

DRAINAGE AREA.—12,860 square miles (from "Daily river stages," published by United States Weather Bureau).

RECORDS AVAILABLE.—Records of discharge October 1, 1918, to September 30, 1920. Gage readings obtained by United States Weather Bureau since 1873.

GAGE.—One inclined and three vertical sections at foot of Broad Street. The sloping section, graduated from −2.0 to 46.3 feet, consists of timbers imbedded in rock; second section, 45.6 to 49.5 feet, consists of an iron plate bolted vertically to face of retaining wall near foot of Borad Street, 18 feet from end of wall and 3 feet upstream from sloping section; third section, 48.1 to 56.0 feet, is a wooden strip nailed to a telephone pole at top of bank on north side of Broad Street; fourth section, 50.7 to 56.0 feet, is an iron strap bolted to southeast corner of Temperance Hall on north side of Broad Street, near corner of First Avenue North.

DISCHARGE MEASUREMENTS.—Made from downstream side of Sparkman Street highway bridge about 300 feet above gage.

CHANNEL AND CONTROL.—Bed composed of sediment. Low-water control is formed by dam at Lock No. 1 about 2.6 miles below gage. Completion of this lock has raised water level about 6 feet above normal at low water. Operation of locks probably have a negligible effect on stage-discharge relation. The dam is drowned out at stages above about 12½ feet and the control transferred to points farther downstream.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 44.9 feet January 7 and 8 (discharge, 137,000 second-feet); minimum discharge, 1,030 second-feet October 8 and September 18–21 and 25.

Maximum stage recorded during year ending September 30, 1920, 44.1 feet January 30 (discharge, 134,000 second-feet); minimum stage 6.9 feet October 5 (discharge, 1,030 second-feet).

A stage of 55.3 feet on January 22, 1882, is reported by the United States Weather Bureau.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 1,500 and 18,000 second-feet, and fairly well defined between 18,000 and 160,000 second-feet. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records below 18,000 second-feet good; above that stage fair.

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

Discharge measurements of Cumberland River at Nashville, Tenn., during the period Apr. 13, 1905, to Sept. 30, 1920.

Gage.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1905.		*Feet.*	*Sec.-ft.*	1914.		*Feet.*	*Sec.-ft.*
Apr. 13	W. E. Hall	11.09	14,300	Aug. 3	Ellsworth and Adams	7.44	2,280
1910.				1918.			
July 23	Horton and Dort	15.34	25,400	Aug. 24	Peterson and Hopkins	7.32	1,950
27	do	10.06	10,400	26	do	7.13	1,520
				27	do	7.12	1,250
1912.				Nov. 25	L. J. Hall	10.98	14,300
Apr. 5	U. S. Army Engineers	45.40	135,000	1919.			
5	do	45.60	134,000	Jan. 16	do	11.91	17,400
6	do	45.85	148,000	Mar. 13	C. G. Paulsen	24.45	55,900
6	do	46.00	151,000	19	do	27.04	56,700
7	do	46.49	151,000	26	do	12.42	18,600
8	do	46.55	162,000	Apr. 16	do	12.61	20,100
9	do	46.25	149,000	1920.			
9	do	46.00	145,000	Feb. 3	W. R. King	17.50	25,860
10	do	45.20	144,000	27	do	35.00	93,500
10	do	44.85	138,000	May 20	do	11.84	17,100

NOTE.—The measurements on Aug. 24 and 26, 1918, were made from a boat 1,000 feet below Lock No. 1. Measurement on Aug. 27, 1918, was made by wading on dam at Lock No. 1 and does not include the leakage through upper gates and valves of the lock (14 second-feet) nor the leakage through the dam. Leakage through upper gates and valves (lower gates open) was 14 second-feet and through lower gates and valves (upper gates open) 42 second-feet as determined August 26, 1918.

Measurements by the U. S. Army Engineers were made by the double-float method.

Daily discharge, in second-feet, of Cumberland River at Nashville, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1,870	30,000	7,920	74,000	21,600	36,900	36,900	8,260	29,500	6,270	3,250	5,950
2	1,630	36,000	8,600	125,000	16,900	33,400	32,200	10,700	22,500	5,950	2,690	4,720
3	1,630	39,900	9,650	134,000	14,800	30,300	24,300	14,400	15,100	5,020	2,970	3,540
4	1,630	41,200	9,650	133,000	14,000	26,000	21,600	22,700	13,300	4,420	2,970	2,690
5	1,410	34,000	10,400	134,000	12,500	24,300	18,000	26,000	17,400	3,830	2,970	2,140
6	1,210	23,000	9,650	136,000	11,400	34,800	15,500	26,800	10,700	3,540	2,690	2,140
7	1,410	15,500	8,260	137,000	11,100	42,400	10,400	24,800	8,260	3,830	2,690	2,140
8	1,030	11,100	7,580	137,000	9,650	62,200	12,500	22,300	7,250	2,970	2,690	1,630
9	1,210	9,300	6,920	136,000	10,000	87,700	12,200	29,700	6,590	2,970	4,120	1,410
10	1,210	7,920	6,270	131,000	9,650	83,600	12,500	32,200	6,590	3,250	3,830	1,410
11	1,210	6,920	6,270	110,000	8,950	74,000	17,400	30,000	6,920	2,970	3,830	1,410
12	1,210	6,270	6,920	60,700	8,260	63,700	14,800	35,400	7,580	2,970	3,830	1,210
13	1,210	5,330	7,580	26,300	8,950	53,200	15,500	36,000	7,920	2,970	3,250	1,210
14	1,210	5,020	15,100	21,100	10,400	44,700	14,800	32,800	7,580	2,690	2,970	1,210
15	1,210	4,720	27,300	19,100	11,100	38,700	15,500	25,300	6,920	2,690	2,690	1,210
16	1,210	4,720	28,100	17,200	10,400	32,800	19,100	18,300	6,270	2,410	2,690	1,210
17	1,210	10,400	28,400	16,600	11,100	74,000	20,100	18,800	5,950	2,410	3,250	1,210
18	1,210	34,800	30,000	26,300	10,400	75,600	19,900	16,600	4,720	2,140	2,690	1,030
19	3,250	35,100	33,700	39,900	11,100	63,000	20,100	13,300	5,020	2,410	2,410	1,030
20	9,650	36,300	31,700	50,700	11,800	58,000	19,900	17,200	4,720	2,410	2,410	1,030
21	14,800	29,500	25,800	53,900	14,400	53,900	20,400	16,600	4,420	2,690	2,410	1,030
22	12,500	24,800	22,500	48,600	16,200	43,700	19,600	17,400	3,830	2,690	5,330	1,630
23	10,700	21,300	23,000	43,100	22,500	33,400	17,400	18,000	3,540	2,410	2,970	1,630
24	9,650	16,600	23,900	41,800	25,300	25,800	14,800	18,800	3,250	1,870	2,410	1,210
25	12,500	14,800	23,900	41,800	31,100	21,600	12,500	23,900	3,830	1,870	2,410	1,030
26	18,600	11,800	25,800	44,400	35,700	18,600	11,100	25,800	5,330	1,630	2,140	1,630
27	14,800	11,800	27,300	47,300	38,700	23,600	11,100	33,700	5,330	1,630	2,140	2,690
28	12,900	9,650	28,400	46,300	39,300	28,900	9,650	41,500	5,330	1,410	1,610	2,410
29	12,200	8,950	24,300	39,600	.....	31,100	8,260	44,700	5,330	1,410	1,610	1,870
30	11,100	8,260	20,600	30,300	.....	35,700	8,260	43,700	6,270	1,410	6,920	1,630
31	23,900	.....	18,000	24,300	.....	35,700	.....	39,300	.....	2,690	6,590	.....
1919–20.												
1	1,630	20,800	106,000	10,000	128,000	38,400	18,600	32,000	11,400	5,330	3,250	12,500
2	1,410	59,200	99,700	9,650	101,000	27,300	86,800	29,200	12,900	5,020	2,690	13,600
3	1,630	70,800	86,800	9,650	46,000	23,000	117,000	35,400	15,100	4,420	1,870	13,600
4	1,410	72,800	63,700	9,300	20,400	20,100	119,000	37,500	18,000	3,830	1,610	10,000
5	1,030	77,600	40,600	9,300	20,400	27,600	122,000	36,300	50,000	3,830	1,610	9,300
6	1,210	81,200	29,700	8,950	25,800	35,400	125,000	31,700	62,600	4,120	1,610	9,300
7	1,630	81,200	27,300	8,260	44,000	38,700	125,000	26,500	65,700	5,330	1,870	7,580
8	2,690	69,600	39,900	8,950	57,200	39,000	123,000	23,200	67,200	5,330	3,250	6,920
9	2,410	37,500	53,600	45,700	58,800	36,600	112,000	21,600	59,900	5,640	3,250	6,590
10	2,140	19,900	72,800	73,200	47,600	33,100	84,800	22,700	43,700	6,590	4,420	6,270
11	2,410	18,300	81,200	74,000	34,200	28,600	46,000	24,300	27,300	6,590	4,720	9,650
12	4,120	16,200	83,200	74,400	26,800	33,700	28,900	25,800	19,600	6,270	12,500	12,200
13	8,260	14,400	81,600	75,600	23,200	76,000	25,300	21,100	14,800	5,950	21,600	22,300
14	11,800	15,900	96,800	72,800	21,300	80,400	22,500	16,600	11,100	5,330	39,600	32,500
15	31,100	17,700	97,200	52,800	18,800	90,500	20,100	14,400	9,650	5,020	47,600	41,500
16	45,000	18,800	96,400	31,400	18,300	98,000	18,300	15,500	8,600	4,720	50,000	53,600
17	53,600	17,200	97,600	28,600	30,000	97,200	17,200	14,800	7,580	7,580	54,300	55,000
18	52,100	14,800	96,400	26,300	15,900	90,500	18,000	15,100	6,590	9,650	51,800	44,700
19	55,400	13,300	90,100	24,600	14,800	84,400	23,600	17,400	5,950	7,920	52,100	33,100
20	55,000	11,800	74,000	24,300	14,000	81,200	20,400	17,200	5,640	6,270	45,000	24,100
21	48,600	10,400	43,700	25,300	13,600	77,600	48,600	14,800	5,950	5,020	32,800	17,400
22	36,300	9,300	27,600	54,300	26,300	82,000	36,300	17,400	6,270	7,580	30,300	13,600
23	26,500	8,260	22,500	82,400	69,600	85,600	35,400	18,800	8,600	8,600	24,600	10,400
24	36,900	7,580	19,600	110,000	82,400	85,600	31,100	16,900	11,100	8,600	19,100	8,260
25	38,400	6,920	17,200	119,000	91,400	81,200	28,100	16,900	18,000	8,260	16,900	6,590
26	34,000	46,000	15,100	124,000	96,800	60,700	33,100	14,000	16,900	7,250	19,100	6,920
27	34,800	83,600	13,600	127,000	96,400	33,400	51,800	16,900	14,400	5,950	19,100	6,270
28	36,600	82,400	12,900	131,000	87,700	24,100	43,700	14,400	11,800	5,020	17,400	7,920
29	32,000	84,800	11,400	133,000	66,500	21,600	38,100	12,200	10,400	4,120	16,600	9,650
30	24,300	103,000	10,700	134,000	.....	19,600	34,000	12,900	6,920	3,830	13,300	8,600
31	18,000	.....	10,400	133,000	.....	18,300	.....	12,500	.....	3,540	11,400	.....

Monthly discharge of Cumberland River at Nashville, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 12,860 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	23,900	1,030	6,140	0.477	0.55
November	41,200	4,720	18,500	1.43	1.60
December	33,700	6,270	18,200	1.41	1.63
January	137,000	16,600	68,600	5.33	6.14
February	39,300	8,260	16,300	1.27	1.32
March	87,700	18,600	44,900	3.49	4.02
April	36,900	8,260	16,900	1.32	1.47
May	44,700	8,260	25,300	1.97	2.27
June	29,500	3,250	8,240	.641	.72
July	6,270	1,410	2,900	.226	.26
August	6,590	1,610	3,140	.244	.28
September	5,950	1,030	1,880	.146	.16
The year	137,000	1,030	19,400	1.51	20.42
1919–20.					
October	55,400	1,030	22,700	1.76	2.03
November	103,000	6,920	39,700	3.08	3.44
December	106,000	10,400	55,500	4.31	4.97
January	134,000	8,260	59,700	4.63	5.34
February	128,000	14,000	48,200	3.75	4.04
March	98,000	18,300	53,900	4.18	4.82
April	125,000	17,200	60,300	4.68	5.22
May	37,500	12,500	20,800	1.62	1.87
June	67,200	5,640	21,100	1.64	1.83
July	8,600	3,540	5,890	.458	.53
August	54,300	1,610	20,200	1.57	1.81
September	55,000	6,270	17,300	1.34	1.50
The year	134,000	1,030	35,400	2.75	37.40

SOUTH FORK OF CUMBERLAND RIVER AT NEVELSVILLE, KY.

LOCATION.—One-fourth mile below Turkey Creek ferry on Greenwood-Monticello pike, and 1 mile from Nevelsville, McCreary County. Little South Fork enters on left 1¾ miles above station.

DRAINAGE AREA.—1,260 square miles (measured on United States Geological Survey State maps; scale, 1:500,000).

RECORDS AVAILABLE.—March 10, 1915, to September 30, 1920.

GAGE.—Staff gage in 5 sections bolted to rock ledges on left bank; read by Ben Whitehead and Mart Keith; a 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 at low stages.

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 ending September 30, 1919, 43.2 feet at 6.30 a. m. January 2 (discharge, 67,900 second-feet); minimum stage, 1.53 feet at 5.30 p. m. September 19 (discharge, 49 second-feet).

Maximum stage recorded during year ending September 30, 1920, 35.8 feet at at 6.30 a. m. March 13 (discharge, 53,100 second-feet); minimum stage, 1.65 feet at 5.30 p. m. October 4 (discharge, 62 second-feet).

1915–1920: Maximum stage recorded 51.4 feet on January 28, 1918 (discharge, 84,300 second-feet); minimum stage occurred in 1919.

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

REGULATION.—Operation of a small power plant short distance above gage may affect flow at extremely low water.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice during 1918–19 and 1919–20. Rating curve well defined between 500 and 25,000 second-feet, and fairly well defined below 500 second-feet; extended above 25,000 second-feet. Gage read to hundredths twice daily until November 15, 1919. After that date read once daily at low water and twice daily at high water. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

The following discharge measurement was made by W. R. King:
May 15, 1920: Gage height, 3.88 feet; discharge, 874 second-feet.

Daily discharge, in second-feet, of South Fork of Cumberland River at Nevelsville, Ky., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	167	5,740	1,660	16,500	1,330	3,050	2,290	9,100	850	244	81	106
2	142	2,970	1,330	64,900	1,210	2,500	1,870	6,820	712	212	108	114
3	130	1,870	1,090	22,200	1,150	2,010	1,590	4,190	575	174	130	126
4	120	1,450	970	11,400	1,090	1,800	1,390	2,970	500	160	158	110
5	114	1,150	850	5,980	1,090	1,940	1,330	2,220	430	151	278	95
6	104	970	740	3,560	1,030	19,300	1,270	1,940	371	162	500	82
7	95	740	630	2,970	910	8,580	1,150	1,800	371	147	314	79
8	88	658	602	2,730	910	5,410	1,030	1,800	352	167	261	79
9	82	575	575	2,500	910	8,710	970	2,970	430	261	160	76
10	79	525	550	2,430	850	8,710	970	3,560	452	278	120	85
11	76	475	740	2,080	850	5,300	1,090	2,290	550	278	110	71
12	79	452	768	1,940	795	3,650	2,890	1,800	630	261	218	66
13	82	410	685	1,730	850	2,810	2,650	1,520	740	198	352	58
14	85	390	1,330	1,660	970	2,360	2,010	1,270	1,520	172	222	61
15	82	352	2,650	1,800	1,270	2,430	1,660	1,210	910	149	187	58
16	88	333	4,010	1,940	1,450	2,220	2,430	1,090	630	142	165	56
17	85	740	2,650	2,010	1,330	4,670	5,740	1,270	452	126	151	54
18	134	4,770	2,010	4,870	1,270	14,700	4,190	1,030	352	118	156	52
19	970	4,370	1,520	8,580	1,210	7,060	2,730	970	314	130	142	50
20	1,800	2,970	1,270	5,080	1,210	5,080	2,080	1,210	390	170	134	52
21	3,470	2,220	1,210	3,330	1,590	3,210	1,730	2,360	296	147	122	57
22	1,940	1,800	1,940	2,730	2,430	2,290	1,450	2,500	261	138	112	206
23	1,150	1,330	6,340	3,050	9,750	1,870	1,520	1,940	228	128	106	206
24	740	1,210	4,370	8,840	5,300	1,730	1,450	1,660	371	122	112	170
25	1,030	1,030	3,380	6,940	4,670	1,520	1,150	2,010	712	106	114	130
26	1,390	970	2,650	4,190	4,970	1,390	970	2,150	712	85	102	118
27	1,210	850	2,150	3,210	4,470	2,220	970	2,360	550	82	90	88
28	1,150	850	1,730	2,570	3,560	12,400	850	2,220	475	82	95	82
29	1,330	1,090	1,520	2,080	.....	5,520	1,090	1,730	390	79	92	76
30	3,830	2,360	1,390	1,730	.....	3,740	2,890	1,270	296	76	88	79
31	14,200	.....	1,210	1,450	.....	2,810	.....	1,030	.....	69	96	.....
1919–20.												
1	71	13,200	6,940	1,090	1,660	2,150	4,770	2,970	630	352	116	740
2	66	21,600	3,740	1,030	1,450	2,150	35,300	2,890	575	314	108	1,210
3	63	7,300	2,650	850	1,330	2,010	24,300	4,370	768	278	100	850
4	63	3,380	2,080	740	13,600	1,800	9,100	4,010	4,280	352	90	712
5	95	2,500	1,660	630	22,200	2,810	7,180	3,130	9,890	314	96	525
6	296	1,870	1,730	602	8,840	3,470	5,300	2,500	8,430	296	92	500
7	452	1,390	5,300	712	4,970	2,890	4,010	2,220	3,050	278	158	500
8	314	1,210	12,800	1,520	3,740	2,730	3,470	2,080	2,220	278	149	475
9	204	1,030	6,460	6,220	2,810	2,290	2,890	1,940	1,450	261	244	475
10	170	910	8,710	6,580	2,570	2,150	2,500	1,520	1,150	244	3,740	550
11	147	1,450	6,580	4,280	2,430	1,940	2,150	1,330	910	244	3,470	578
12	2,970	3,470	4,280	2,890	2,150	16,800	1,870	1,210	740	261	4,670	1,270
13	3,290	3,830	6,100	2,360	2,010	40,700	1,800	1,090	602	192	7,540	8,450
14	2,220	2,970	20,800	1,940	1,870	9,750	1,660	970	525	174	7,670	3,650
15	2,890	1,940	11,500	1,660	1,730	5,630	1,390	850	430	172	6,700	5,860
16	11,400	1,660	5,740	1,870	1,450	4,100	1,270	740	371	190	10,900	4,770
17	9,100	1,210	3,650	2,430	1,270	4,370	1,270	685	314	222	5,860	3,130
18	4,190	1,030	3,050	2,500	1,450	4,570	1,940	685	278	234	5,980	1,870
19	2,810	910	2,430	2,220	1,520	14,100	2,080	685	261	278	3,210	1,390
20	1,730	768	2,150	2,010	1,450	16,300	2,890	685	768	1,330	2,220	1,090
21	1,090	658	1,940	10,300	1,450	7,540	5,860	740	11,800	850	1,030	850
22	1,090	602	1,590	31,500	24,700	4,100	5,410	850	5,080	525	712	685
23	1,940	550	1,450	39,700	21,600	3,050	3,290	910	2,810	371	3,210	575
24	10,900	525	1,330	33,100	12,000	2,500	2,500	795	1,730	296	2,080	500
25	6,700	575	1,210	19,500	7,300	2,150	2,080	2,730	1,150	231	1,390	475
26	3,470	7,670	1,090	8,710	4,770	2,010	5,300	3,210	850	204	1,090	525
27	2,080	11,600	1,030	4,870	3,130	1,870	6,100	2,010	602	170	1,090	590
28	1,800	6,580	970	3,650	2,500	1,660	4,100	1,330	525	147	1,090	790
29	1,390	4,470	910	2,730	2,290	2,010	3,050	1,090	525	136	740	850
30	1,210	6,820	850	2,290	.....	1,590	2,570	850	390	128	500	550
31	1,090	.....	768	1,940	.....	1,390	.....	740	.....	126	1,030	.....

Monthly discharge of South Fork of Cumberland River at Nevelsville, Ky., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,260 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	14,200	76	1,160	0.921	1.06
November	5,740	333	1,520	1.21	1.35
December	6,340	550	1,760	1.40	1.61
January	64,900	1,450	6,690	5.31	6.12
February	9,750	795	2,090	1.66	1.73
March	19,300	1,390	4,870	3.87	4.46
April	5,740	850	1,850	1.47	1.64
May	9,100	970	2,330	1.85	2.13
June	1,520	228	527	.418	.47
July	278	69	155	.123	.14
August	500	81	164	.130	.15
September	206	50	91.4	.073	.08
The year	64,900	50	1,940	1.54	20.94
1919–20.					
October	11,400	63	2,430	1.93	2.22
November	21,600	525	3,790	3.01	3.36
December	20,800	768	4,240	3.37	3.88
January	39,700	602	6,530	5.18	5.97
February	24,700	1,270	5,530	4.39	4.74
March	40,700	1,390	5,570	4.42	5.10
April	35,300	1,270	5,250	4.17	4.65
May	4,370	685	1,670	1.33	1.53
June	11,800	261	2,100	1.67	1.86
July	1,330	126	305	.242	.28
August	10,900	90	2,490	1.98	2.28
September	8,450	475	1,500	1.19	1.33
The year	40,700	63	3,440	2.73	37.20

OBEY RIVER NEAR BOOM, TENN.

LOCATION.—At county bridge on Livingston-Byrdstown highway, 1¼ miles above mouth of Eagle Creek, 1½ miles below mouth of Franklin Creek, 1½ miles northeast of Boom, Pickett County, and 4 miles southwest of Byrdstown.

DRAINAGE AREA.—416 square miles (measured on topographic maps).

RECORDS AVAILABLE.—March 16, 1919, to September 30, 1920.

GAGE.—Chain gage attached to lower side of steel highway bridge, 103 feet from concrete pier on right bank; read by Eunice Reynolds.

DISCHARGE MEASUREMENTS.—Made from downstream side of highway bridge to which gage is attached.

CHANNEL AND CONTROL.—Bed composed chiefly of rock. Banks are high, but left bank is subject to overflow above a stage of 30 feet. Control is not well defined. There is a riffle composed of gravel and rock about one-fourth mile below, but its influence on the stage-discharge relation may not be thoroughly effective, particularly at high stages, owing to channel contraction caused by growth of heavy brush and trees on bank.

EXTREMES OF STAGE.—Maximum stage recorded during period March 16 to September 30, 1919, 10.8 feet at 9 a. m. March 18; minimum stage 1.0 foot September 27.

Maximum stage recorded during year ending September 30, 1920, 26.7 feet February 22 and April 2; minimum stage, 1.1 feet August 2–7.

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

Data inadequate for determination of discharge.

Discharge measurements of Obey River near Boom, Tenn., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*
Mar. 17	C. G. Paulsen	4.06	1,190
1920.			
Apr. 14	W. R. King	2.96	584

Daily gage height, in feet, of Obey River near Boom, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919.							
1	.....	3.4	4.1	2.3	1.6	1.5	1.5
2	.....	3.1	3.7	2.2	1.5	1.9	1.6
3	.....	3.0	3.5	2.1	1.4	1.6	1.6
4	.....	2.9	3.1	2.0	1.5	1.5	1.4
5	.....	2.9	2.8	1.9	1.5	1.4	1.5
6	.....	2.8	3.1	1.9	1.6	1.8	1.4
7	.....	2.7	3.0	1.9	1.7	1.7	1.3
8	.....	2.6	3.0	1.8	1.7	1.5	1.4
9	.....	2.6	3.0	1.8	1.7	1.5	1.4
10	.....	2.5	3.0	1.8	1.6	1.5	1.3
11	.....	2.6	2.9	1.8	1.7	1.4	1.4
12	.....	2.6	2.6	2.5	1.7	1.6	1.4
13	.....	2.6	2.4	2.3	1.7	2.0	1.4
14	.....	2.4	2.4	2.0	1.6	1.8	1.3
15	.....	2.4	2.4	1.9	1.4	1.8	1.4
16	3.5	3.0	2.5	1.8	1.5	1.8	1.4
17	5.6	3.4	2.5	1.6	1.5	1.5	1.3
18	9.8	3.3	2.5	1.7	1.5	1.5	1.4
19	6.3	3.1	2.4	1.8	1.5	1.5	1.3
20	4.9	2.9	3.8	1.8	1.3	1.4	1.4
21	4.2	2.7	3.5	1.9	1.3	1.6	1.3
22	3.7	2.7	3.2	1.9	1.2	1.5	1.2
23	3.4	2.7	3.0	2.0	1.2	1.4	1.4
24	3.3	2.6	2.8	2.0	1.2	1.5	1.3
25	3.1	2.5	2.7	1.9	1.3	1.5	1.4
26	2.9	2.4	2.6	2.1	1.4	1.4	1.3
27	3.9	2.3	2.6	2.0	1.2	1.5	1.0
28	6.1	2.3	2.7	1.9	1.2	1.6	1.3
29	4.7	2.3	2.5	1.8	1.5	1.5	1.3
30	4.1	3.5	2.5	1.6	1.2	1.5	1.3
31	3.7	.....	2.3	.....	1.4	1.5	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	1.3	9.2	6.3	2.2	3.2	3.6	9.7	4.3	2.1	1.5	1.2	3.0
2	1.3	15.6	4.9	2.4	3.0	3.5	26.7	5.3	2.4	1.4	1.1	2.9
3	1.3	7.1	4.0	2.3	2.8	3.4	11.3	7.2	3.8	1.2	1.1	2.8
4	1.4	4.9	3.7	2.3	.....	3.4	9.7	5.5	4.8	1.2	1.1	2.5
5	1.3	3.9	3.3	2.3	8.2	6.6	5.4	4.6	.....	1.2	1.1	2.3
6	1.9	3.5	3.2	2.2	5.9	5.9	4.7	4.3	5.8	1.7	1.1	2.2
7	1.9	3.0	5.0	2.1	4.8	5.3	4.4	3.8	4.7	1.9	1.1	2.1
8	1.7	2.9	8.1	2.2	4.3	4.0	3.9	4.3	3.8	1.8	1.2	2.0
9	1.7	2.6	5.5	7.5	3.8	3.8	3.8	4.0	3.2	1.7	.....	2.0
10	1.6	2.7	5.3	6.0	3.4	3.6	3.6	3.6	2.8	1.6	2.2	2.1
11	1.6	2.9	5.1	4.5	3.5	3.4	3.3	3.4	2.6	1.5	2.5	2.2
12	3.5	6.0	4.5	3.0	3.5	12.2	3.2	3.2	2.5	1.4	3.0	2.3
13	3.3	4.4	7.9	3.5	3.4	10.0	3.1	3.0	2.3	1.3	3.4	8.5
14	3.1	3.8	16.2	3.4	3.2	6.5	3.0	2.8	2.2	1.3	4.7	9.5
15	2.9	3.3	7.1	3.2	3.1	5.2	2.9	2.7	2.1	1.4	5.3	11.6
16	8.0	3.1	5.5	3.2	2.9	5.0	2.8	2.5	2.0	1.5	6.2	7.6
17	6.4	2.8	4.5	3.0	2.8	4.9	5.1	2.4	1.9	1.7	5.2	5.6
18	3.7	2.7	4.0	3.5	2.8	4.7	4.4	2.4	2.0	1.8	4.3	4.2
19	3.3	2.5	3.7	3.6	2.9	5.8	3.3	2.5	2.1	2.0	3.7	3.8
20	2.9	2.5	3.5	3.7	3.0	6.2	3.2	2.4	2.3	1.9	3.4	3.2
21	2.5	2.3	3.4	4.6	3.0	5.4	8.5	3.8	2.4	1.8	3.2	2.8
22	2.3	2.3	3.1	14.4	26.7	3.9	5.2	3.3	2.8	1.7	2.8	2.6
23	4.8	2.1	2.9	18.9	12.8	3.7	4.4	3.2	2.6	1.6	2.8	2.5
24	10.9	2.2	2.8	14.9	9.0	3.6	3.8	3.1	2.5	1.5	2.7	2.3
25	5.6	.....	2.8	10.5	6.2	3.4	3.6	3.4	2.2	1.4	2.5	2.2
26	4.3	7.6	2.6	6.7	5.0	3.3	5.3	3.3	2.0	1.4	2.3	2.1
27	3.5	16.1	2.6	5.1	4.2	3.2	5.9	3.0	1.9	1.4	2.2	2.4
28	2.9	6.7	2.4	4.4	3.9	3.2	4.9	2.7	1.8	1.3	2.1	2.9
29	2.8	5.6	2.4	4.0	3.7	3.2	4.2	2.5	1.7	1.3	2.1	2.7
30	2.6	10.0	2.4	3.6	.....	3.1	3.8	2.3	1.6	1.3	2.1	2.4
31	2.4	.....	2.2	3.4	.....	3.1	.....	2.2	.....	1.2	2.3	.....

COLLINS RIVER NEAR ROWLAND, TENN.

LOCATION.—At Hennessee's iron highway bridge, 1 mile below Mountain Creek, 2½ miles west of Rowland, Warren County, 5 miles southwest of Rock Island, and 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, 1920.

GAGE.—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 in making 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.—1916–1920: Maximum stage recorded 16.67 feet April 2, 1920 (discharge, 34,000 second-feet); minimum stage recorded 1.02 feet October 12, 1918 (discharge, 83 second-feet). High-water marks of flood of 1854 as reported by old residents indicate stage of 32.6 feet (estimated discharge, 82,200 second-feet). High-water marks of flood of 1902 indicate 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; rating curve well defined below 8,000 second-feet and extended above that point. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records below 11,300 second-feet are good; above that point only fair.

COOPERATION.—Gage-height record furnished by Tennessee Power Co.

The following discharge measurement was made by L. J. Hall:

February 2, 1920: Gage-height, 2.45 feet; discharge, 1,230 second-feet.

Daily discharge, in second-feet, of Collins River near Rowland, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	155	1,760	940	4,060	1,200	1,690	1,790	660	1,030	303	351	343
2	145	1,160	801	21,200	1,090	1,500	1,530	706	920	291	383	401
3	155	811	697	12,400	1,030	1,330	1,370	660	792	284	270	319
4	145	706	622	5,350	1,070	1,240	1,260	600	697	327	219	256
5	125	586	586	3,460	1,080	4,390	1,270	532	640	291	284	195
6	115	460	532	2,670	1,000	14,700	1,170	532	532	284	270	189
7	120	426	469	2,250	962	6,230	1,060	550	478	249	256	150
8	125	392	451	2,250	910	4,240	972	1,070	435	263	195	150
9	107	375	469	2,350	880	6,700	890	1,460	514	291	171	130
10	99	367	443	2,010	860	4,580	870	1,320	505	311	150	140
11	99	343	417	1,750	860	3,320	1,000	1,010	678	284	343	160
12	83	343	443	1,600	860	2,670	1,010	910	487	277	207	171
13	99	311	451	1,470	930	2,110	910	792	409	256	150	150
14	99	303	613	1,370	1,330	2,070	860	660	367	213	171	140
15	107	284	2,010	1,340	1,430	2,060	850	706	359	263	160	120
16	111	277	1,800	1,330	1,260	1,760	1,450	660	327	256	189	140
17	107	1,130	1,440	1,550	1,130	4,520	1,650	735	295	249	171	120
18	982	4,090	1,150	7,930	1,030	7,390	1,560	726	451	155	171	120
19	1,610	2,660	962	6,530	982	4,000	1,350	688	383	207	160	150
20	811	1,940	900	3,970	1,000	2,930	1,140	860	311	277	150	171
21	650	1,450	880	2,850	1,260	2,330	1,010	1,200	263	189	165	135
22	417	1,260	1,080	2,300	2,520	1,870	910	1,150	242	207	171	160
23	311	1,230	2,230	2,850	4,090	1,690	850	1,000	327	242	235	195
24	400	1,080	1,760	3,360	2,900	1,480	840	1,080	568	219	189	171
25	716	940	1,790	2,990	2,410	1,330	773	2,190	640	177	183	150
26	640	830	1,550	2,880	2,470	1,200	706	2,000	532	150	219	130
27	496	745	1,300	2,120	2,160	4,270	668	2,890	496	171	207	140
28	426	754	1,140	1,800	1,900	5,950	650	3,750	443	160	171	135
29	392	792	1,000	1,640	.....	3,630	610	2,500	409	177	195	165
30	880	1,080	880	1,400	.....	2,600	600	1,730	343	213	298	125
31	2,640	.....	800	1,280	.....	2,220	.....	1,120	.....	201	298	.....

Daily discharge, in second-feet, of Collins River near Rowland, Tenn., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	115	1,030	3,390	678	1,400	1,590	4,830	1,370	706	514	284	1,080
2	135	1,900	2,480	716	1,320	1,400	29,700	1,240	940	541	242	880
3	195	1,560	1,860	678	1,220	1,340	19,100	1,520	1,570	568	263	716
4	150	1,210	1,470	640	2,650	1,590	8,410	1,320	3,630	870	303	697
5	270	961	1,270	586	4,980	4,690	6,100	1,170	7,230	1,020	263	754
6	298	726	1,280	622	3,520	4,170	4,090	1,070	3,720	910	303	726
7	207	660	2,410	559	2,680	2,780	3,080	1,020	2,470	716	383	622
8	235	640	3,830	604	2,170	2,130	2,600	1,040	1,780	697	367	600
9	207	568	3,040	870	1,820	1,820	2,280	1,000	1,330	541	1,030	1,950
10	135	541	5,540	1,400	1,600	1,640	2,110	890	1,070	523	3,800	2,510
11	140	550	4,580	1,250	1,560	1,570	1,850	800	962	451	10,700	1,270
12	880	716	3,180	1,100	1,400	22,600	1,730	744	860	420	7,010	1,160
13	595	890	3,120	1,000	1,350	20,000	1,730	1,100	745	392	4,460	2,000
14	367	783	8,960	930	1,340	6,260	1,560	2,950	631	303	6,990	2,120
15	577	668	5,250	850	1,270	4,090	1,400	2,120	541	678	6,720	3,020
16	1,200	604	3,460	870	1,160	4,180	1,490	1,600	514	514	7,560	2,800
17	920	559	2,580	1,290	1,080	6,190	1,580	1,300	478	443	7,070	1,680
18	613	532	2,170	1,760	1,080	3,880	1,860	1,550	469	640	4,470	1,430
19	550	478	1,860	1,470	1,150	4,740	1,560	1,540	631	1,010	3,180	1,120
20	469	435	1,680	1,370	1,120	4,060	1,500	1,550	812	1,290	2,500	910
21	401	392	1,540	1,180	1,180	3,160	2,610	1,550	1,500	972	1,940	830
22	426	375	1,360	3,900	3,780	2,470	2,030	1,710	2,820	697	1,710	716
23	1,350	359	1,230	6,410	9,640	2,110	1,530	1,500	1,790	586	1,660	640
24	2,930	351	1,150	8,660	6,280	1,780	1,400	2,400	1,270	487	1,510	577
25	2,200	351	1,040	7,910	3,560	1,640	1,270	2,040	1,000	460	1,380	514
26	1,390	2,240	940	4,780	1,270	2,390	2,780	1,730	811	417	1,170	496
27	1,000	4,140	880	3,310	2,150	2,180	2,220	1,350	706	343	1,130	716
28	754	2,460	830	2,560	1,820	1,900	2,190	1,200	640	319	982	532
29	650	2,460	811	2,070	1,690	1,870	1,840	1,000	559	303	812	460
30	577	5,140	754	1,770	.....	1,670	1,540	930	523	291	773	426
31	595	.....	710	1,610	.....	1,500	.....	800	.....	298	1,240	.....

Monthly discharge of Collins River near Rowland, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 800 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	2,640	83	431	0.539	0.62
November	4,090	277	963	1.20	1.34
December	2,230	417	987	1.23	1.42
January	21,200	1,280	3,620	4.52	5.21
February	4,090	860	1,450	1.81	1.88
March	14,700	1,200	3,480	4.35	5.02
April	1,790	600	1,050	1.31	1.46
May	3,750	532	1,180	1.48	1.71
June	1,030	242	496	.620	.69
July	327	150	240	.300	.35
August	383	150	218	.272	.31
September	401	120	174	.218	.24
The year	21,200	83	1,190	1.49	20.36
1919–20.					
October	2,930	115	662	.828	.95
November	5,140	351	1,140	1.42	1.58
December	8,960	710	2,410	3.01	3.47
January	8,660	559	2,050	2.56	2.95
February	9,640	1,080	2,320	2.90	3.13
March	22,600	1,340	3,980	4.98	5.74
April	29,700	1,270	3,900	4.88	5.44
May	2,950	744	1,400	1.75	2.02
June	7,230	469	1,420	1.78	1.99
July	1,290	291	587	.734	.85
August	10,700	242	2,650	3.31	3.82
September	3,020	426	1,130	1.41	1.57
The year	29,700	115	1,970	2.46	33.51

HARPETH RIVER AT BELLEVUE, TENN.

LOCATION.—At county highway bridge on Harding Pike, a quarter of a mile south of Bellevue, Davidson County, Tenn., and 12 miles south of Nashville.

DRAINAGE AREA.—410 square miles.

RECORDS AVAILABLE.—April 11 to September 30, 1920.

GAGE.—Vertical staff spiked to 18-inch tree on left bank about 40 feet below highway bridge.

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

CHANNEL AND CONTROL.—Right bank steep and high and is not overflowed; left bank fairly steep up to 12 feet, then flat. Low-water control is well defined shoal 700 feet below gage, composed of limestone and coarse gravel. May shift in extreme high water. Control is drowned out at gage height of 5 feet. High-water control not determined.

EXTREMES OF DISCHARGE.—Maximum stage during period of record not known as water overtopped the gage. Minimum stage, 0.4 foot August 2–7 (discharge, 16 second-feet).

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

ACCURACY.—Stage-discharge relation may change slightly. Rating curve fairly well defined below 6,000 second-feet. Gage read to half-tenths once daily, except Sundays. Daily discharge ascertained by applying gage height to rating table. Records below 6,000 second-feet are fair; others poor.

Discharge measurements of Harpeth River at Bellevue, Tenn., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 4	King and Nelson	6.76	3,680	May 8	W. R. King	1.59	334
11	W. R. King	1.98	584	Aug. 31	do	1.14	176
21	King and Nelson	10.40	5,940				

Daily discharge, in second-feet, of Harpeth River at Bellevue, Tenn., for the year ending Sept. 30, 1920.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	940	648	59	22	2,020	16	50	325	107	59	1,130	580
2	.....	839	230	59	16	265	17	81	400	81	135	265	455
3	.....	738	165	41	16	165	18	335	475	81	165	265	335
4	.....	648	962	41	16	107	19	435	550	81	195	230	282
5	.....	435	1,750	41	16	94	20	9,000	625	81	265	135	230
6	.....	395	1,140	535	16	81	21	6,090	495	81	107	81	195
7	.....	318	535	940	16	135	22	1,330	580	265	59	70	165
8	.....	335	415	230	28	81	23	850	422	230	59	59	107
9	.....	345	335	165	41	59	24	625	265	107	41	81	107
10	.....	355	265	107	59	895	25	4,000	625	81	41	59	107
11	495	282	230	151	165	455	26	7,500	300	81	41	59	94
12	471	180	195	195	81	360	27	2,670	230	70	27	41	81
13	435	212	165	107	375	265	28	1,300	195	59	27	535	81
14	282	318	135	81	195	3,160	29	1,100	165	81	27	365	195
15	135	248	107	135	2,340	1,030	30	962	165	59	27	195	107
							31	.....	165	.....	27	107	.....

NOTE.—Water was over top of gage Apr. 20, 21, and 26; discharge estimated and may be considerably in error. Discharge interpolated for the following days: Apr. 25; May 2, 9, 16–19, 23, 30; June 6, 13, 20, 27; July 4, 11, 18, 25; Aug. 1, 8, 22, 29; Sept. 5, 12, 19, and 26.

Monthly discharge of Harpeth River at Bellevue, Tenn., for the year ending Sept. 30, 1920.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
April 11-30	9,000	50	1,910	4.66	3.47
May	940	165	405	.988	1.14
June	1,750	59	294	.717	.80
July	940	27	135	.329	.38
August	2,340	16	228	.556	.64
September	3,160	59	410	1.00	1.12

RED RIVER NEAR ADAMS, TENN.

LOCATION.—At county highway bridge 1½ miles north of Adams, Robertson County, Tenn., three-eighths mile below the Louisville & Nashville Railroad bridge, a half mile below mouth of Elk Creek, and 10 miles upstream from mouth of Sulphur Fork and Port Royal.

DRAINAGE AREA.—678 square miles (average value from United States post-route map and United States Geological Survey map; scale 1:500,000).

RECORDS AVAILABLE.—June 15 to September 30, 1920.

GAGE.—Chain gage attached to handrail on downstream side of bridge; read by C. S. Smith.

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

CHANNEL AND CONTROL.—Right bank steep and high and not subject to overflow; left bank subject to overflow at gage height of about 28 feet. Control is a solid rock shoal about 200 feet below bridge; permanent. High-water control not known.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 10.4 feet, September 13 (discharge, 6,210 second-feet); minimum stage, 1.90 feet August 6, 7, and September 25 (discharge, 150 second-feet).

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

ACCURACY.—Stage-discharge relation permanent. Rating curve very well defined below 12,000 second-feet; extended above that point. Gage read to hundredths once daily, except Sundays. Daily discharge ascertained by applying gage height to rating table. Records fair.

Discharge measurements of Red River near Adams, Tenn., during the year ending Sept. 30, 1920.

[Made by W. R. King.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
May 25	5.60	2,310	June 15	3.02	581
26	4.26	1,320	Aug. 28	2.70	438

Daily discharge, in second-feet, of Red River near Adams, Tenn., for the year ending Sept. 30, 1920.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1		280	186	1,690	16	485	262	2,240	910
2		315	180	1,250	17	485	245	1,380	712
3		280	168	685	18	485	550	970	530
4		360	168	408	19	440	850	740	462
5		440	168	450	20	440	530	630	395
6		530	150	490	21	440	395	550	355
7		485	150	530	22	395	315	865	262
8		395	418	395	23	355	280	1,180	217
9		315	685	375	24	355	355	850	165
10		280	347	440	25	335	318	685	150
11		271	395	467	26	335	280	530	160
12		262	363	3,340	27	325	245	485	165
13		245	301	6,210	28	315	228	440	170
14		228	280	3,370	29	298	210	462	180
15	580	228	1,260	1,280	30	280	195	485	190
					31		192	379	

NOTE.—Discharge interpolated for the following days: June 20, 27; July 3, 4, 11, 18, 25; Aug. 1, 8, 15, 22, 29; Sept. 5, 6, 12, 19. Discharge, Sept. 26–30, estimated by comparison with records of flow of nearby streams.

Monthly discharge of Red River near Adams, Tenn., for the year ending Sept. 30, 1920.

[Drainage area, 678 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
June 15–30	580	280	396	0.585	0.35
July	850	192	334	.493	.57
August	2,240	150	584	.861	.99
September	6,210	150	880	1.30	1.45

TENNESSEE RIVER BASIN.

FRENCH BROAD RIVER AT ASHEVILLE, N. C.

LOCATION.—At the concrete highway bridge that replaced Smith's bridge, washed out July 16, 1916, 1,000 feet above Southern Railway bridge, 1 mile below Southern Railway station at Asheville, and 2 miles below mouth of Swannanoa River.

DRAINAGE AREA.—987 square miles.

RECORDS AVAILABLE.—January 1, 1905, to July 16, 1916; January 1, 1917, to September 30, 1920. Records were obtained at Bingham School Bridge, about 1 mile downstream from September 17, 1895, to December 31, 1901.

GAGES.—Gage graduations from −2.0 to 14.7 feet are cast into concrete on right side of the third pier from right abutment of bridge. 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. All gages set to same datum. A temporary vertical staff a short distance above the old Smith's bridge was used January 1 to November 21, 1917; readings have been reduced to the datum of the original gage.

DISCHARGE MEASUREMENTS.—Made from upstream 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 railroad 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 ending September 30, 1919, 9.0 feet at 10 a. m. December 23 (discharge, 25,600 second-feet); minimum stage recorded, −0.8 foot October 17–19 (discharge, 630 second-feet).

Maximum stage recorded during year ending September 30, 1920, 6.5 feet April 2 (discharge, 17,000 second-feet); minimum stage recorded, −0.7 foot October 2–3 (discharge, 700 second-feet).

1905–1920: Maximum stage recorded, 23.6 feet[1] July 16, 1916, determined by levels from flood marks November 21, 1917 (discharge not determined; stage-discharge relation probably affected by backwater caused by débris lodged against railroad bridge). Maximum discharge recorded before and after flood of July 16, 1916, 25,800 second-feet, January 23, 1906 (gage height, 7.8 feet). Minimum discharge, 380 second-feet September 16 and 20, 1907.

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

DIVERSIONS.—None.

REGULATION.—Negligible.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve used for the years ending September 30, 1919 and 1920, based on all discharge measurements made since flood in July, 1916, but differs only slightly from the curve used prior to October 1, 1918; curve is well defined below 11,000 second-feet. Gage read to tenths once daily. Daily discharge determined by applying daily gage height to rating table. Records good.

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

Discharge measurements of French Broad River at Asheville, N. C., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Nov. 3	A. H. Condron	2.40	5,090	Apr. 19	A. H. Condron	1.00	2,590
1919.				June 16	Hall and Condron	.12	1,490
Jan. 13	do	1.30	3,050	18	A. H. Condron	.00	1,370
14	do	1.22	2,900				
June 19	do	.55	1,940				
Sept. 22	do	−.45	908				

[1] Supersedes figures published in previous reports.

Daily discharge, in second-feet, of French Broad River at Asheville, N. C., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	780	13,800	2,720	3,720	3,040	3,900	3,200	2,880	2,130	2,270	1,660	1,440
2	780	9,190	2,420	5,320	2,720	3,370	2,880	2,880	2,000	2,000	1,660	1,340
3	780	5,320	2,130	9,190	2,570	3,040	2,880	2,420	2,000	1,770	1,660	1,240
4	780	3,900	2,130	8,070	2,570	3,040	2,570	2,270	1,880	1,660	1,660	1,140
5	780	3,540	2,000	5,090	2,880	2,880	3,040	2,130	1,880	1,660	1,550	1,040
6	780	3,040	2,000	4,460	2,570	6,020	2,720	2,720	1,880	1,660	1,550	1,040
7	780	2,720	2,000	4,080	2,420	5,090	2,570	2,880	2,130	2,000	1,550	1,040
8	780	2,420	1,880	3,900	2,420	3,900	2,420	3,200	1,880	1,770	1,550	950
9	700	2,270	1,770	3,900	2,270	9,190	2,270	2,880	1,770	1,770	1,440	950
10	700	2,270	1,880	3,540	2,270	8,900	2,270	4,080	1,660	1,880	1,440	950
11	700	2,130	1,880	3,200	2,130	7,020	2,420	3,370	1,660	1,770	1,550	950
12	700	2,000	2,000	3,200	2,130	4,460	4,270	2,720	1,660	1,770	3,370	1,040
13	700	1,880	1,770	3,040	2,130	3,900	3,370	2,570	1,770	1,660	2,270	1,040
14	700	1,880	1,770	2,880	3,900	3,540	2,880	3,540	1,660	1,550	1,770	950
15	700	1,880	9,190	2,880	3,720	3,200	2,570	3,200	1,660	1,440	1,880	860
16	700	1,770	7,540	2,720	3,200	3,540	2,570	2,720	1,550	1,550	1,770	860
17	630	3,540	10,600	2,570	2,570	4,660	3,900	2,570	1,660	2,880	1,770	860
18	630	6,500	7,540	3,900	2,270	4,870	3,200	2,420	1,880	2,570	1,550	860
19	630	5,090	4,660	3,720	2,270	4,270	2,720	2,270	2,130	2,420	1,550	780
20	700	3,370	3,720	3,200	2,130	3,900	2,570	2,270	1,770	5,780	1,440	780
21	1,240	2,880	3,370	2,880	2,130	3,540	2,420	3,720	1,660	6,020	1,340	780
22	1,240	2,570	15,100	2,570	2,880	3,540	2,270	2,880	2,270	3,200	1,340	780
23	860	2,420	25,200	2,880	6,020	3,200	2,270	2,420	1,770	3,720	1,340	860
24	860	2,270	15,400	5,320	4,870	3,040	2,270	2,270	2,570	2,880	1,340	860
25	12,200	2,130	10,600	4,270	3,900	2,880	2,130	2,270	5,320	2,270	1,240	860
26	14,100	2,000	9,190	6,020	4,270	2,570	2,130	2,270	6,020	2,270	1,240	780
27	14,100	2,000	4,460	5,090	3,540	3,200	2,130	2,570	4,080	2,000	1,140	780
28	10,100	2,000	5,090	4,270	3,200	6,020	2,130	2,420	3,200	1,880	1,140	780
29	9,190	4,870	4,460	3,900	.....	4,270	2,130	2,880	3,040	1,880	1,140	780
30	22,100	3,200	4,080	3,370	.....	3,540	3,200	2,570	2,570	1,770	1,880	780
31	20,400	.....	3,900	3,200	.....	3,370	.....	2,270	.....	1,660	1,660	.....
1919–20.												
1	780	860	1,440	1,040	1,880	1,440	3,540	2,720	1,550	1,440	1,240	2,570
2	700	950	1,140	1,040	1,770	1,340	17,000	2,570	1,550	1,550	1,340	2,270
3	700	950	1,140	1,040	1,770	1,240	13,800	2,570	1,550	1,660	1,240	2,570
4	780	860	1,040	1,040	8,620	1,240	12,800	2,420	1,880	1,440	1,140	3,200
5	780	860	950	1,040	7,800	3,040	11,600	2,420	4,660	1,340	1,140	2,880
6	780	860	950	950	4,460	2,880	9,190	2,270	4,270	1,240	2,000	2,570
7	780	780	1,040	950	3,370	2,130	7,280	2,130	2,880	1,880	1,770	2,420
8	780	780	1,040	1,340	2,720	1,880	5,090	2,130	2,130	1,880	1,550	2,130
9	780	780	1,440	1,340	2,270	1,770	4,270	2,130	1,880	1,550	2,420	2,000
10	780	780	7,020	1,660	2,000	1,660	4,660	2,130	1,770	1,550	3,900	2,130
11	780	860	5,320	1,340	2,000	1,550	4,080	2,000	1,660	2,270	4,870	2,000
12	780	1,440	2,880	1,240	1,880	1,550	3,720	1,880	1,660	2,000	4,270	1,880
13	860	1,770	2,270	1,140	2,000	3,040	3,900	2,000	1,550	1,770	4,270	1,880
14	860	1,660	2,130	1,140	2,000	2,880	3,370	2,130	1,440	1,550	3,720	1,770
15	860	1,340	2,000	1,040	1,880	2,270	3,200	1,880	1,440	1,880	3,720	1,880
16	860	1,140	1,770	1,040	1,770	2,130	2,880	1,880	1,550	2,570	3,370	1,770
17	860	1,040	1,660	1,140	1,660	4,660	3,040	1,770	1,440	3,900	3,900	1,660
18	860	1,040	1,550	1,240	1,660	4,270	2,720	1,770	1,340	3,040	4,270	1,660
19	950	950	1,440	1,140	1,660	3,040	2,570	2,130	1,340	2,130	5,320	1,660
20	950	950	1,440	1,140	1,660	4,270	2,570	2,130	1,660	3,370	4,270	1,550
21	860	860	1,340	1,040	1,660	3,370	3,040	2,000	3,370	4,080	3,720	1,550
22	860	860	1,240	1,140	1,550	2,880	4,270	1,880	2,720	3,540	3,040	1,440
23	1,880	860	1,240	1,240	1,660	2,420	3,200	1,770	1,880	2,420	2,880	1,440
24	2,000	860	1,240	1,550	1,660	2,130	3,200	1,770	1,880	2,000	2,570	3,200
25	1,660	780	1,240	3,370	1,660	2,000	2,720	2,000	1,880	1,770	2,420	2,720
26	1,140	860	1,140	3,040	1,660	2,420	2,880	2,000	1,770	1,770	3,720	1,880
27	1,040	860	1,140	2,880	1,550	3,370	3,900	1,880	1,660	1,550	3,200	1,660
28	950	950	1,140	3,200	1,550	2,720	3,720	1,770	1,550	1,440	6,020	1,770
29	956	1,040	1,040	3,370	1,550	7,800	3,040	1,660	1,660	1,440	4,660	1,770
30	860	1,140	1,040	2,880	.....	6,500	2,880	1,770	1,660	1,340	3,200	1,880
31	860	.....	1,040	2,270	.....	4,080	.....	1,660	.....	1,240	2,880	.....

Monthly discharge of French Broad River at Asheville, N. C., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 987 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918-19.					
October	22,100	630	3,900	3.95	4.55
November	13,800	1,770	3,500	3.55	3.96
December	25,200	1,770	5,560	5.63	6.49
January	9,190	2,570	4,080	4.13	4.76
February	6,020	2,130	2,960	3.00	3.12
March	9,190	2,570	4,250	4.31	4.97
April	4,270	2,130	2,680	2.72	3.04
May	4,080	2,130	2,730	2.77	3.19
June	6,020	1,550	2,300	2.33	2.60
July	6,020	1,440	2,300	2.33	2.69
August	3,370	1,140	1,590	1.61	1.86
September	1,440	780	938	.95	1.06
The year	25,200	630	3,070	3.11	42.29
1919-20.					
October	2,000	700	946	.958	1.10
November	1,770	780	990	1.00	1.12
December	7,020	950	1,690	1.71	1.97
January	3,370	950	1,580	1.60	1.84
February	8,620	1,550	2,390	2.42	2.61
March	7,800	1,240	2,840	2.88	3.32
April	17,000	2,570	5,140	5.21	5.81
May	2,720	1,660	2,040	2.07	2.39
June	4,660	1,340	1,970	2.00	2.23
July	4,080	1,240	2,020	2.05	2.36
August	4,870	1,140	3,160	3.20	3.69
September	3,200	1,440	2,060	2.09	2.33
The year	17,000	700	2,240	2.27	30.77

FRENCH BROAD RIVER AT DANDRIDGE, TENN.

LOCATION.—At two-span highway bridge at Dandridge, Jefferson County, Tenn., 12 miles below mouth of Nolichucky River.

DRAINAGE AREA.—4,450 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 1, 1918, to September 30, 1920. Gage-height records have been obtained by United States Weather Bureau since December 1, 1904.

GAGE.—Painted on shoreward side near downstream end of second concrete pier from right bank; read by W. L. Anderson.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Right bank high; left bank subject to overflow for some distance back above stage of 12 feet. The river bed at the gage is composed of silt and mud and is very changeable. Control probably formed by a dam and temporary dikes about 1 mile below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 14.0 feet October 30 (discharge, 66,000 second-feet); minimum discharge, 830 second-feet October 10–12.

Maximum stage recorded during year ending September 30, 1920, 16.5 feet April 3 (discharge, 81,600 second-feet); minimum stage recorded, 0.0 foot October 4 (discharge, 974 second-feet).

The highest flood known reached a stage of 28.0 feet May 21, 1901, according to the United States Weather Bureau.

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

ACCURACY.—Stage-discharge relation not permanent; bed of river is constantly changing. Standard rating curve fairly well defined between 2,000 and 30,000 second-feet. Gage read to tenths once daily. Daily discharge ascertained by shifting-control method. Records fair except those for low stages, which are poor.

Discharge measurements of French Broad River at Dandridge, Tenn., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Nov. 3	Paulsen and Switzer...	4.50	14,900	Nov. 25	A. H. Condron.....	0.50	1,970
1919.				1920.			
Apr. 6	C. G. Paulsen.....	2.26	7,370	Mar. 18	King and Condron.....	6.68	27,500
June 17	A. H. Condron.....	1.70	4,180	June 26	W. R. King.....	1.50	4,850

Daily discharge, in second-feet, of French Broad River at Dandridge, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1,720	41,800	5,880	7,650	8,740	11,600	8,660	8,860	5,280	6,020	3,730	2,180
2	1,550	26,700	5,250	23,400	7,610	9,920	7,540	10,900	4,620	5,060	4,030	3,620
3	1,390	17,400	4,930	45,000	7,650	9,100	7,210	9,630	4,320	4,150	3,750	2,880
4	1,390	11,800	4,620	37,400	6,920	9,100	7,210	8,020	4,290	3,860	3,750	2,640
5	1,390	8,470	4,650	23,500	6,920	8,360	7,210	6,540	4,260	3,330	3,480	2,200
6	1,390	7,390	4,060	19,400	6,600	18,200	7,210	6,190	3,980	3,330	3,220	2,200
7	1,390	6,680	4,060	12,700	6,600	22,900	7,170	6,500	3,950	3,100	4,030	2,000
8	1,390	5,980	4,090	10,500	6,600	15,400	7,170	7,170	4,500	4,470	3,510	2,020
9	960	5,020	4,090	10,500	6,600	13,000	6,780	6,460	3,920	3,890	3,250	1,830
10	830	5,020	3,810	9,260	5,950	24,500	6,400	7,130	3,350	3,620	3,000	1,830
11	830	5,020	3,810	9,300	5,950	22,400	6,400	7,460	3,330	3,620	2,760	1,830
12	830	5,060	3,840	8,510	5,950	16,400	7,060	8,590	3,330	3,350	3,000	1,650
13	1,240	5,060	3,840	7,760	5,980	12,600	7,030	7,420	3,050	3,120	4,990	1,670
14	1,240	4,440	3,840	6,710	6,680	10,900	8,130	6,360	3,020	3,120	5,310	1,670
15	1,240	4,180	8,980	6,710	8,900	10,100	6,990	6,320	3,020	2,880	4,090	1,340
16	1,240	3,890	9,800	6,710	8,940	9,260	6,960	7,030	3,000	3,120	5,310	1,340
17	1,240	3,890	13,300	6,740	8,550	9,260	9,220	6,290	2,760	3,920	4,090	1,340
18	1,100	5,780	23,200	9,380	7,420	11,000	10,900	5,580	3,250	3,950	3,840	1,360
19	1,100	9,880	13,300	14,600	6,710	11,000	9,960	5,580	4,060	5,150	3,560	1,360
20	1,100	7,900	9,840	12,800	6,400	10,100	6,190	6,220	4,350	9,510	3,300	934
21	1,100	6,460	8,240	10,300	6,050	9,300	7,210	6,190	3,510	11,200	3,050	1,070
22	1,390	5,150	9,880	9,420	6,740	8,550	6,820	7,240	4,090	9,510	2,810	1,070
23	1,900	5,150	49,300	8,240	18,100	8,550	6,460	6,850	3,540	6,880	2,830	1,090
24	1,390	4,530	43,200	14,700	16,600	7,790	6,090	6,120	4,380	6,880	2,830	1,700
25	1,550	4,560	27,000	18,600	14,200	7,100	6,090	5,440	9,300	5,850	2,830	1,700
26	44,000	4,560	21,200	14,700	16,200	7,100	6,050	5,410	21,500	4,870	2,830	1,700
27	29,400	4,260	14,800	31,800	17,200	7,100	6,050	7,100	22,600	4,260	2,600	1,700
28	26,200	4,290	13,400	21,200	13,300	7,130	5,350	6,400	13,700	4,000	1,980	1,700
29	18,900	6,220	9,960	14,800	.....	14,700	5,310	6,360	9,340	3,730	1,620	1,720
30	62,200	8,020	8,360	12,500	.....	7,130	7,030	5,980	7,060	3,730	1,620	1,720
31	63,300	.....	7,610	10,800	.....	9,460	.....	5,980	.....	3,460	1,620	.....
1919–20.												
1	1,240	2,230	1,900	3,780	7,720	5,950	13,600	6,850	4,650	4,440	2,710	6,780
2	1,240	2,230	1,900	3,510	6,990	5,950	54,100	6,500	4,350	4,440	3,730	6,090
3	1,240	2,230	1,550	3,000	5,610	5,280	81,600	7,940	4,350	6,400	3,730	6,090
4	974	1,850	1,550	3,000	6,990	4,960	47,500	7,210	4,990	5,020	3,200	6,090
5	1,740	1,850	1,550	2,530	25,100	4,960	48,600	6,850	7,030	4,410	2,950	6,050
6	1,260	1,850	1,900	2,530	17,900	4,960	33,200	6,850	13,600	4,410	2,710	6,050
7	1,260	1,850	2,530	2,530	14,000	8,860	26,300	6,540	11,000	4,410	4,290	5,710
8	1,740	1,670	4,060	3,000	8,860	8,090	21,600	6,190	8,900	4,410	7,980	5,380
9	1,420	1,690	5,950	3,000	7,720	6,640	16,100	6,880	6,680	4,410	4,560	5,060
10	1,270	1,690	17,900	3,780	7,350	6,640	15,100	6,880	5,640	3,840	6,880	5,710
11	1,270	1,690	22,000	3,510	6,290	5,950	14,200	6,540	4,710	3,810	17,800	6,400
12	1,270	1,690	13,100	4,060	5,950	6,640	12,400	6,190	4,410	3,810	13,400	7,790
13	2,140	2,270	8,090	4,060	5,950	32,600	10,600	5,850	4,410	3,810	12,500	9,750
14	2,830	2,980	15,000	3,510	5,950	33,700	9,380	5,540	4,120	3,810	9,960	7,790
15	3,860	2,980	14,000	3,000	5,950	20,400	9,380	5,540	4,120	3,810	9,920	9,750
16	3,590	3,510	12,200	3,000	5,610	12,700	8,630	5,540	4,120	5,640	18,200	14,100
17	2,830	3,510	8,470	4,060	5,610	21,400	8,240	5,220	4,120	6,320	14,300	10,200
18	2,830	2,080	7,720	7,350	5,280	34,800	8,240	4,900	4,120	6,990	14,300	8,170
19	2,400	2,080	5,280	5,280	4,960	23,000	7,870	4,900	4,150	6,990	13,400	6,320
20	2,400	2,100	4,960	4,960	4,960	35,800	7,130	4,590	4,740	6,990	13,400	5,310
21	2,400	2,100	4,960	4,350	4,960	29,400	6,780	4,620	8,590	6,990	11,600	4,990
22	1,980	1,900	4,650	4,350	6,640	18,900	6,430	5,250	10,200	6,990	9,880	4,680
23	2,400	1,900	4,350	6,640	9,670	12,700	9,880	5,250	9,380	6,990	10,700	4,090
24	4,470	1,900	4,350	5,950	17,400	10,500	9,060	4,620	7,830	5,610	11,200	3,810
25	5,120	1,900	4,060	21,400	16,900	8,860	7,900	4,620	5,710	4,320	8,280	4,380
26	4,500	1,900	3,780	18,900	13,100	8,510	6,820	4,930	5,060	3,750	7,540	5,610
27	3,920	1,900	3,510	15,000	10,500	10,600	8,660	5,580	5,060	3,750	14,300	4,960
28	3,380	1,900	3,510	10,500	8,090	9,710	9,880	4,960	5,060	3,220	11,200	4,350
29	2,880	1,900	3,510	9,670	6,640	13,200	9,060	4,960	4,440	3,220	12,400	4,350
30	2,440	1,900	3,250	8,860	.....	26,200	7,570	4,650	4,440	3,220	9,420	4,650
31	2,440	.....	3,250	8,090	.....	19,000	.....	4,650	.....	2,980	7,870	.....

Monthly discharge of French Broad River at Dandridge, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 4,450 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	63,300	830	8,900	2.00	2.31
November	41,800	3,890	8,150	1.83	2.04
December	49,300	3,810	11,400	2.56	2.95
January	45,000	6,710	14,700	3.30	3.80
February	18,100	5,950	8,930	2.01	2.09
March	24,500	7,100	11,600	2.61	3.01
April	10,900	5,310	7,130	1.60	1.78
May	10,900	5,410	6,880	1.55	1.79
June	22,600	2,760	5,820	1.31	1.46
July	11,200	2,880	4,740	1.07	1.23
August	5,310	1,620	3,310	.744	.86
September	3,620	934	1,770	.398	.44
The year	63,300	830	7,790	1.75	23.76
1919–20.					
October	5,120	974	2,410	.542	.62
November	3,510	1,670	2,110	.474	.53
December	22,000	1,550	6,280	1.41	1.63
January	21,400	2,530	6,040	1.36	1.57
February	25,100	4,960	8,920	2.00	2.16
March	35,800	4,960	14,700	3.30	3.80
April	81,600	6,430	17,900	4.02	4.48
May	7,940	4,590	5,730	1.29	1.49
June	13,600	4,120	6,000	1.35	1.51
July	6,990	2,980	4,810	1.08	1.24
August	18,200	2,710	9,490	2.13	2.46
September	14,100	3,810	6,350	1.43	1.60
The year	81,600	974	7,550	1.70	23.09

TENNESSEE RIVER AT KNOXVILLE, TENN.

LOCATION.—At county highway bridge at Gay Street, Knoxville, Knox County, 4 miles below junction of French Broad and Holston rivers.

DRAINAGE AREA.—8,990 square miles.

RECORDS AVAILABLE.—January 17, 1899, to December 31, 1912, and September 1, 1918, to September 30, 1920. Gage-height records have been obtained by United States Weather Bureau since February 1, 1883, but prior to 1899 records were not continuous.

GAGE.—Vertical staff bolted on shoreward side near downstream end of second stone pier from right bank of Gay Street highway bridge. For history of earlier gages see Water-Supply Paper 323.

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

CHANNEL AND CONTROL.—Channel bed below gage is mostly limestone rock, covered by sediment near left bank. Several rock dikes at right angle to current are located below gage near left bank. Prior to September 30, 1918, the Army engineers had done considerable dredging and building of dikes below gage, but now that work has been completed channel will probably remain fairly permanent. Right bank subject to overflow at gage height of 12 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 18.7 feet October 31 (discharge, 104,000 second-feet); minimum stage, −0.3 foot September 19–22 and 28 (discharge, 2,860 second-feet).

Maximum stage recorded during year ending September 30, 1920, 26.7 feet April 3 (discharge, 152,000 second-feet); minimum stage, −0.3 foot October 3 and 4 (discharge, 2,860 second-feet).

1900–1912; 1919–20: Maximum stage recorded 36.4 feet at 5 p. m. March 1, 1902 (discharge, 197,000 second-feet; revised) minimum discharge, 1,600 second-feet October 5–7, 1903 (revised).

The United States Weather Bureau reports a stage of 44.4 feet March 10, 1867, which is the highest stage known.

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

ACCURACY.—Stage-discharge relation practically permanent during years ending September 30, 1919 and 1920. Rating curve well defined below 110,000 second-feet; extended above 110,000 second-feet. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good.

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

Discharge measurements of Tennessee River at Knoxville, Tenn., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Mar. 29	Paulsen and Adkerson.	4.67	22,200	Mar. 14	Condron and King.....	11.30	59,500
Apr. 12	.....do.....	2.70	11,500				
Nov. 22	Condron and Adkerson.	.20	3,820				

Daily discharge, in second-feet, of Tennessee River at Knoxville, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	4,920	87,800	15,000	18,300	18,800	22,400	17,800	16,600	15,800	12,700	7,710	5,820
2	4,920	57,800	12,700	39,100	18,300	20,600	15,000	19,300	11,400	11,400	8,420	4,920
3	4,710	36,200	12,000	76,400	17,800	20,600	12,700	20,200	10,200	10,800	7,390	6,060
4	4,710	24,200	10,800	89,000	18,800	18,800	12,000	19,800	9,260	9,740	6,810	5,360
5	4,710	19,800	10,800	60,800	15,800	20,200	12,000	17,200	9,260	8,820	6,810	5,360
6	4,310	17,800	9,740	45,400	15,800	27,300	11,400	15,800	9,260	8,820	6,550	4,510
7	4,920	13,400	7,710	30,000	14,200	33,900	11,400	14,200	8,820	6,550	6,060	4,120
8	4,120	12,000	7,390	22,800	13,400	31,700	10,800	14,200	9,260	6,300	6,550	3,740
9	3,930	10,200	6,810	21,400	12,000	28,900	10,800	14,200	8,420	7,390	5,820	3,740
10	3,930	11,400	6,810	20,200	12,000	34,500	10,800	13,400	8,050	7,710	5,590	3,380
11	3,380	10,800	7,710	19,300	10,800	36,800	11,400	13,400	7,390	7,090	5,360	3,380
12	3,380	10,800	7,710	19,300	10,800	27,800	11,400	20,200	7,090	6,810	7,390	3,380
13	3,380	10,200	7,390	17,200	10,800	25,200	12,000	14,200	7,090	6,810	7,390	3,200
14	3,560	9,260	7,710	15,000	15,800	24,200	15,000	15,000	7,390	6,300	8,420	3,380
15	3,380	9,260	19,800	15,000	15,800	19,300	10,800	12,700	7,090	6,300	10,800	3,380
16	3,380	8,820	26,200	12,700	18,300	17,800	12,000	11,400	6,810	6,300	13,400	3,200
17	3,380	8,050	26,200	12,700	17,200	17,800	14,200	12,000	6,550	6,300	8,820	3,030
18	3,380	8,820	27,800	17,800	14,200	17,200	12,700	11,400	6,550	6,550	7,390	3,030
19	3,380	14,200	28,400	20,200	13,400	17,800	18,300	10,800	6,550	11,400	7,090	2,860
20	3,200	15,000	20,600	21,400	12,000	17,800	16,600	17,200	10,200	12,000	6,550	2,860
21	3,380	12,000	18,300	17,800	12,000	15,000	12,700	20,200	8,050	12,000	6,550	2,860
22	3,560	10,200	22,000	20,200	15,800	13,400	12,700	17,800	7,390	17,800	6,030	2,860
23	4,310	9,740	65,000	20,200	21,700	13,400	11,400	17,800	11,400	15,000	5,140	3,200
24	4,310	9,260	69,800	22,800	26,200	12,700	11,400	15,800	14,200	10,800	5,140	3,030
25	5,360	8,050	66,200	23,200	25,200	12,000	10,800	12,000	13,400	9,740	4,710	3,380
26	40,200	7,710	32,800	23,800	26,800	11,400	10,800	13,400	22,400	9,740	4,710	3,380
27	63,800	7,710	27,300	50,100	25,800	11,400	10,200	31,100	31,700	7,710	4,710	3,030
28	48,900	7,710	24,200	37,900	24,200	14,200	10,800	25,200	23,800	7,390	4,510	2,860
29	31,700	11,400	23,200	27,800	.....	19,800	10,800	21,700	19,300	7,090	4,510	3,030
30	60,200	14,200	18,300	22,000	.....	18,800	14,200	19,800	15,800	7,390	4,310	3,200
31	104,000	.....	15,000	20,200	.....	19,300	.....	17,800	.....	6,810	5,360	.....

Daily discharge, in second-feet, of Tennessee River at Knoxville, Tenn., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	3,030	5,140	4,710	7,090	16,600	13,400	23,800	12,700	7,090	6,060	5,360	15,000
2	3,030	5,820	4,510	7,390	13,400	12,700	74,000	12,000	7,090	6,060	6,060	11,400
3	2,860	4,920	4,310	7,090	11,400	12,000	152,000	12,700	7,390	11,400	5,590	10,800
4	2,860	4,920	4,710	6,810	14,200	12,000	123,000	12,700	9,740	11,400	5,360	11,400
5	3,030	4,920	4,710	6,550	27,300	12,000	81,200	11,400	13,400	10,800	5,360	11,400
6	3,380	4,920	4,710	5,360	27,300	12,700	60,800	11,400	20,200	6,300	5,140	11,400
7	3,200	4,920	5,590	4,920	22,800	20,200	44,300	10,800	23,200	6,060	5,140	10,800
8	3,200	4,710	7,090	4,920	20,600	19,300	37,400	10,800	19,800	7,390	9,740	9,260
9	3,200	4,510	11,400	5,820	16,600	17,800	32,800	12,000	12,700	7,390	9,740	8,820
10	3,200	4,510	25,200	5,820	13,400	12,700	28,400	11,400	9,740	7,090	11,400	8,820
11	3,030	4,710	33,900	8,050	12,000	12,700	24,200	11,400	8,820	7,090	21,700	10,800
12	3,200	4,920	29,500	7,390	10,800	13,400	22,400	11,400	8,050	6,810	21,700	13,400
13	4,510	4,710	22,400	7,090	10,800	51,200	19,800	10,800	7,390	6,550	19,300	17,800
14	5,140	4,920	27,300	7,090	12,000	63,200	19,300	9,740	7,390	6,300	17,800	17,800
15	11,400	5,360	43,700	6,810	12,000	52,400	18,300	10,200	7,090	6,300	22,000	15,000
16	12,000	5,140	41,400	7,090	12,000	33,900	17,800	10,200	6,810	9,260	33,900	21,000
17	12,000	4,710	25,200	8,050	11,400	36,800	18,300	8,820	6,810	10,800	28,900	22,000
18	7,390	4,510	22,000	8,820	10,800	52,400	17,800	8,050	6,810	10,800	30,600	20,600
19	6,550	4,310	15,000	17,800	9,740	46,600	14,200	7,710	7,390	9,740	23,200	13,400
20	6,550	4,310	12,000	12,700	9,740	69,800	13,400	8,820	7,390	12,700	23,800	10,200
21	6,060	4,310	10,800	9,740	9,260	67,400	12,700	8,420	12,700	12,000	20,600	9,260
22	6,300	4,310	10,800	10,800	13,400	48,300	12,000	8,420	20,200	10,200	22,000	8,820
23	8,050	4,310	10,200	18,800	20,200	29,500	17,200	9,260	20,600	8,820	24,200	8,420
24	10,200	3,560	9,740	32,800	28,900	23,200	15,000	7,710	15,800	8,050	27,800	7,390
25	10,800	3,560	9,260	48,300	31,100	19,800	12,000	7,710	11,400	7,390	23,200	7,090
26	10,800	3,380	7,710	44,300	28,400	19,300	12,000	8,420	10,200	7,090	17,800	6,550
27	12,000	3,560	7,390	32,800	22,800	18,800	12,700	8,820	8,420	6,550	18,800	8,420
28	7,710	3,560	7,390	23,200	18,800	19,800	15,000	8,420	7,390	6,550	20,600	7,390
29	7,710	3,740	6,550	19,800	17,200	19,800	14,200	8,050	6,810	5,820	20,200	7,710
30	7,090	4,710	6,550	18,800	.....	32,300	12,000	8,050	6,300	5,590	18,800	7,390
31	5,140	.....	6,300	17,200	.....	29,500	.....	7,390	.....	5,360	16,600	.....

Monthly discharge of Tennessee River at Knoxville, Tenn., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	104,000	3,200	14,500	1.61	1.86
November	87,800	7,710	16,500	1.84	2.05
December	69,800	6,810	21,300	2.37	2.73
January	89,000	12,700	28,400	3.16	3.64
February	26,800	10,800	16,900	1.88	1.96
March	36,800	11,400	20,700	2.30	2.65
April	18,300	10,200	12,500	1.39	1.55
May	31,100	10,800	16,600	1.85	2.13
June	31,700	6,550	11,300	1.26	1.41
July	17,800	6,300	8,950	.996	1.15
August	13,400	4,310	6,650	.740	.85
September	6,060	2,860	3,650	.406	.45
The year	104,000	2,860	14,900	1.66	22.43
1919–20.					
October	12,000	2,860	6,280	.699	.81
November	5,820	3,380	4,530	.504	.56
December	43,700	4,310	14,300	1.59	1.83
January	48,300	4,920	13,800	1.54	1.78
February	31,100	9,260	16,700	1.86	2.01
March	69,800	12,000	29,200	3.25	3.75
April	152,000	12,000	32,600	3.63	4.05
May	12,700	7,390	9,860	1.10	1.27
June	23,200	6,300	10,800	1.20	1.34
July	12,700	5,360	8,060	.897	1.03
August	33,900	5,140	17,500	1.95	2.25
September	22,000	6,550	11,700	1.30	1.45
The year	152,000	2,860	14,600	1.62	22.13

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, 1874, to October 21, 1913; March 1, 1915, to September 30, 1920.

GAGES.—From March 1, 1915, to September 30, 1918, two gages, 7 miles apart and set to the same datum, were used to determine variations 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 (the regular United States Weather Bureau gage) consists of a sloping section of steel railroad rail bolted to rocks and a vertical timber section bolted to the cliff on the left bank of the river about 200 feet upstream from the Walnut Street Bridge. Gage No. 2 was a vertical staff in 3 sections fastened to trees on left bank 100 feet upstream from the Cincinnati Southern Railroad bridge, and 7 miles above Chattanooga. As readings of gage No. 2 were discontinued September 30, 1918, and not resumed until January 1, 1921, the United States Weather Bureau's gage readings at Bridgeport, Ala., were used for determination of discharge as explained under "Accuracy."

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. The control for the Bridgeport gage is a gravel and rock shoal about half a mile below gage and is permanent.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year ending September 30, 1919, 189,000 second-feet January 5; minimum discharge, 6,000 second-feet September 30 represents outflow at Hales Bar dam.

Maximum discharge recorded during year ending September 30, 1920, 275,000 second-feet April 5; minimum discharge, 5,500 second-feet October 3, 4, and 5 represents outflow at Hales Bar dam.

1874–1920: Maximum stage recorded, 54.0 feet at 7 a. m. March 1, 1875 (discharge, 361,000 second-feet); minimum stage, zero on gage September 11–14, 1881, and September 19, 1883 (discharge, 4,800 second-feet).

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

REGULATION.—Flow during low stages is regulated to some extent by operation of power plant at Hales Bar dam.

ACCURACY.—Discharge at Chattanooga for years ending September 30, 1919 and 1920, could not be computed from readings of gage No. 1 owing to lack of readings of gage No. 2 to show the variations in slope of water surface caused by operation of power plant at Hales Bar dam. Readings of the United States Weather Bureau's gage at Bridgeport, Ala., 17 miles below Hales Bar, since 1896, plotted against readings of the gage near Walnut Street Bridge, Chattanooga, show that there was no radical change in relation between readings of the two gages until construction of the Hales Bar dam in 1913, indicating that the control for the Bridgeport gage is reasonably permanent. A rating curve for the Bridgeport gage was then constructed by plotting the discharge of all current-meter measurements made at Chattanooga against the gage height at Bridgeport, allowing an interval of one day

for flow between the two sites. Additional points were obtained by plotting crest discharge at Chattanooga against the crest gage height at Bridgeport for various rises before and after construction of the dam. These data indicate that the rating curve thus developed for the Bridgeport gage is probably not subject to an error greater than 10 per cent and is fairly well defined between 5,000 and 300,000 second-feet.

Daily discharge at Chattanooga as given in the following table was ascertained by applying the daily gage reading at Bridgeport to the rating table developed as explained above, allowing an interval of one day for flow between stations. As a check on accuracy of results obtained, monthly discharge for 1908 and 1912 (before construction of dam) and for year ending September 30, 1917 (after construction of dam) were computed by this method and found to agree within 10 per cent of published discharge. Daily discharge showed greater differences due in part to time interval involved. As result of regulation caused by operation of power plant at Hales Bar dam the flow for individual days during low-water season is different above and below the dam.

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

No discharge measurements were made at this station during the years ending September 30, 1919 and 1920.

Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	12,100	162,000	42,800	68,100	52,500	72,900	56,200	36,900	36,900	34,800	11,500	12,700
2	11,500	163,000	38,300	131,000	47,200	65,700	49,500	44,200	32,700	29,200	12,100	12,100
3	10,400	138,000	35,500	167,000	44,200	59,300	42,800	50,200	29,900	25,000	15,100	12,100
4	11,500	90,400	31,300	183,000	43,500	55,500	40,500	50,200	24,300	21,600	15,100	13,300
5	10,400	59,300	28,500	189,000	43,500	82,000	38,300	46,500	24,300	19,600	15,100	13,300
6	10,400	45,800	26,400	164,000	39,000	115,000	36,900	43,500	23,600	20,900	15,100	11,500
7	9,800	38,300	24,300	129,000	37,600	126,000	36,200	45,000	20,200	28,500	10,400	10,400
8	8,700	31,300	22,900	90,400	35,500	122,000	34,800	45,000	19,000	25,700	12,700	9,250
9	8,700	29,900	21,600	71,300	34,100	128,000	32,000	45,000	19,600	22,900	14,500	10,400
10	8,700	28,500	19,600	63,300	32,000	128,000	32,700	42,000	19,600	20,900	15,100	10,400
11	8,700	25,000	20,900	57,000	32,000	116,000	36,200	41,200	20,200	20,900	14,500	9,250
12	8,150	23,600	17,000	52,500	32,000	101,000	38,300	35,500	20,200	20,900	15,700	8,150
13	8,150	22,200	17,000	46,500	38,300	85,400	42,000	39,800	18,300	17,600	15,700	8,150
14	7,600	20,200	25,000	42,800	46,500	72,100	39,800	39,800	18,300	17,600	15,700	8,150
15	7,600	20,200	28,500	42,800	49,500	61,700	42,800	37,600	18,300	15,700	18,300	8,150
16	7,600	19,600	65,700	40,500	49,500	57,000	46,500	35,500	20,200	15,100	20,200	8,150
17	8,150	21,600	70,500	48,000	45,800	60,100	51,000	32,000	12,100	14,500	20,200	8,150
18	7,600	31,300	68,900	60,100	42,800	64,900	55,500	32,700	17,600	14,500	19,600	8,150
19	7,600	35,500	64,100	63,300	39,000	64,900	51,800	30,600	12,700	16,400	17,600	7,600
20	7,600	34,100	54,000	65,700	38,300	57,000	45,000	30,600	19,600	20,900	16,400	8,150
21	8,150	34,100	58,500	65,700	42,800	51,000	43,500	34,100	17,600	25,700	13,900	8,150
22	8,150	32,000	90,400	61,700	59,300	44,200	39,800	37,600	19,000	25,700	13,900	8,150
23	9,250	27,800	129,000	61,700	78,600	42,800	36,900	39,000	19,000	25,700	14,500	8,150
24	10,900	27,800	149,000	66,500	89,600	39,000	34,100	43,500	19,600	25,700	13,900	8,150
25	15,100	25,000	141,000	79,400	91,300	37,600	32,000	41,200	25,000	21,600	14,500	7,600
26	17,000	23,600	116,000	89,600	87,000	40,500	27,100	37,600	29,900	18,300	13,300	7,050
27	31,300	22,900	89,600	97,200	82,800	65,700	32,000	39,000	48,000	18,300	12,100	7,050
28	71,300	35,500	68,900	107,000	78,600	76,900	31,300	49,500	60,100	18,300	10,900	8,150
29	76,100	45,000	57,000	86,200	.....	75,300	29,200	57,800	54,000	15,700	12,100	7,050
30	97,200	46,500	49,500	70,500	.....	69,700	29,200	50,200	42,800	14,500	17,000	6,000
31	142,000	.....	47,200	57,800	.....	66,500	.....	42,000	.....	13,300	15,100	.....

Daily discharge, in second-feet, of Tennessee River, at Chattanooga, Tenn., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20												
1	8,150	19,600	32,000	20,900	48,800	42,800	149,000	43,500	24,300	22,900	14,500	40,500
2	8,150	19,000	31,300	20,900	42,000	41,200	211,000	42,000	22,900	27,100	14,500	38,300
3	5,500	15,700	25,700	19,000	46,500	39,000	246,000	42,800	25,000	40,500	14,500	35,500
4	5,500	15,700	25,000	17,600	78,600	39,000	266,000	46,500	42,800	42,800	13,300	37,600
5	5,500	17,600	21,600	15,100	96,400	47,200	275,000	44,200	58,500	39,000	13,300	41,200
6	6,000	21,600	19,600	15,700	96,400	54,000	266,000	39,000	64,900	29,900	12,700	36,200
7	8,150	17,600	19,000	14,500	84,500	52,500	239,000	38,300	57,000	26,400	12,700	34,100
8	8,150	15,100	31,300	15,100	70,500	49,500	193,000	36,200	57,000	25,000	17,600	32,000
9	8,150	15,100	72,900	18,300	57,000	48,800	141,000	35,500	53,200	22,900	47,200	32,000
10	8,150	15,100	117,000	18,300	50,200	39,800	102,000	35,500	39,000	24,300	80,200	39,000
11	6,500	17,600	124,000	21,600	42,000	45,000	86,200	35,500	32,000	22,200	93,800	41,200
12	8,700	18,300	104,000	25,700	38,300	83,200	75,300	36,900	27,800	19,600	102,000	35,500
13	9,800	19,000	93,000	25,000	40,500	128,000	66,500	42,800	25,000	18,300	125,000	39,000
14	9,800	20,900	92,200	23,600	34,800	145,000	61,700	44,200	22,900	16,400	140,000	61,700
15	14,500	18,300	105,000	22,200	34,800	145,000	56,200	39,000	21,600	15,100	145,000	63,300
16	20,200	17,600	105,000	23,600	34,800	144,000	54,800	32,700	19,600	16,400	163,000	59,300
17	25,000	15,700	99,800	25,700	32,000	138,000	54,000	29,900	19,600	17,000	165,000	57,800
18	25,000	15,700	75,300	35,500	30,600	140,000	52,500	29,900	18,300	42,000	149,000	55,500
19	24,300	15,700	57,000	40,500	32,000	144,000	49,500	32,000	18,300	50,200	125,000	48,000
20	20,200	13,900	46,500	40,500	29,900	144,000	51,800	30,600	25,000	54,800	98,100	38,300
21	19,600	12,100	41,200	37,600	32,000	148,000	55,500	32,700	40,500	48,000	83,600	33,400
22	22,900	13,900	36,900	41,200	63,300	140,000	55,500	33,400	58,500	39,000	81,100	29,900
23	30,600	13,900	32,000	66,500	84,500	119,000	52,500	32,000	59,300	34,800	80,200	26,400
24	42,800	10,900	27,800	98,100	94,700	89,600	49,500	28,500	54,000	29,900	77,700	22,200
25	39,800	11,500	27,800	133,000	93,000	72,100	47,200	29,900	46,500	26,400	69,700	19,000
26	32,000	13,900	25,000	147,000	84,500	64,100	45,000	32,700	37,600	23,600	62,500	23,600
27	30,600	13,900	23,600	140,000	69,700	58,500	44,200	32,700	32,000	21,600	54,000	21,600
28	30,600	15,700	21,600	113,000	61,700	59,300	46,500	32,000	27,100	20,200	56,200	21,600
29	27,800	19,600	22,900	87,000	49,500	56,200	46,500	30,600	24,300	18,300	60,900	21,600
30	22,900	26,400	22,200	68,900	.....	76,100	43,500	28,500	24,300	17,600	52,500	21,600
31	20,900	.....	21,600	57,000	.....	80,200	.....	24,300	.....	15,100	46,500	.....

NOTE.—Discharge as shown represent more nearly the outflow from Hales Bar dam than they do normal flow at Chattanooga. See "Accuracy" in station description.

Monthly discharge of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 21,400 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918-19.					
October	142,000	7,600	21,500	1.00	1.15
November	163,000	19,600	45,300	2.12	2.36
December	149,000	17,000	55,400	2.59	2.99
January	189,000	40,500	84,500	3.95	4.55
February	91,300	32,000	51,200	2.39	2.49
March	128,000	37,600	74,300	3.47	4.00
April	56,200	27,100	39,500	1.85	2.06
May	57,800	30,600	41,100	1.92	2 21
June	60,100	12,100	25,400	1.19	1.33
July	34,800	13,300	20,800	.972	1.12
August	20,200	10,400	14,900	.696	.80
September	13,300	6,000	9,100	.425	.47
The year	189,000	6,000	40,300	1.88	25.53
1919-20.					
October	42,800	5,500	17,900	.836	.96
November	26,400	10,900	16,600	.776	.87
December	124,000	19,000	51,600	2.41	2.78
January	147,000	14,500	46,700	2.18	2.51
February	96,400	29,900	57,000	2.66	2.87
March	148,000	39,000	86,300	4.03	4.65
April	275,000	43,500	106,000	4.95	5.52
May	46,500	24,300	35,300	1.65	1.90
June	64,900	18,300	36,000	1.68	1.87
July	54,800	15,100	28,000	1.31	1.51
August	165,000	12,700	73,300	3.43	3.95
September	63,300	19,000	36,900	1.72	1.92
The year	275,000	5,500	49,300	2.30	31.31

NOTE.—See footnote to daily-discharge table.

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, Ala.

DRAINAGE AREA.—30,800 square miles.

RECORDS AVAILABLE.—November 7, 1871, to September 30, 1920.

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, page 151.

DISCHARGE MEASUREMENTS.—Made from downstream side of combined railway and highway bridge at gage, using highway section which is the low level or through section of bridge.

CHANNEL AND CONTROL.—Bed rocky, rough, and uneven; probably permanent. Control practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 19.5 feet at 4 p. m., March 9 (discharge, 236,000 second-feet); minimum stage, −0.5 foot October 12, September 16–22 and 27–30 (discharge, 9,600 second-feet).

Maximum stage recorded during year ending September 30, 1920, 23.5 feet April 10 (discharge, 300,000 second-feet); minimum stage, −0.8 foot October 2 and 3 (discharge, 8,400 second-feet).

1871–1920: Maximum stage recorded, 32.5 feet at 10 p. m. and midnight, March 19, 1897 (discharge, 444,000 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. No discharge measurements were made by the Geological Survey during years ending September 30, 1919 and 1920, but a large number of measurements made by Hugh L. Cooper & Co., consulting engineers, during the fall of 1920, verify the rating curve below 125,000 second-feet. Rating curve is 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 United States Weather Bureau; results of discharge measurements by Hugh L. Cooper & Co.

Discharge measurements of Tennessee River at Florence, Ala., during August, September, and October, 1920.

[Made by engineers of Hugh L. Cooper & Co.]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
12.60	129,000	5.05	50,000	2.50	28,600	1.25	17,300
10.90	108,000	4.95	49,900	2.30	26,500	1.15	18,200
10.05	101,000	4.80	47,500	2.20	26,100	1.15	17,100
7.35	74,500	4.80	47,100	2.15	24,600	.95	16,900
7.00	67,000	4.65	44,300	2.15	22.900	.90	16,000
6.75	63,800	4.55	44,400	2.12	23,800	.85	15,800
6.70	64,900	4.40	42,700	1.85	22,900	.85	16,300
6.60	66.100	4.40	42,700	1.50	20,100	.75	15,500
6.50	64,600	4.10	41,400	1.40	19,200	.75	15,500
5.90	60,500	3.65	37,100	1.35	19,300	.55	13,400
5.90	55,600	3.15	32,500	1.30	18,200	.55	14,300
5.70	52,700						

Daily discharge, in second-feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	13,700	120,000	53,400	76,600	93,800	111,000	91,400	35,200	68,300	61,500	20,900	25,400
2	12,700	139,000	54,300	122,000	76,600	102,000	81,000	35,200	58,800	55,200	34,400	24,600
3	12,200	153,000	51,600	145,000	65,300	92,600	74,400	36,000	51,600	46,200	26,100	22,400
4	12,200	160,000	48,000	182,000	60,600	84,300	66,300	42,800	48,000	37,800	24,600	19,000
5	12,200	162,000	42,800	193,000	61,500	97,400	60,600	49,800	46,200	32,600	19,000	17,800
6	11,800	141,000	39,400	194,000	57,000	139,000	55,200	55,200	44,600	27,700	17,800	16,700
7	11,400	99,800	37,800	199,000	55,200	159,000	49,800	55,200	38,600	26,900	17,800	14,700
8	10,900	65,300	34,400	204,000	53,400	180,000	47,100	53,400	32,600	26,900	17,800	14,200
9	10,400	49,800	31,000	199,000	48,000	231,000	43,700	58,800	31,000	29,300	17,800	13,700
10	10,000	42,800	29,300	176,000	47,100	224,000	46,200	64,300	31,000	35,200	16,700	12,700
11	10,000	37,800	27,700	138,000	46,200	205,000	52,500	57,900	34,400	31,800	15,700	12,700
12	9,600	31,000	26,100	107,000	42,000	180,000	49,800	53,400	31,000	30,100	14,700	11,800
13	10,000	30,100	24,600	85,400	42,800	170,000	48,000	51,600	27,700	31,000	14,700	10,900
14	10,900	26,900	26,100	74,400	46,200	152,000	46,200	48,000	26,900	31,000	15,700	10,900
15	10,900	26,100	42,000	67,300	53,400	133,000	49,800	45,400	24,600	29,300	19,000	10,900
16	10,900	26,100	46,200	57,000	57,000	107,000	56,100	46,200	23,100	27,700	18,400	9,600
17	10,000	31,800	44,600	57,000	58,800	138,000	60,600	48,000	21,600	23,800	20,900	9,600
18	10,900	51,600	52,500	64,300	60,600	158,000	62,400	46,200	19,600	21,600	21,600	9,600
19	12,700	52,500	77,700	81,000	58,800	138,000	63,300	42,800	19,600	19,000	23,100	9,600
20	21,600	50,700	81,000	87,800	53,400	120,000	63,300	39,400	19,600	18,400	23,100	9,600
21	16,700	51,600	76,600	87,800	51,600	103,000	62,400	39,400	19,600	18,400	21,600	9,600
22	14,700	51,600	74,400	87,800	60,600	92,600	60,600	39,400	19,600	19,000	20,200	9,600
23	14,200	45,400	81,000	85,400	76,600	75,500	55,200	39,400	21,600	24,600	18,400	10,000
24	15,200	42,800	99,800	85,400	85,400	66,300	52,500	44,600	26,100	27,700	18,400	10,000
25	15,700	40,300	133,000	87,800	101,000	60,600	45,400	47,100	31,800	29,300	19,600	10,000
26	20,900	36,000	149,000	86,600	122,000	57,000	41,200	51,600	32,600	29,300	19,000	10,000
27	24,600	34,400	158,000	102,000	126,000	71,300	39,400	66,300	31,000	28,500	17,800	9,600
28	24,600	31,800	155,000	111,000	122,000	83,200	39,400	91,400	37,800	24,600	16,700	9,600
29	24,600	34,400	131,000	112,000	.....	92,600	36,000	82,100	46,200	23,100	17,200	9,600
30	60,600	44,600	99,800	118,000	.....	103,000	35,200	68,300	60,600	20,900	21,600	9,600
31	105,000	.....	78,800	109,000	.....	99,800	.....	70,300	.....	20,900	23,100	.....
1919–20.												
1	8,800	35,200	65,300	29,300	109,000	87,800	113,000	66,800	45,400	30,500	22,000	62,400
2	8,400	34,400	57,000	28,500	85,400	74,400	244,000	62,000	43,300	28,500	20,600	57,000
3	8,400	34,400	51,600	27,700	68,300	62,400	274,000	67,800	43,300	28,500	18,700	51,600
4	9,200	30,100	47,100	26,100	61,500	58,800	281,000	80,400	64,800	28,100	17,500	47,600
5	9,600	26,100	42,800	26,100	68,300	64,300	284,000	76,000	96,800	36,900	17,200	45,000
6	9,600	23,100	39,400	24,600	92,600	73,300	288,000	69,800	102,000	49,400	16,700	42,800
7	9,600	21,600	40,300	23,100	111,000	76,600	288,000	64,300	105,000	50,200	16,200	44,100
8	9,600	20,900	49,800	23,100	117,000	76,600	292,000	58,800	89,000	41,200	17,000	45,000
9	9,600	23,800	48,000	37,800	109,000	72,300	297,000	53,400	80,400	37,300	20,200	43,700
10	9,200	23,800	73,300	46,200	95,000	66,300	300,000	50,200	71,800	33,500	28,900	43,700
11	8,800	26,900	117,000	37,800	81,000	64,300	286,000	42,700	66,300	31,400	54,800	42,800
12	10,000	26,900	148,000	34,400	69,300	166,000	271,000	49,800	57,400	31,400	105,000	44,600
13	10,900	28,500	160,000	31,000	60,600	184,000	220,000	72,800	47,600	30,100	118,000	48,900
14	15,700	29,300	172,000	32,600	56,100	205,000	161,000	94,400	40,300	27,300	131,000	46,700
15	23,100	27,700	166,000	36,000	51,600	200,000	116,000	93,800	34,400	25,000	151,000	46,200
16	26,900	26,900	148,000	38,600	49,800	192,000	97,400	81,000	31,400	23,500	164,000	60,600
17	24,600	26,100	141,000	44,600	48,000	193,000	94,400	69,800	28,900	22,700	178,000	72,300
18	20,200	24,600	138,000	50,700	46,200	196,000	83,800	62,800	28,100	25,700	186,000	70,800
19	23,800	23,100	127,000	51,600	44,600	196,000	75,500	60,200	26,500	38,200	186,000	65,800
20	26,900	21,600	113,000	49,800	42,800	194,000	76,600	55,200	25,400	61,000	180,000	62,800
21	26,900	20,900	90,200	55,200	40,300	196,000	87,800	51,200	26,900	71,300	176,000	57,000
22	27,700	20,200	72,300	71,300	53,400	192,000	87,200	50,700	29,300	72,300	155,000	48,400
23	35,200	19,000	60,600	91,400	87,800	187,000	81,000	48,400	36,900	67,300	133,000	41,200
24	49,800	17,800	53,400	109,000	117,000	181,000	75,000	47,600	54,800	56,100	111,000	35,600
25	54,300	16,700	46,200	130,000	145,000	172,000	71,300	48,900	65,300	46,200	99,200	32,200
26	55,200	22,400	42,800	149,000	138,000	155,000	91,400	48,900	63,300	40,300	92,000	28,900
27	53,400	41,200	39,400	160,000	124,000	130,000	106,000	46,700	57,000	35,200	82,600	26,500
28	46,200	42,800	36,900	169,000	114,000	109,000	92,000	45,400	48,400	31,000	73,300	24,600
29	40,300	42,800	34,400	172,000	99,800	92,600	78,800	43,300	40,700	28,100	66,300	25,400
30	36,900	68,300	32,600	163,000	.....	87,800	72,300	41,600	34,400	25,700	63,300	24,600
31	36,000	.....	31,000	138,000	.....	85,400	.....	40,700	.....	23,500	66,300	.....

Monthly discharge of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 30,800 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	105,000	9,600	18,400	0.597	0.69
November	162,000	26,100	63,700	2.07	2.31
December	158,000	24,600	68,000	2.20	2.54
January	204,000	57,000	116,000	3.77	4.35
February	126,000	42,000	67,200	2.18	2.27
March	231,000	57,000	123,000	4.00	4.61
April	91,400	35,200	54,500	1.77	1.98
May	91,400	35,200	51,800	1.68	1.94
June	68,300	19,600	34,200	1.12	1.25
July	61,500	18,400	29,300	.951	1.10
August	34,400	14,700	19,800	.643	.74
September	25,400	9,600	12,800	.416	.46
The year	231,000	9,600	54,900	1.78	24.24
1919–20.					
October	55,200	8,400	24,000	.779	.90
November	68,300	16,700	28,200	.916	1.02
December	172,000	31,000	80,100	2.60	3.00
January	172,000	23,100	68,000	2.21	2.55
February	145,000	40,300	82,300	2.67	2.88
March	205,000	58,800	132,000	4.29	4.95
April	300,000	71,300	166,000	5.39	6.01
May	94,400	40,700	59,500	1.93	2.22
June	105,000	25,400	52,800	1.71	1.91
July	72,300	22,700	38,000	1.23	1.42
August	186,000	16,200	89,300	2.90	3.34
September	72,300	24,600	46,300	1.50	1.67
The year	300,000	8,400	72,200	2.34	31.87

PIGEON RIVER AT NEWPORT, TENN.

LOCATION.—At Cocke County steel highway bridge, 300 feet upstream from Southern Railway bridge, 1 mile upstream from Newport railroad station, and 6 miles upstream from mouth of river.

DRAINAGE AREA.—655 square miles.

RECORDS AVAILABLE.—September 4, 1900, to October 12, 1901 (fragmentary); January 1, 1903, to December 31,1905; December 1, 1906, to December 31, 1909; and November 6, 1918, to September 30, 1920. The United States Weather Bureau has obtained gage heights since December 1, 1906.

GAGE.—Chain gage bolted to latticed railing on downstream side of bridge near left bank; read by C. M. Babb.

DISCHARGE MEASUREMENTS.—Made from downstream side of highway bridge to which gage is attached.

CHANNEL AND CONTROL.—Left bank is high rock cliff; right bank is overflowed above 10-foot stage. Bed solid rock near left bank and sand near right bank. Control is a rock ledge 500 feet below gage extending across stream in front of a sand bar island below railroad bridge; probably permanent and is well defined for low and medium stages. There is a possibility of back-water effect from mill pond of Newport flour mills, 1 mile below, during low stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 10.0 feet at 6 p. m. December 22 (discharge not determined); minimum stage, 0.5 foot September 21 (discharge, 130 second-feet).

Maximum stage recorded during year ending September 30, 1920, 17.0 feet at 5 a. m. April 2 (discharge not determined); minimum stage 0.4 foot October 3 (discharge, 102 second-feet).

1903–1905; 1907–1909; 1919–20: Maximum stage recorded 17.0 feet, April 2, 1920 (discharge, not determined); minimum stage recorded, 0.4 foot October 3. 1919 (discharge, 102 second-feet).

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

REGULATION.—Some regulation at low stages is caused by operation of industrial plants at Hartford, Tenn., 18 miles upstream, but the effect at gaging station is probably slight.

ACCURACY.—Stage-discharge relation fairly permanent during years ending September 30, 1919 and 1920. Rating curve fairly well defined between 300 and 4,000 second-feet; extended beyond these points. Gage read to tenths once daily. Daily discharge ascertained by applying gage height to rating table. Records fair except for stages below 300 and above 4,000 second-feet.

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

Discharge measurements of Pigeon River at Newport, Tenn., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Nov. 5	A. H. Condron	2.45	1,550	Nov. 25	A. H. Condron	1.02	291
1919.				1920.			
Apr. 10	C. G. Paulsen	1.95	876	Mar. 18	King and Condron	4.10	3,890
June 17	A. H. Condron	1.43	533	June 25	W. R. King	1.61	694

Daily discharge, in second-feet, of Pigeon River at Newport, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1			780	1,200	980	1,560	875	1,680	780	875	445	348
2			780	10,300	980	1,320	780	2,200	695	780	555	348
3			695	3,700	980	980	780	1,680	695	695	555	265
4			695	3,210	875	980	780	1,320	620	555	555	228
5			620	2,200	1,090	780	875	980	555	555	498	228
6		1,320	620	2,200	980	5,020	780	1,090	555	498	445	228
7		1,090	620	1,940	875	2,900	695	875	555	498	395	228
8		980	695	1,560	875	2,200	620	1,320	498	445	395	228
9		980	695	1,940	875	4,240	980	980	498	980	980	193
10		980	695	1,680	980	3,370	980	1,090	445	1,090	875	193
11		980	875	980	980	2,760	980	875	445	980	980	193
12		875	875	980	980	2,200	1,320	875	445	875	1,560	160
13		875	780	980	980	1,810	1,090	875	445	695	1,680	348
14		875	695	780	1,090	1,430	980	980	498	620	1,200	348
15		780	3,370	780	1,430	980	980	980	555	555	980	305
16		780	2,200	695	695	980	1,200	780	695	555	980	265
17		875	2,760	695	695	875	2,760	780	780	980	780	228
18		1,200	2,200	1,200	1,200	1,430	1,680	980	498	1,680	780	228
19		1,680	1,940	1,680	1,680	980	1,680	875	555	2,760	620	193
20		980	1,200	1,560	1,560	875	1,200	980	555	1,680	555	160
21		780	980	1,320	1,320	780	1,090	1,090	555	1,320	498	130
22		1,430	12,200	1,090	1,090	780	980	980	620	1,430	498	160
23		980	6,610	980	3,370	780	980	980	695	1,680	445	229
24		780	4,820	3,050	2,760	780	980	875	1,090	980	445	980
25		780	3,700	2,200	2,200	695	980	1,090	2,200	980	395	1,200
26		695	3,370	6,610	3,370	780	875	980	2,480	875	305	875
27		695	2,200	3,700	2,200	780	1,090	1,200	2,200	875	305	395
28		875	2,200	1,560	1,940	1,940	1,320	1,430	1,680	695	265	193
29		1,430	1,680	1,560	.....	1,560	980	1,320	1,430	620	305	160
30		875	1,200	1,430	.....	1,330	2,620	1,200	980	498	305	160
31		.....	980	980	.....	1,100	.....	980	.....	445	348	.....

Daily discharge, in second-feet, of Pigeon River at Newport, Tenn., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	130	305	395	498	1,320	980	3,370	1,560	555	498	555	980
2	130	395	395	498	1,200	875	.....	1,430	555	620	620	780
3	102	348	445	445	980	875	8,520	1,680	555	875	620	780
4	305	395	445	445	6,000	780	6,400	1,320	980	620	555	620
5	265	395	445	445	3,210	875	7,020	1,200	1,320	498	555	620
6	348	348	498	498	2,480	1,680	3,370	1,200	1,680	498	555	980
7	498	305	555	445	2,070	1,680	2,900	980	1,200	498	555	1,200
8	498	305	555	498	1,680	1,560	2,620	980	980	555	980	875
9	780	305	620	498	1,560	1,200	2,480	2,200	780	498	780	780
10	620	305	4,620	555	1,320	980	2,620	1,430	695	498	1,430	980
11	228	395	3,370	555	1,200	980	2,760	1,090	620	498	2,760	875
12	265	498	1,430	555	1,200	1,430	2,200	980	620	555	1,940	980
13	1,430	555	1,200	498	1,680	5,210	2,200	980	555	980	1,940	1,810
14	395	555	2,200	498	1,430	3,700	1,940	1,320	555	780	1,810	1,200
15	445	498	1,940	445	1,200	3,370	1,940	980	555	780	2,620	980
16	498	445	1,680	498	1,200	2,760	1,680	980	555	620	2,200	1,680
17	620	305	1,090	2,070	1,200	8,960	2,200	875	498	695	3,370	980
18	695	305	980	980	1,320	4,620	1,940	780	445	875	2,620	875
19	555	305	780	980	980	4,820	1,810	780	445	980	2,200	780
20	555	305	555	1,200	875	5,600	1,560	780	498	1,200	2,200	780
21	498	305	555	1,090	875	3,370	2,200	695	1,680	980	2,340	620
22	395	265	555	1,200	980	2,200	2,760	695	2,200	780	1,200	620
23	2,070	305	620	1,430	1,680	1,810	2,200	695	1,810	780	1,560	555
24	1,430	305	620	1,810	2,200	1,430	1,940	695	1,430	695	1,090	555
25	780	305	555	3,880	2,200	1,430	1,200	620	980	620	980	555
26	780	348	555	3,370	1,940	1,560	1,200	980	620	980	980	555
27	498	348	498	3,210	1,680	1,810	1,940	875	620	780	2,070	555
28	445	348	498	3,530	1,200	1,560	1,430	780	555	695	1,810	555
29	445	498	498	2,200	980	6,820	1,320	695	555	620	1,560	498
30	395	395	445	1,680	.....	4,060	1,200	695	498	620	1,430	620
31	348	.....	445	1,560	.....	3,210	.....	620	.....	555	980	.....

NOTE.—Gage not read Mar. 30, 31, and Sept. 1, 1919; discharge interpolated. Rating curve not sufficiently well defined to warrant determination of discharge for the high stage (16.0 feet) on Apr. 2, 1920.

Monthly discharge of Pigeon River at Newport, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 655 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
November 6-30	1,680	695	983	1.50	1.40
December	12,200	620	2,060	3.14	3.62
January	10,300	695	2,090	3.19	3.68
February	3,370	695	1,390	2.12	2.21
March	5,020	695	1,580	2.41	2.78
April	2,760	620	1,130	1.72	1.92
May	2,200	780	1,110	1.69	1.95
June	2,480	445	843	1.29	1.44
July	2,760	445	927	1.42	1.64
August	1,680	265	643	.982	1.13
September	1,200	130	313	.478	.53
1919–20.					
October	2,070	102	563	.860	.99
November	555	265	366	.559	.62
December	4,620	395	969	1.48	1.71
January	3,880	445	1,230	1.88	2.17
February	6,000	875	1,650	2.52	2.72
March	8,960	780	2,650	4.05	4.67
May	2,200	620	1,020	1.56	1.80
June	2,200	445	853	1.30	1.45
July	1,200	498	701	1.07	1.23
August	3,370	555	1,510	2.30	2.65
September	1,810	498	841	1.28	1.43

NORTH TOE RIVER AT SPRUCE PINE, N. C.

LOCATION.—At county highway bridge in Spruce Pine, Mitchell County, 600 feet southwest of Carolina, Clinchfield & Ohio Railroad station, and half a mile below Beaver Creek.

DRAINAGE AREA.—130 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 19, 1907, to July 1, 1908, and April 21 to September 30, 1920.

GAGE.—Vertical staff fastened to rock ledge on left bank 50 feet upstream from bridge; read to hundredths twice daily by G. A. Wilkie.

DISCHARGE MEASUREMENTS.—Made from downstream side of single span highway bridge 50 feet below gage.

CHANNEL AND CONTROL.—Stream bed composed of rock and shifting sand. Left bank low and subject to overflow at flood stages. Right bank high and not subject to overflow. Control is well-defined shoal 100 feet below gage; probably permanent.

EXTREMES OF STAGE.—Maximum stage recorded during period ending September 30, 1920, 3.55 feet at 5 a. m. August 9; minimum stage, 1.28 feet at 6 p. m. August 1.

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

REGULATION.—Some regulation caused by small power development 1 mile above gage.

Data inadequate for determination of discharge.

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

April 20, 1920: Gage height not determined; discharge, 384 second-feet.

Daily gage height, in feet, of North Toe River at Spruce Pine, N. C., for the year ending Sept. 30, 1920.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	1.94	1.65	1.94	1.30	1.73	16	.....	1.69	1.58	1.53	2.33	1.85
2	.....	1.87	1.63	1.72	1.65	1.71	17	.....	1.71	1.57	1.49	2.13	1.65
3	.....	1.90	1.90	1.63	1.43	1.79	18	.....	1.90	1.58	1.90	2.10	1.61
4	.....	1.84	2.45	1.61	1.33	1.79	19	.....	1.94	1.66	1.66	2.62	1.55
5	.....	1.81	2.46	1.59	1.47	1.75	20	.....	1.84	2.02	1.57	2.35	1.69
6	.....	1.81	2.20	1.57	1.77	1.72	21	2.21	1.83	2.17	1.53	2.15	1.67
7	.....	1.81	1.98	1.57	1.59	1.71	22	1.99	1.81	1.86	1.49	2.07	1.63
8	.....	1.86	1.86	1.55	1.85	1.69	23	2.03	1.72	1.75	1.45	2.02	1.59
9	.....	1.83	1.81	1.55	3.38	1.65	24	1.92	1.77	1.73	1.41	1.89	1.69
10	.....	1.78	1.75	1.53	3.05	1.59	25	1.93	2.15	1.69	1.37	1.82	1.65
11	.....	1.76	1.71	1.67	2.85	1.57	26	2.15	1.93	1.62	1.36	2.01	1.73
12	.....	1.76	1.67	1.59	2.55	1.70	27	2.19	1.82	1.60	1.35	2.40	1.67
13	.....	1.80	1.64	1.59	2.45	1.69	28	2.04	1.75	1.57	1.37	2.92	2.45
14	.....	1.75	1.63	1.56	2.38	2.35	29	1.97	1.71	1.66	1.35	2.08	1.85
15	.....	1.70	1.59	1.57	2.51	2.30	30	1.90	1.69	2.29	1.33	1.97	1.75
							31	.....	1.69	.....	1.32	1.79	.....

NOLICHUCKY RIVER AT EMBREEVILLE, TENN.

LOCATION.—At county highway bridge at Embreeville, Washington County, 3½ miles northwest of Erwin and 14 miles southwest of Johnson City. North Indian Creek enters at Erwin and South Indian Creek enters 1½ miles farther upstream.

DRAINAGE AREA.—795 square miles (measured on topographic maps).

RECORDS AVAILABLE.—July 1 to September 30, 1920.

GAGE.—Chain gage bolted to top of downstream handrail of new steel highway bridge; read to hundredths twice daily by James Ammons.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Right bank is steep and high. Left bank subject to overflow at gage height of about 15 feet. Banks are wooded. Control is well-defined shoal 600 feet below gage; mainly solid rock and permanent.

EXTREMES OF STAGE.—Maximum stage recorded during period of records, 5.30 feet September 15; minimum stage, 2.22 feet July 31.

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

Rating curve not sufficiently well defined to warrant publication of discharge.

The following discharge measurement was made by W. R. King:

June 24, 1920: Gage height, 3.24 feet; discharge, 1,130 second-feet.

Daily gage height, in feet, of Nolichucky River at Embreeville, Tenn., for the year ending Sept. 30, 1920.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1	4.38	2.40	3.11	11	2.66	4.10	2.97	21	2.59	3.58	2.97
2	3.85	3.05	2.93	12	2.81	3.60	3.38	22	2.50	3.52	2.86
3	3.18	2.63	2.93	13	2.78	3.50	3.44	23	2.39	4.10	2.78
4	2.91	2.42	3.16	14	2.58	3.45	4.62	24	2.37	3.60	2.90
5	2.75	2.31	2.99	15	2.84	2.88	4.95	25	2.44	3.35	3.08
6	2.69	3.49	2.97	16	2.57	3.98	4.62	26	2.37	3.36	3.01
7	2.68	3.68	2.90	17	2.55	3.80	4.25	27	2.39	3.48	2.81
8	2.65	3.05	2.77	18	2.65	3.80	3.60	28	2.33	4.15	3.22
9	2.63	3.26	2.81	19	2.74	3.62	3.27	29	2.28	3.48	3.19
10	2.54	3.85	3.00	20	2.76	3.72	3.04	30	2.27	3.28	3.24
								31	2.26	3.16	.....

NOLICHUCKY RIVER NEAR GREENEVILLE, TENN.

LOCATION.—At Jones highway bridge, half a mile below Camp Creek, 5 miles southeast of Greeneville, Greene County, and 9 miles above power plant of Tennessee Eastern Electric Co.

DRAINAGE AREA.—1,100 square miles.

RECORDS AVAILABLE.—May 9, 1903, to December 31, 1908, and April 7, 1919, to September 30, 1920.

GAGE.—Chain gage bolted to downstream side of bridge. Prior to December 31, 1908, a chain gage was attached to upstream side of this same bridge. Datum of present gage is 2.04 feet lower than that of original gage. Read by Mrs. J. A. Blevins.

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

CHANNEL AND CONTROL.—Bed composed of gravel and rock; somewhat shifting. Right bank is high but subject to overflow at extreme flood stages; left bank not subject to overflow. Control is formed by well-defined gravel and rock riffle about 50 feet below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period April 7, 1919, to September 30, 1920, 15.1 feet April 2, 1920 (discharge, not determined); minimum stage recorded, 2.0 feet September 30 and October 5, 1919 (discharge, 385 second-feet).

1903–1908; 1919–20: Maximum stage recorded, 19.3 feet (original datum); crest stage during early morning of January 23, 1906 (discharge not determined); minimum stage, −0.15 foot (original datum), October 23, 1904 (discharge, 320 second-feet).

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

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined between 500 and 9,000 second-feet; extended above 9,000 second-feet. Gage read to half-tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good except those for high stages, which are subject to error.

Discharge measurements of Nolichucky River near Greeneville, Tenn., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Apr. 7	C. G. Paulsen	3.09	1,530	Mar. 19	Condron and King	5.95	8,180
Nov. 20	A. H. Condron	2.23	567	June 25	W. R. King	2.90	1,370

Daily discharge, in second-feet, of Nolichucky River near Greeneville, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Apr.	May.	June.	July.	Aug.	Sept.
1919.						
1	.....	2,320	1,830	1,910	1,310	940
2	.....	2,590	1,680	1,450	1,520	885
3	.....	2,240	1,450	1,310	1,680	625
4	.....	1,830	1,380	1,180	1,310	625
5	.....	1,750	1,310	1,120	1,180	580
6	.....	1,600	1,310	1,120	1,120	535
7	1,600	1,600	1,240	1,450	1,060	535
8	1,520	1,750	1,120	1,380	1,060	535
9	1,520	1,910	1,060	1,310	885	535
10	1,450	1,910	1,060	1,120	830	535
11	1,450	2,770	1,000	1,060	1,180	535
12	2,770	1,910	1,120	1,060	1,180	535
13	2,240	1,680	1,000	1,000	1,240	725
14	2,320	1,830	1,120	885	1,180	625
15	1,750	2,070	1,000	1,060	2,070	535
16	1,750	1,750	940	2,070	1,060	495
17	2,770	1,600	1,380	1,520	940	495
18	2,410	1,680	1,450	1,180	940	580
19	2,070	1,600	1,450	4,240	885	455
20	1,830	1,450	1,180	4,600	830	830
21	1,750	2,240	2,160	3,350	775	535
22	1,680	2,240	1,450	2,320	830	535
23	1,680	1,830	1,380	3,150	775	675
24	1,750	1,750	2,320	1,520	740	675
25	1,600	1,750	3,060	1,680	710	675
26	1,450	2,770	4,240	1,450	675	625
27	1,380	2,240	4,010	1,310	675	580
28	1,310	3,350	3,900	1,180	625	495
29	1,380	2,240	2,500	1,180	625	455
30	1,910	2,960	2,160	1,380	675	385
31	.....	1,990	.....	1,180	1,600	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	455	625	725	830	2,240	1,600	3,350	1,680	940	1,310	725	1,600
2	455	675	775	940	1,450	1,750	.....	1,680	940	3,560	1,450	1,380
3	455	725	675	675	1,180	1,450	14,300	1,600	1,120	1,830	625	1,380
4	495	625	625	625	6,300	1,910	8,460	1,680	1,520	1,310	725	1,380
5	385	625	580	535	4,240	1,600	10,700	1,380	2,680	1,060	725	1,380
6	580	580	625	495	2,500	3,350	6,720	1,450	3,150	1,000	775	1,310
7	625	580	725	625	2,070	2,240	5,220	1,380	2,320	1,000	3,150	1,240
8	625	580	775	830	1,830	1,680	4,720	1,450	1,990	940	1,750	1,180
9	535	580	1,450	940	1,600	1,750	4,720	1,600	1,380	885	2,410	1,060
10	455	420	6,860	885	1,310	1,520	3,350	1,310	1,180	830	2,960	1,310
11	495	580	2,860	830	1,520	1,750	3,060	1,380	1,310	885	2,960	1,450
12	535	625	2,240	830	1,310	2,150	2,770	1,180	1,120	1,000	2,410	2,240
13	860	725	1,750	625	1,450	11,300	2,680	1,310	1,030	940	1,830	1,910
14	1,180	940	3,150	725	1,750	7,150	1,990	1,240	940	1,000	1,750	4,720
15	1,000	775	2,500	775	1,310	4,240	2,160	1,380	885	940	2,590	6,580
16	830	675	2,160	725	1,310	3,560	2,070	1,120	940	885	3,250	4,720
17	830	625	1,600	1,380	1,060	8,310	2,240	1,120	830	775	2,410	4,240
18	1,310	625	1,450	1,910	1,180	6,580	2,070	1,000	830	830	3,900	2,770
19	885	580	1,600	1,380	1,450	5,920	1,910	1,240	885	1,000	3,150	2,070
20	830	455	1,120	1,060	1,120	5,250	1,680	1,310	1,600	1,120	2,770	1,830
21	775	535	1,120	1,180	1,120	4,580	2,070	1,380	1,600	940	2,770	1,520
22	725	535	1,060	1,180	1,180	3,920	1,750	1,120	3,150	830	2,320	1,380
23	830	535	1,060	1,310	2,680	3,260	1,750	1,060	2,410	775	3,670	1,240
24	1,600	580	1,060	2,070	3,150	2,590	1,830	1,060	1,910	675	2,770	1,240
25	1,270	420	830	5,220	3,900	2,240	1,830	1,060	1,380	675	1,910	1,380
26	940	535	885	3,560	2,960	2,240	1,600	1,450	1,120	725	1,830	1,380
27	885	580	830	2,960	2,070	2,590	2,240	1,180	1,000	675	2,500	1,310
28	830	625	885	2,680	1,750	2,320	2,070	1,060	940	625	2,410	1,310
29	775	580	830	2,590	1,910	4,480	1,910	1,120	940	625	2,240	1,990
30	580	535	725	1,910	.....	5,100	1,600	1,060	1,000	625	1,750	1,380
31	625	.....	830	1,750	.....	3,250	.....	1,000	.....	625	1,680	.....

NOTE.—Gage not read Oct. 13, 25, 1919, and Mar. 19–23, 1920; discharge interpolated. Stage on Apr. 2, 1920 (14.5 feet) too high for determination of discharge.

Monthly discharge of Nolichucky River near Greeneville, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,100 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1919.					
April 7–30	2,770	1,310	1,810	1.65	1.47
May	3,350	1,450	2,040	1.85	2.13
June	4,240	940	1,740	1.58	1.76
July	4,600	885	1,670	1.52	1.75
August	2,070	625	1,040	.946	1.09
September	940	385	592	.538	.60
1920.					
October	1,600	385	763	.694	.80
November	940	420	603	.548	.61
December	6,860	580	1,430	1.30	1.50
January	5,220	495	1,420	1.29	1.49
February	6,300	1,050	2,030	1.85	2.00
March	11,300	1,450	3,600	3.27	3.77
April		1,600			
May	1,680	1,000	1,290	1.17	1.35
June	3,150	830	1,440	1.31	1.46
July	3,580	625	997	.906	1.04
August	3,900	625	2,200	2.00	2.31
September	6,580	1,050	2,000	1.82	2.03
The year		385			

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 10 miles upstream from mouth of Watauga River.

DRAINAGE AREA.—828 square miles.

RECORDS AVAILABLE.—July 17, 1900, to September 30, 1920.

GAGE.—Chain gage fastened to vertical steel member and downstream guardrail of bridge, about 20 feet left of pier to which old staff gage was bolted; installed March 21, 1920. Previous to that date gage was a vertical staff attached to downstream side of bridge pier, nearest the right bank. Gage datum not changed. Read by W. C. Massengill.

DISCHARGE MEASUREMENTS.—Made from footway on upstream side of Virginia & Southwestern Railway bridge.

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 ending September 30, 1919, 7.7 feet October 26 (discharge, 11,800 second-feet); minimum stage 0.0 foot October 8 and September 18–21 (discharge, 185 second-feet).

Maximum stage recorded during year ending September 30, 1920, 8.2 feet at noon April 2 (discharge, 13,000 second-feet); minimum stage, 0.0 foot October 5 (discharge, 185 second-feet).

1900–1920: Maximum stage recorded 15 feet May 22, 1901 (discharge[1] not determined); 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.

[1] Discharge of 33,000 second-feet for stage of 11.45 feet Feb. 28, 1902, as published in previous reports, is considerably too large owing to erroneous extension of rating curve.

ACCURACY.—Stage-discharge relation practically permanent since 1909. Rating curve well defined below 6,000 second-feet. Gage read once daily to tenths previous to August, 1920, and to hundredths since that date. Daily discharge ascertained by applying daily gage height to rating table. Records good except those for high stages, which are fair.

Discharge measurements of South Fork of Holston River at Bluff City, Tenn., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Apr. 9	C. G. Paulsen	1.26	826	Mar. 21	King and Condron	4.15	4,270
Nov. 19	A. H. Condron	.40	322	Aug. 10	W. R. King	.89	550
19	do	.39	321				

Daily discharge, in second-feet, of South Fork of Holston River at Bluff City, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	285	4,900	1,100	1,020	1,380	2,130	1,280	1,580	1,280	530	370	475
2	245	2,900	860	6,780	1,280	2,010	1,100	2,130	1,190	530	590	475
3	245	2,010	785	10,100	1,100	1,680	1,020	2,630	1,100	475	715	370
4	245	1,580	785	5,800	1,100	1,680	940	1,900	1,020	475	475	325
5	212	1,280	715	3,460	1,190	1,380	1,020	1,580	940	420	420	285
6	212	1,100	650	2,760	1,020	2,630	1,020	1,280	940	420	420	245
7	212	1,020	590	2,250	940	2,370	940	1,190	940	860	370	245
8	185	940	590	1,900	940	2,010	940	1,480	860	590	475	245
9	212	860	590	1,790	940	1,790	860	1,380	785	650	370	245
10	212	785	530	1,480	940	2,010	860	1,680	715	530	325	245
11	212	715	590	1,380	860	1,790	785	1,380	650	420	325	245
12	212	715	590	1,280	785	1,680	1,380	1,190	650	715	1,280	245
13	285	715	530	1,100	785	1,580	1,480	1,020	590	590	785	245
14	285	715	530	1,190	1,480	1,380	1,280	1,280	590	475	475	212
15	245	715	1,280	1,190	1,790	1,280	1,100	1,280	530	590	420	212
16	285	715	1,790	1,280	1,580	1,190	1,020	1,190	590	475	420	212
17	245	715	1,480	1,190	1,380	1,020	2,010	1,190	590	475	420	212
18	245	785	1,580	2,370	1,280	1,020	1,580	2,250	590	420	475	185
19	245	1,020	1,480	3,040	1,100	1,100	1,280	2,130	590	530	530	185
20	285	1,020	1,280	2,500	1,020	1,020	1,100	1,790	530	530	420	185
21	325	940	1,020	2,010	1,020	940	1,020	2,010	475	475	325	185
22	420	940	1,020	1,680	1,190	940	940	1,680	530	475	325	285
23	370	785	2,630	1,480	2,130	860	1,280	1,680	650	475	325	325
24	325	715	2,370	4,560	2,130	860	2,250	1,380	860	590	325	420
25	650	715	1,900	3,760	1,790	715	1,900	2,010	1,380	475	285	325
26	11,800	650	1,480	3,180	3,760	715	1,580	8,720	1,790	475	285	285
27	4,560	590	1,280	2,500	3,320	785	1,380	4,220	2,250	475	285	285
28	2,370	590	1,280	2,130	2,630	2,500	1,190	3,460	1,280	475	285	245
29	1,900	1,380	1,020	1,680	.....	2,250	1,020	2,630	860	420	285	245
30	5,260	1,280	860	1,580	.....	1,580	1,100	1,900	650	420	245	212
31	8,270	.....	860	1,580	.....	1,380	.....	1,580	.....	370	325	.....

Daily discharge, in second-feet, of South Fork of Holston River at Bluff City, Tenn., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	212	370	370	650	1,190	1,380	1,790	860	475	590	285	860
2	212	475	370	650	1,100	1,020	12,500	860	420	860	370	940
3	212	650	325	530	1,020	1,100	9,180	860	530	3,180	352	743
4	212	530	325	530	1,100	1,190	4,900	785	590	1,790	352	940
5	185	475	325	785	1,580	1,380	3,760	785	1,680	940	317	626
6	245	420	370	590	1,480	1,790	2,900	785	4,560	715	321	626
7	245	370	1,020	715	1,280	1,680	2,760	715	2,250	590	497	554
8	285	370	4,900	715	1,100	1,280	3,180	1,020	1,380	650	519	542
9	285	370	2,370	715	1,020	1,190	2,760	1,280	1,020	590	578	530
10	245	325	3,910	650	940	1,190	2,250	1,020	860	530	566	602
11	245	325	4,220	590	940	1,020	1,900	860	785	475	508	566
12	245	370	2,500	530	940	1,280	1,680	860	650	475	475	715
13	1,100	370	1,680	530	860	6,580	1,580	785	590	475	602	1,020
14	1,480	370	6,380	475	1,020	6,580	1,580	715	590	420	1,360	860
15	1,380	370	5,440	475	940	3,910	1,380	715	530	420	2,180	1,320
16	785	325	2,900	530	715	2,900	1,280	650	475	590	1,680	1,380
17	785	325	2,130	2,370	530	3,910	1,280	590	475	650	1,190	1,120
18	650	325	1,680	2,010	1,100	3,460	1,100	590	475	530	1,160	830
19	590	285	1,480	1,480	940	3,040	1,020	590	475	530	1,660	663
20	475	285	1,280	1,190	940	10,600	1,020	590	530	860	3,320	614
21	370	285	1,100	1,020	860	4,540	1,020	590	1,190	715	3,320	590
22	420	325	1,020	2,130	860	3,320	940	530	1,380	530	5,440	530
23	475	325	1,020	8,050	1,580	2,500	860	530	1,020	475	5,620	486
24	530	325	940	5,620	3,180	2,010	860	590	785	420	3,320	554
25	1,020	325	860	6,380	3,040	1,900	785	650	650	590	2,250	785
26	1,020	285	715	4,390	2,370	1,900	785	650	530	475	1,660	876
27	785	285	715	3,040	1,680	1,790	1,020	590	475	420	1,480	815
28	650	370	715	2,370	1,480	1,580	1,020	530	475	370	1,260	715
29	530	370	715	2,130	1,480	1,900	940	530	475	370	1,020	614
30	475	370	650	1,580	.....	1,900	860	530	475	325	908	578
31	420	.....	650	1,480	.....	1,680	.....	475	.....	325	785	.....

Monthly discharge of South Fork of Holston River at Bluff City, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 828 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918-19.					
October	11,800	185	1,320	1.59	1.83
November	4,900	590	1,130	1.36	1.52
December	2,630	530	1,100	1.33	1.53
January	10,100	1,020	2,580	3.12	3.60
February	3,760	785	1,460	1.76	1.83
March	2,630	715	1,490	1.80	2.08
April	2,250	785	1,220	1.47	1.64
May	8,720	1,020	2,030	2.45	2.82
June	2,250	475	880	1.06	1.18
July	860	370	510	.616	.71
August	1,280	245	431	.520	.60
September	475	185	270	.326	.36
The year	11,800	185	1,200	1.45	19.70
1919-20.					
October	1,480	185	541	.654	.75
November	650	285	366	.442	.49
December	6,380	325	1,710	2.06	2.38
January	6,380	475	1,770	2.14	2.47
February	3,180	530	1,280	1.55	1.67
March	10,600	1,020	2,630	3.18	3.67
April	12,500	785	2,300	2.78	3.10
May	1,280	475	713	.861	.99
June	4,560	420	893	1.08	1.20
July	3,180	325	673	.813	.94
August	5,620	285	1,460	1.76	2.03
September	1,380	486	753	.910	1.02
The year	12,500	185	1,260	1.52	20.71

HOLSTON RIVER NEAR ROGERSVILLE, TENN.

LOCATION.—At Virginia & Southwestern Railway bridge near Austin Mill, Hawkins County, half a mile below 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, 1920.

GAGE.—Vertical staff attached to right side of bridge pier nearest the right bank; read by Fred Beal.

DISCHARGE MEASUREMENTS.—Made from steel highway bridge 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 ending September 30, 1919, 12.2 feet January 3 (discharge, 38,900 second-feet); minimum stage, 1.3 feet October 13, 15, and 18 (discharge, 720 second-feet).

Maximum stage recorded during year ending September 30, 1920, 15.0 feet (crest) April 3 (discharge, 50,400 second-feet); minimum stage 1.4 feet October 1–6 (discharge, 850 second-feet).

1904–1920: Maximum stage recorded, 20.0 feet crest on January 29, 1918 (discharge, 70,900 second-feet); minimum stage 1.0 foot October 23 to November 3, 1904 (discharge, 490 second-feet).

The United States Weather Bureau reports a stage of 38.4 feet for March 10, 1867.

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

REGULATION.—Some diurnal fluctuation is caused by operation of Austin Mill power plant and several small plants on tributaries, but the effect is negligible except during very low water.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve used for years ending September 30, 1919 and 1920, differs slightly from curve used previously, the maximum difference being 10 per cent for stages which occurred in those years. Curve fairly 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.

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

Discharge measurements of Holston River near Rogersville, Tenn., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Nov. 1	C. G. Paulsen	7.70	21,100	Mar. 20	King and Condron	10.72	32,800
				Aug. 11	W. R. King	2.86	3,470
1919							
Nov. 24	A. H. Condron	1.58	1,160				

Daily discharge, in second-feet, of Holston River near Rogersville, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	990	24,200	3,370	3,840	4,590	6,910	3,840	3,840	4,330	2,510	1,440	1,440
2	990	11,800	2,720	15,300	4,080	6,300	3,600	6,600	3,840	2,120	1,600	1,280
3	850	7,860	2,510	38,900	3,840	5,140	3,370	8,190	3,370	1,940	3,840	1,440
4	850	5,420	2,310	25,800	3,370	4,860	3,150	6,300	2,930	1,770	2,310	1,280
5	850	3,840	2,120	13,700	3,370	4,330	2,930	4,860	2,720	1,770	1,600	1,280
6	850	3,840	2,120	9,220	3,370	7,860	3,150	4,080	2,510	1,600	1,600	1,130
7	850	3,600	1,940	7,540	3,150	9,220	2,930	3,840	2,510	2,120	1,440	990
8	850	3,150	1,770	6,300	2,930	7,220	2,720	3,600	2,310	2,310	1,440	990
9	850	2,720	1,770	6,000	2,720	7,860	2,310	3,840	2,120	2,120	1,600	850
10	850	2,510	1,770	5,710	2,510	7,860	2,310	4,080	1,940	1,770	1,440	850
11	850	2,120	1,770	4,590	2,510	7,220	2,310	9,220	1,940	1,600	1,440	850
12	850	2,120	1,940	4,590	2,310	6,300	2,720	5,140	1,770	1,440	1,940	850
13	720	1,940	1,940	4,080	2,510	5,140	4,590	3,840	1,770	1,440	4,860	720
14	850	1,940	1,940	3,840	3,370	4,590	4,080	3,840	1,770	1,600	2,510	850
15	720	1,940	4,330	3,840	4,590	4,330	3,600	4,330	1,600	1,440	6,910	990
16	850	1,770	7,860	3,840	4,860	3,840	3,370	4,330	1,600	2,120	2,120	990
17	850	1,770	6,000	3,840	3,840	3,600	3,840	3,840	1,600	1,770	1,770	990
18	720	1,770	7,220	5,710	3,600	3,370	5,140	4,330	2,310	1,600	1,770	990
19	850	2,930	5,710	8,190	3,370	3,370	4,590	6,600	2,310	1,770	1,940	850
20	850	2,720	4,590	8,530	3,150	3,370	3,840	5,420	1,770	2,310	1,940	850
21	850	2,510	3,840	6,910	3,150	3,150	3,370	5,710	1,600	2,510	1,600	850
22	1,280	2,310	6,600	6,000	3,370	2,720	2,930	6,300	1,940	1,940	1,440	850
23	1,600	2,310	14,100	5,140	6,300	2,510	2,930	4,860	1,770	1,770	1,280	990
24	1,280	2,120	10,300	9,220	6,910	2,310	6,000	4,330	2,930	1,940	1,280	1,280
25	10,700	2,120	7,540	12,900	6,000	2,120	6,000	4,590	6,910	1,770	1,130	1,440
26	22,500	1,940	6,000	12,900	7,540	1,940	4,860	18,800	6,300	1,600	1,130	1,280
27	21,300	1,940	5,140	13,300	10,300	1,940	4,330	15,300	7,860	1,440	1,130	1,130
28	10,700	1,940	4,330	8,190	8,190	3,370	3,600	9,220	6,300	1,440	1,130	1,130
29	6,600	3,600	3,840	6,600	.....	1,940	3,150	8,190	4,590	1,280	1,130	990
30	21,700	3,840	3,370	5,710	.....	5,140	3,370	6,600	3,370	1,280	1,130	990
31	25,000	.....	3,150	5,140	.....	4,330	.....	5,140	.....	1,440	1,280	.....
1919–20.												
1	850	1,600	1,940	2,120	3,840	4,590	6,910	2,720	1,600	3,840	1,280	2,930
2	850	1,600	1,600	2,120	3,600	4,330	25,800	2,720	1,600	2,930	1,600	2,510
3	850	1,600	1,600	2,120	3,370	3,840	48,400	2,720	1,600	3,840	1,440	2,510
4	850	1,940	1,440	1,770	5,140	3,600	21,300	2,720	1,770	4,080	1,440	2,310
5	850	1,770	1,440	1,770	5,420	3,840	15,600	2,510	5,140	3,370	1,440	2,120
6	850	1,600	1,440	1,600	5,420	6,000	11,800	2,510	8,870	2,720	1,280	2,120
7	990	1,600	3,840	1,440	4,590	5,420	9,570	2,310	8,870	2,120	1,440	1,940
8	1,280	1,440	13,700	2,120	3,840	4,860	9,930	2,310	5,420	2,120	2,510	1,770
9	1,280	1,440	9,570	2,310	3,600	3,840	9,220	3,600	3,840	1,940	3,150	1,770
10	1,130	1,440	9,570	2,120	3,150	3,840	7,860	3,600	2,930	1,940	4,080	1,940
11	990	1,280	12,900	2,120	3,150	3,600	6,600	3,150	2,510	1,770	2,510	1,770
12	990	1,280	8,870	1,770	2,930	4,330	6,000	2,930	2,120	1,600	3,840	1,940
13	1,600	1,280	6,000	1,770	2,930	20,900	5,140	2,510	1,940	1,600	5,420	1,770
14	6,000	1,600	16,000	1,770	2,930	25,800	5,140	2,510	1,770	1,600	12,200	3,840
15	5,710	1,440	23,800	1,600	3,370	15,300	4,860	2,510	2,930	1,940	7,540	5,420
16	4,080	1,440	11,800	1,600	3,150	9,930	4,590	2,510	1,600	1,770	6,000	7,860
17	5,420	1,280	7,540	1,770	2,720	11,800	4,080	2,120	1,440	1,770	4,860	4,590
18	2,510	1,280	6,000	6,300	2,510	15,300	4,080	2,120	1,280	1,770	6,000	3,840
19	2,310	1,280	4,860	4,860	3,150	18,000	3,600	1,940	1,440	2,120	6,300	3,130
20	1,940	1,280	4,590	3,840	2,930	30,700	3,370	1,940	1,770	1,940	7,540	2,510
21	1,600	1,280	3,840	3,150	2,720	22,900	3,370	2,310	5,710	1,600	10,300	2,510
22	1,600	1,280	3,600	6,000	5,140	12,200	3,370	1,940	3,840	1,600	13,700	1,940
23	1,770	1,280	3,150	16,800	5,140	8,870	3,150	1,940	3,150	1,440	11,400	1,770
24	1,940	1,280	2,720	19,200	9,220	6,910	3,150	1,940	3,840	2,310	7,860	1,770
25	3,840	990	2,510	18,800	9,930	6,300	2,930	1,770	3,150	1,440	5,710	1,770
26	4,860	1,130	2,510	14,900	8,190	5,710	2,930	1,940	2,510	1,600	5,420	2,120
27	3,370	1,280	2,510	9,930	6,600	5,420	3,150	2,120	1,940	1,440	4,590	2,310
28	2,510	1,280	2,310	7,540	5,420	5,140	3,370	1,940	1,770	1,600	4,080	2,510
29	1,940	1,130	2,310	6,300	4,860	5,710	3,370	1,940	1,770	1,600	4,080	2,120
30	1,770	1,770	2,120	5,140	.....	6,910	3,150	1,770	1,600	1,440	3,370	1,940
31	1,600	.....	2,120	4,860	.....	6,000	.....	1,770	.....	1,440	2,930	.....

Monthly discharge of Holston River near Rogersville, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 3,060 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	25,000	720	4,530	1.48	1.71
November	24,200	1,770	3,820	1.25	1.40
December	14,100	1,770	4,320	1.41	1.63
January	38,900	3,840	8,880	2.90	3.34
February	10,300	2,310	4,280	1.40	1.46
March	9,220	1,940	4,650	1.52	1.75
April	6,000	2,310	3,630	1.19	1.33
May	18,800	3,600	6,100	1.99	2.29
June	7,860	1,600	3,020	.987	1.10
July	2,510	1,280	1,790	.585	.67
August	6,910	1,130	1,910	.624	.72
September	1,440	850	1,050	.343	.38
The year	38,900	720	4,010	1.31	17.78
1919–20.					
October	6,000	850	2,200	.719	.83
November	1,940	990	1,410	.460	.51
December	23,800	1,440	5,750	1.88	2.17
January	19,200	1,600	5,140	1.68	1.94
February	9,930	2,510	4,450	1.45	1.56
March	30,700	3,600	9,420	3.08	3.55
April	48,400	2,930	8,190	2.67	2.98
May	3,600	1,770	2,370	.774	.89
June	8,870	1,280	2,990	.977	1.09
July	4,080	1,440	2,070	.676	.78
August	13,700	1,280	5,010	1.64	1.89
September	7,860	1,770	2,640	.863	.96
The year	48,400	850	4,310	1.41	19.15

LITTLE TENNESSEE RIVER AT McGHEE, TENN.

LOCATION.—At the Louisville & Nashville Railroad bridge half a mile south of railroad station at McGhee and half a mile downstream from mouth of Tellico River.

DRAINAGE AREA.—2,470 square miles.

RECORDS AVAILABLE.—January 1, 1905, to December 31, 1913, and October 1, 1918, to September 30, 1920. Gage-height records have been obtained by United States Weather Bureau since November 29, 1904.

GAGE.—Chain gage bolted to ties on upstream side of railroad bridge; read by Annie V. Hill. The gage was moved to its present location November 30, 1905, the original location having been at the old railroad bridge 500 feet downstream. Datum was raised 0.3 foot when this change was made. Datum of gage used since October 1, 1918, is 0.79 foot lower than when station was discontinued in 1913.

DISCHARGE MEASUREMENTS.—Made from the downstream lower chord members of the 9-span bridge.

CHANNEL AND CONTROL.—Banks slope up to cultivated land and are subject to overflow above a gage height of 12 feet, but all water will pass under bridge and its trestle approaches. Bed is rocky; probably permanent. Control not determined.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 19.6 feet October 30 (discharge, 63,000 second-feet); minimum stage, 2.4 feet December 9 (discharge, 720 second-fect), caused by closing flood gates when dam at Tapoco, N. C., was completed.

Maximum stage recorded during year ending September 30, 1920, 30.5 feet at, noon April 2 (discharge, not determined); minimum stage 2.4 feet, October 2 (discharge, 720 second-feet).

1905–1920: Maximum stage recorded, 30.0 feet at 5 p. m. November 19, 1906 (30.8 feet referred present datum); the flood of April 2, 1920, reached a stage of

30.5 feet; minimum discharge 1905–1913 and 1919–20, 720 second-feet December 9, 1918, and October 2, 1919.

The United States Weather Bureau reports a stage of 39.0 feet in March, 1869 (discharge not determined).

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

REGULATION.—Large power development of Aluminum Co. of America at Tapoco, 30 miles upstream, completed in December, 1918, causes some diurnal fluctuation at gage.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined between 1,500 and 25,000 second-feet; extended beyond these limits. Gage read to tenths once daily. Gage readings during low stages may not represent mean gage height for the day owing to considerable diurnal fluctuation in stage caused by operation of power plant above station. Daily discharge ascertained by applying gage height to rating table. Records good except for low stages when discharge for individual days may be greatly in error because of diurnal fluctuations.

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

Discharge measurements of Little Tennessee River at McGhee, Tenn., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft*
Nov. 6	A. H. Condron	5.31	6,340	Mar. 13	King and Condron	9.81	20,200
1919.				Aug. 13	W. R. King	6.71	10,200
Apr. 14	C. G. Paulsen	5.22	6,260				
June 16	A. H. Condron	3.90	3,250				

Daily discharge, in second-feet, of Little Tennessee River at McGhee, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	1,980	25,100	5,940	7,850	7,850	9,530	7,290	7,850	4,680	6,750	2,510	2,700
2	1,980	14,900	5,170	30,000	7,290	9,530	7,020	16,800	4,210	3,530	3,100	2,330
3	1,980	11,300	4,920	37,600	6,750	8,970	6,480	9,530	3,980	3,100	2,900	2,510
4	1,810	8,970	4,680	24,400	6,750	7,850	5,940	7,020	3,750	2,900	2,510	1,810
5	1,650	7,850	4,210	15,200	7,290	7,290	6,210	6,480	3,530	2,700	2,510	1,810
6	1,650	6,750	3,980	13,400	6,480	24,800	5,940	7,020	3,530	2,900	2,510	1,650
7	1,650	5,940	3,750	11,300	5,940	16,800	5,680	8,690	3,750	3,980	3,530	1,490
8	1,490	5,420	1,980	10,400	5,680	12,200	5,420	7,850	3,530	3,100	2,700	1,490
9	1,490	5,170	720	9,820	5,680	18,500	5,170	9,530	3,310	3,980	2,700	1,490
10	1,650	4,680	770	8,970	5,680	20,600	5,170	8,410	3,530	3,310	2,510	1,490
11	1,650	4,440	820	8,410	5,170	14,300	5,170	8,130	3,750	2,900	2,510	1,490
12	1,650	4,210	1,200	7,850	5,170	12,200	4,920	5,940	3,750	2,900	3,310	1,490
13	1,810	3,980	1,070	7,290	5,420	10,400	7,570	5,940	4,210	2,700	4,440	1,650
14	1,980	3,980	2,330	7,020	11,600	9,530	6,480	8,690	3,750	2,700	3,100	1,490
15	1,650	3,980	20,200	6,750	9,820	8,970	5,940	6,480	4,210	2,700	2,700	1,490
16	1,490	3,980	11,600	6,480	7,570	8,130	6,480	3,530	3,100	2,700	2,510	1,490
17	1,340	5,680	9,250	5,940	6,750	8,690	14,000	7,850	2,700	3,100	2,510	1,340
18	1,340	7,020	8,690	9,820	6,210	11,300	10,400	7,850	3,310	2,700	2,510	1,200
19	1,650	7,570	8,130	10,700	5,940	9,820	8,130	4,920	2,900	6,480	2,700	1,200
20	1,980	5,680	6,210	8,410	5,680	8,130	7,290	6,210	2,700	4,920	2,510	1,070
21	3,100	4,920	5,940	7,290	6,750	7,570	6,750	7,020	2,700	4,680	2,510	1,200
22	3,310	4,920	32,000	6,750	8,130	7,020	6,210	7,570	2,700	4,680	2,700	1,340
23	2,150	4,920	59,000	6,480	22,600	6,750	7,020	6,750	2,700	5,680	2,510	940
24	1,980	4,680	23,700	15,900	13,400	6,480	5,680	6,480	7,020	4,210	2,510	940
25	3,530	4,440	18,900	11,900	11,000	6,480	4,440	8,690	9,530	4,680	2,510	940
26	15,600	4,210	14,300	15,600	15,600	6,480	5,170	5,940	12,800	3,100	2,510	940
27	11,300	3,980	11,600	18,500	12,800	8,410	4,920	7,020	11,000	2,700	2,510	940
28	10,700	4,680	10,400	13,100	10,400	13,100	4,680	5,680	8,690	4,440	2,510	940
29	13,700	12,200	9,250	10,400	.....	9,820	4,680	7,850	5,940	2,700	2,510	820
30	63,000	7,020	8,130	9,250	.....	8,130	6,750	6,480	6,210	2,510	2,510	820
31	55,500	.....	7,570	8,410	.....	7,290	.....	5,170	.....	2,510	2,700	.....

Daily discharge, in second-feet, of Little Tennessee River at McGhee, Tenn., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	820	2,150	4,680	3,100	8,410	5,680	12,800	8,410	3,980	2,900	3,310	8,410
2	720	2,330	3,310	3,530	6,480	4,440	46,400	8,410	3,530	4,920	2,900	7,020
3	940	3,100	3,100	3,100	5,940	4,210	89,000	8,410	3,530	5,170	3,100	7,650
4	1,070	2,900	2,700	2,330	11,600	4,210	45,400	9,530	5,940	3,530	3,100	11,600
5	940	2,150	2,700	2,700	14,300	8,410	45,900	9,530	8,130	4,680	3,100	7,300
6	1,070	1,980	2,700	2,150	8,130	10,100	30,000	10,700	8,410	2,700	2,900	6,400
7	1,490	2,150	3,310	1,810	8,410	6,210	23,000	10,400	4,920	2,330	2,330	5,400
8	1,200	1,980	5,680	3,530	7,570	5,940	18,200	10,700	3,980	3,310	2,510	4,500
9	1,200	2,150	13,700	4,210	3,980	5,680	15,200	10,700	3,750	2,700	2,900	6,800
10	1,340	2,150	43,600	4,680	6,210	4,920	16,500	11,000	3,100	2,150	5,170	9,000
11	1,200	2,150	18,900	4,680	6,480	5,170	14,300	9,530	3,100	2,330	19,200	4,500
12	1,200	3,310	10,100	3,750	5,680	10,100	12,500	4,920	2,510	2,330	10,100	6,000
13	4,440	3,980	8,690	3,530	5,940	26,600	12,200	6,480	2,700	2,330	11,600	25,100
14	3,980	4,440	18,900	3,530	6,480	14,600	13,100	7,850	2,700	2,150	16,500	12,200
15	3,530	3,750	17,800	3,530	5,680	10,700	8,130	8,970	2,330	2,330	39,400	10,700
16	2,700	2,510	11,600	3,310	5,170	8,410	4,920	3,980	2,700	3,530	23,000	8,690
17	3,530	2,510	4,440	11,600	4,210	44,500	11,300	7,570	2,510	2,900	16,200	8,130
18	3,530	1,980	4,210	8,970	5,680	26,600	8,690	5,940	2,510	3,980	14,300	6,210
19	2,510	2,150	5,940	6,750	4,680	16,800	8,410	6,210	2,700	6,750	14,900	5,420
20	2,330	2,150	5,680	5,420	4,210	25,800	8,690	5,940	3,750	8,690	12,800	5,170
21	2,150	2,150	5,680	4,440	4,210	14,900	10,100	5,680	11,300	5,940	11,600	4,680
22	2,150	1,980	4,680	7,290	4,920	12,200	10,400	7,570	6,750	3,310	13,100	4,680
23	17,500	1,980	4,210	7,570	10,400	10,400	6,750	5,420	4,210	3,310	14,600	4,210
24	11,600	1,980	4,210	13,700	12,200	9,530	8,690	5,170	4,920	3,100	10,400	4,210
25	5,420	2,330	4,210	32,900	10,400	8,410	7,290	4,440	2,700	3,100	8,970	4,440
26	3,100	2,150	4,210	13,700	5,420	9,250	7,570	5,940	3,750	3,530	7,850	4,440
27	2,700	3,310	3,750	5,420	5,680	13,700	10,400	6,480	3,310	3,750	8,410	3,980
28	2,150	2,700	3,530	15,200	5,680	7,290	11,300	5,170	3,310	3,530	14,600	3,980
29	2,510	2,900	3,750	10,100	5,170	20,900	8,970	4,920	3,310	3,100	9,530	3,530
30	2,330	3,530	3,530	8,130	.....	18,500	8,410	4,440	2,700	3,100	8,410	3,530
31	1,980	.....	3,310	8,410	.....	12,500	.....	4,680	.....	2,900	7,570	.....

NOTE.—Gage reading Dec. 10, 1918, apparently in error; discharge interpolated. Low discharge, Dec. 8–13, 1918, caused by closing gates when dam at Tapoco, N. C., 30 miles upstream, was completed. No gage readings Sept. 5–12, 1920 (gage chain stolen); discharge estimated by comparison with records at Tapoco dam obtained by Knoxville Power Co.

Monthly discharge of Little Tennessee River at McGhee, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 2,470 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918-19.					
October	63,000	1,340	7,020	2.84	3.27
November	25,100	3,980	6,750	2.73	3.05
December	59,000	720	9,880	4.00	4.61
January	37,600	5,940	12,000	4.86	5.60
February	22,600	5,170	8,400	3.40	3.54
March	24,800	6,480	10,500	4.25	4.90
April	14,000	4,680	6,430	2.60	2.90
May	16,800	3,530	7,400	3.00	3.46
June	12,800	2,700	4,720	1.91	2.13
July	6,750	2,510	3,610	1.46	1.68
August	4,440	2,510	2,720	1.10	1.27
September	2,700	820	1,420	.575	.64
The year	63,000	720	6,740	2.73	37.05
1919-20.					
October	17,500	720	3,010	1.22	1.41
November	4,440	1,980	2,570	1.04	1.16
December	43,600	2,700	7,640	3.09	3.56
January	32,900	1,810	6,870	2.78	3.20
February	14,300	3,980	6,870	2.78	3.00
March	44,500	4,210	12,500	5.06	5.83
April	89,000	4,920	17,800	7.21	8.04
May	11,000	3,980	7,260	2.94	3.39
June	11,300	2,330	4,100	1.66	1.85
July	8,690	2,150	3,560	1.44	1.66
August	39,400	2,510	10,500	4.25	4.90
September	25,100	3,530	6,900	2.79	3.11
The year	89,000	720	7,470	3.02	41.11

NANTAHALA RIVER AT WESSER, N. C.

LOCATION.—At Wesser station on Murphy branch of Southern Railway in Swain County, 500 feet below upper railroad bridge, one-fourth mile below mouth of Silvermine Creek, one-fourth mile above mouth of Wesser Creek, and 4 miles upstream from Almond, at junction of Nantahala River with Little Tennessee River.

DRAINAGE AREA.—160 square miles (measured on topographic map).

RECORDS AVAILABLE.—April 15 to September 30, 1920.

GAGE.—Vertical rod gage in two sections on left bank, 500 feet downstream from upper Southern Railway bridge; section 0 to 6.7 feet attached to 2 by 6 inch timber driven in river bed to rock and braced to a tree on bank; section 6.7 to 10.1 feet attached to large oak tree 15 feet from bank of river. Both rods are faced with enamel gage sections. Gage read once daily by J. Z. Wright.

DISCHARGE MEASUREMENTS.—Good measurements may be made only by wading. Measuring sections at the three bridges at Wesser are poor.

CHANNEL AND CONTROL.—Bed of river rough and rocky. Channel straight but current sweeps fron side to side owing to obstructions. Control is a rocky riffle or shoal which heads 10 feet below gage; probably permanent.

EXTREMES OF STAGE.—Maximum stage recorded during period of records, 3.0 feet at 8 a. m. August 14; minimum stage, 1.68 feet at 8 a. m. August 5.

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

REGULATION.—Negligible.

Data inadequate for determination of discharge.

Daily gage height, in feet, of Nantahala River at Wesser, N. C., for the year ending Sept. 30, 1920.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	2.4	2.0	1.85	1.8	2.05	16	2.5	2.15	1.9	1.8	2.75	2.05
2	.....	2.3	2.05	1.95	1.75	2.0	17	2.5	2.15	1.95	1.8	2.6	2.1
3	.....	2.35	2.05	1.95	1.7	2.05	18	2.4	2.25	1.9	2.2	2.35	2.0
4	.....	2.3	2.05	1.9	1.7	2.05	19	2.4	2.2	2.05	2.55	2.6	1.95
5	.....	2.25	2.0	1.8	1.7	2.0	20	2.4	2.15	2.4	2.35	2.45	1.9
6	.....	2.25	2.0	1.85	1.7	1.95	21	2.6	2.2	2.15	2.15	2.45	1.9
7	.....	2.2	2.0	1.85	1.8	1.95	22	2.35	2.15	1.95	2.05	2.45	1.9
8	.....	2.35	1.95	1.8	1.8	1.9	23	2.55	2.15	1.9	1.95	2.25	1.9
9	.....	2.2	1.95	1.8	2.2	1.9	24	2.35	2.15	1.9	1.9	2.05	1.9
10	.....	2.2	1.9	1.8	2.5	2.0	25	2.35	2.15	1.85	1.85	2.0	1.85
11	.....	2.2	1.9	1.8	2.45	2.0	26	2.45	2.2	1.9	1.8	2.0	1.9
12	.....	2.15	1.9	1.8	2.1	1.9	27	2.55	2.1	1.9	1.8	2.0	1.9
13	.....	2.45	1.9	1.75	2.55	2.55	28	2.45	2.05	1.9	1.8	2.1	1.9
14	.....	2.25	1.85	1.75	3.0	2.3	29	2.4	2.05	1.8	1.8	2.1	1.85
15	2.45	2.2	1.85	1.75	2.7	2.1	30	2.35	2.0	1.85	1.8	2.1	1.8
							31	.....	2.0	.....	1.75	2.15	.....

CLINCH RIVER NEAR LONE MOUNTAIN, TENN.

LOCATION.—At Southern Railway bridge at Clinch River station, three-fourths mile below mouth of Dutch Valley Creek, 1¼ miles above mouth of Big Sycamore Creek, and 3½ miles southeast of Lone Mountain, Claiborne County, Tenn.

DRAINAGE AREA.—1,560 square miles (measured on topographic maps).

RECORDS AVAILABLE.—April 1, 1919, to September 30, 1920.

GAGE.—Chain gage bolted to guard timber attached to top of ties on downstream side of Southern Railway bridge; read by S. K. Rosenbalm. A temporary staff gage, 500 feet downstream from chain gage, was used November 21, 1919, to August 8, 1920, when bridge was being repaired. All readings from temporary gage reduced to datum of chain gage by use of curve showing relation between readings of the two gages.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge. Measuring section is poor for low water and some inaccuracy introduced on this account.

CHANNEL AND CONTROL.—Bed composed of gravel and rock with a few gravel bars covered with small brush below the gage. Right bank fairly high but subject to overflow at extreme stages for about 50 feet. Left bank not subject to overflow. A permanent rock shoal about one-fourth mile below forms the control but formation of small gravel bars immediately below the gage may affect stage-discharge relation slightly.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period April 1, 1919, to September 30, 1920, 15.8 feet, January 24, 1920 (discharge, 28,300 second-feet); minimum stage, 2.9 feet, September 20–22, October 4 and 5, 1919 (discharge, 265 second-feet).

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

ACCURACY.—Stage-discharge relation may change occasionally. Rating curve fairly well defined between 300 and 25,000 second-feet. Gage read to half-tenths once daily. Daily discharge ascertained by applying gage height to rating table. Records fair.

Discharge measurements of Clinch River near Lone Mountain, Tenn., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Oct. 31	C. G. Paulsen.....	14.48	24,000	Mar. 16	King and Condron.....	8.43	8,060
				June 27	W. R. King.....	4.26	1,180
1919.				Aug. 7	.....do.....	3.44	483
Apr. 2	.....do.....	5.30	2,450				

Daily discharge, in second-feet, of Clinch River near Lone Mountain, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1919.							1919.						
1.....	2,620	2,400	2,260	940	395	395	16.....	2,330	3,140	733	592	625	305
2.....	2,470	4,360	1,870	770	500	350	17.....	2,910	2,910	695	770	560	305
3.....	2,330	5,320	1,450	660	500	500	18.....	2,620	2,760	625	695	560	305
4.....	2,060	3,860	1,340	625	473	445	19.....	2,470	2,620	660	810	592	285
5.....	1,930	2,910	1,140	560	445	420	20.....	2,200	3,220	695	988	500	265
6.....	1,800	2,330	1,040	530	420	395	21.....	1,800	5,960	625	850	560	265
7.....	1,680	2,130	940	500	420	395	22.....	1,560	7,090	850	625	530	265
8.....	1,560	2,470	850	560	372	328	23.....	1,450	4,360	1,040	625	500	350
9.....	1,450	2,620	895	560	395	305	24.....	1,680	3,220	1,240	592	420	500
10.....	1,340	3,700	940	770	395	305	25.....	3,060	2,690	1,560	560	395	500
11.....	1,560	5,060	895	695	395	285	26.....	2,620	6,520	5,960	530	350	445
12.....	1,930	5,770	940	625	445	285	27.....	2,060	10,600	3,700	445	328	395
13.....	2,620	3,620	770	500	770	500	28.....	1,800	6,700	2,200	395	305	350
14.....	2,470	3,060	770	660	592	372	29.....	1,560	4,540	1,450	395	305	328
15.....	2,200	2,910	850	733	560	328	30.....	1,870	3,860	1,180	395	305	305
							31.....	.....	2,910	.....	372	500	.....

Daily discharge, in second-feet, of Clinch River near Lone Mountain, Tenn., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	305	1,180	3,200	913	2,560	2,860	2,400	1,640	913	1,340	435	1,510
2	285	1,680	2,720	913	2,200	2,640	10,300	1,710	660	1,770	462	1,290
3	285	5,060	2,030	868	1,900	2,330	19,200	1,710	660	3,440	818	1,080
4	265	4,540	1,640	868	6,530	2,260	13,200	1,640	732	2,560	818	940
5	265	2,840	1,340	660	8,340	2,560	9,850	1,520	2,030	2,030	548	895
6	395	1,930	1,180	518	7,360	4,880	8,910	1,400	12,700	1,580	518	810
7	350	1,450	2,400	660	4,980	5,840	6,950	1,220	8,010	1,550	518	770
8	350	1,240	9,610	818	3,640	4,430	6,030	1,180	4,060	1,520	660	770
9	305	1,140	9,260	1,020	3,030	3,200	6,950	1,450	2,560	2,260	1,340	770
10	305	940	10,200	1,340	1,830	2,720	5,660	1,830	2,330	1,640	1,450	732
11	305	940	8,470	1,450	2,260	2,470	4,430	1,770	1,450	1,280	2,690	695
12	350	1,140	4,980	1,280	1,970	12,300	3,540	1,710	1,220	1,020	2,690	850
13	560	1,080	4,250	1,180	1,970	20,700	3,540	1,520	1,070	913	3,460	1,800
14	3,220	1,020	8,050	1,060	1,970	25,800	3,460	1,280	913	732	7,280	3,060
15	4,200	955	14,000	959	1,970	14,900	3,030	1,220	818	695	9,260	2,200
16	3,540	894	10,700	913	1,970	8,240	2,640	1,220	732	1,020	7,790	3,540
17	3,220	832	6,340	1,400	1,770	8,910	2,400	1,060	660	944	5,870	2,060
18	3,540	770	4,520	2,860	1,640	9,150	2,260	959	625	868	3,950	1,560
19	3,220	709	3,440	2,200	1,710	11,800	1,970	913	625	732	6,320	1,300
20	2,130	647	2,940	1,830	1,770	18,400	1,940	959	818	959	5,260	1,040
21	1,560	586	2,470	1,640	1,710	15,900	1,900	959	7,000	959	4,200	850
22	1,240	548	2,030	3,440	4,600	8,810	1,770	959	5,550	1,520	4,880	770
23	1,290	518	1,770	20,700	7,250	5,940	1,710	914	4,330	1,180	6,140	695
24	2,200	518	1,580	28,300	8,810	4,700	1,640	868	2,940	818	7,890	660
25	5,960	489	1,460	21,700	7,250	3,900	1,520	913	1,970	695	5,140	625
23	7,680	548	1,340	14,000	6,030	3,360	1,450	1,400	1,520	1,020	3,460	625
27	4,880	2,560	1,180	8,340	4,790	3,030	1,710	1,710	1,220	1,340	2,760	625
28	3,220	3,360	1,060	5,840	3,720	2,720	1,900	1,400	1,020	868	3,860	770
29	2,200	2,470	1,020	4,640	3,200	2,400	1,970	1,180	1,120	660	3,220	940
30	1,770	2,860	966	3,440	.....	2,260	1,770	959	1,060	548	2,260	770
31	1,340	.....	913	2,940	.....	1,970	.....	818	.....	489	1,740	.....

NOTE.—Gage was not read on the following days: June 19, Oct. 30, Dec. 25, 30, 1919, Jan. 29, Feb. 15, Apr. 20, May 23, June 13, 21, July 7, 17, 26, Aug. 17, 20, Sept. 19, 1920; discharge interpolated except June 21, for which it was estimated on basis of discharge at Clinton. No gage Nov. 13–20, 1919; discharge estimated by comparison with records of flow at Clinton.

Monthly discharge of Clinch River near Lone Mountain, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,560 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1919.					
April	3,060	1,340	2,070	1.33	1.48
May	10,600	2,130	4,050	2.60	3.00
June	5,960	625	1,340	.859	.96
July	988	372	623	.399	.46
August	770	305	465	.298	.34
September	500	265	359	.230	.26
1919-20.					
October	7,680	265	1,960	1.26	1.45
November	5,060	489	1,510	.968	1.08
December	14,000	913	4,100	2.63	3.03
January	28,300	518	4,470	2.87	3.31
February	8,810	1,640	3,750	2.40	2.59
March	25,800	1,970	7,140	4.58	5.28
April	19,200	1,450	4,530	2.90	3.24
May	1,830	818	1,290	.827	.95
June	12,700	625	2,380	1.53	1.71
July	3,440	489	1,260	.808	.93
August	9,260	435	3,470	2.22	2.56
September	3,540	625	1,170	.750	.84
The year	28,300	265	3,090	1.98	26.97

CLINCH RIVER AT CLINTON, TENN.

LOCATION.—At highway bridge at Clinton, Anderson County, 1,000 feet below Southern Railway bridge and 15 miles below mouth of Powell River.

DRAINAGE AREA.—3,090 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 1, 1918, to September 30, 1920. Gage readings have been obtained by the United States Weather Bureau since December 1, 1884.

GAGE.—Chain gage bolted to downstream railing of highway bridge 1,000 feet below Southern Railway bridge, used since July 1, 1920. Previous to July 1, 1920, the United States Weather Bureau's vertical staff gage bolted to downstream end of center concrete pier of Southern Railway bridge was used. Datum of chain gage is 0.10 foot lower than that of staff gage. Gages read practically the same at all stages. Gage read by George W. Massengale.

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

CHANNEL AND CONTROL.—Left bank high but right bank is subject to overflow at gage height of about 30 feet. Control is formed by a rock shoal 1½ miles below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 31.0 feet January 4 (discharge, 56,800 second-feet); minimum stage, 2.5 feet September 20–23 (discharge, 380 second-feet).

Maximum stage recorded during year ending September 30, 1920, 29.0 feet January 25 (discharge, 51,800 second-feet); minimum stage, 2.4 feet October 4 and 5 (discharge, 340 second-feet).

The United States Weather Bureau reports a stage of 45.0 feet on March 31, 1886, which is the maximum since December 1, 1884. The next highest stage is 38.0 feet which occurred March 5, 1917.

ICE.—River frozen over at gage for short periods during extremely cold weather.

ACCURACY.—Stage-discharge relation probably permanent during years ending September 30, 1919 and 1920. Rating curve well defined between 500 and 25,000 second-feet; extended beyond these limits. Gage read once daily to tenths prior to July 1, 1920, and to hundredths after that date; readings at low stages prior to July 1, 1920, subject to error owing to poor condition of staff gage. Daily discharge ascertained by applying gage height to rating table. Records since July 1, 1920, good except those for high stages which are only fair as gage was read only once daily. Previous to July 1, 1920, records are only fair owing to uncertainty in gage readings especially for low stages.

COOPERATION.—Gage-height record prior to July 1, 1920, furnished by United States Weather Bureau.

Discharge measurements of Clinch River at Clinton, Tenn., during period July 24, 1902, to Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1902.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
July 24	B. M. Hall	3.7	1,240	Mar. 28	C. G. Paulsen	10.16	8,650
				31	do	9.89	8,110
1904.				Apr. 4	do	7.18	4,310
Aug. 8	B. S. Drane	3.90	1,110	Nov. 23	A. H. Condron	4.18	1,540
1918.				1920.			
Oct. 29	C. G. Paulsen	7.60	4,610	June 26	W. R. King	6.85	3,800
				Aug. 5	do	4.20	1,470

Daily discharge, in second-feet, of Clinch River at Clinton, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1,060	39,300	2,550	5,250	5,250	9,560	6,500	4,990	4,610	2,740	860	680
2	990	28,400	2,640	29,400	4,010	6,650	5,120	7,570	3,790	2,460	1,060	625
3	925	11,700	2,460	49,000	4,010	6,210	4,610	9,560	3,040	2,100	1,330	625
4	860	7,730	2,280	56,800	3,140	5,510	4,010	8,540	2,740	1,780	1,330	625
5	740	5,120	2,020	29,400	2,940	4,990	3,570	7,410	2,460	1,550	1,260	570
6	625	3,680	1,780	16,800	2,740	17,400	3,350	5,250	2,100	1,330	1,190	520
7	570	2,840	1,550	10,800	2,740	18,900	3,040	4,860	1,860	1,330	1,060	520
8	520	2,640	1,400	9,050	2,640	17,600	2,840	4,860	1,620	1,060	1,190	470
9	470	2,550	1,400	7,410	2,640	17,200	2,550	4,990	1,860	1,120	1,120	425
10	470	2,460	1,400	6,210	2,640	17,000	2,370	5,120	1,860	1,260	990	425
11	470	2,370	1,330	5,790	2,640	17,000	2,190	6,070	1,940	1,260	860	425
12	470	2,280	1,260	5,120	2,460	13,600	2,550	6,950	1,780	1,120	860	625
13	470	2,190	1,260	4,490	2,190	9,910	2,740	7,250	1,860	990	1,120	520
14	425	2,020	2,020	4,010	2,550	7,410	4,370	5,790	1,860	925	1,260	520
15	425	1,940	9,050	3,680	3,460	6,070	4,610	5,250	1,860	925	1,260	520
16	425	1,780	13,800	3,570	4,610	5,250	3,570	4,860	1,700	860	1,120	470
17	425	1,620	18,300	3,570	4,370	4,610	4,860	4,990	1,620	740	990	470
18	425	1,700	13,600	4,730	3,680	4,370	5,250	4,860	1,550	680	1,060	425
19	425	1,860	7,250	6,210	2,840	4,010	5,790	4,610	1,480	740	1,120	425
20	470	1,860	6,210	6,650	2,640	3,680	4,730	4,730	1,330	860	1,120	380
21	520	1,860	4,370	10,600	2,460	2,840	4,010	6,650	1,480	1,260	1,060	380
22	860	1,860	8,210	8,210	5,250	2,550	3,790	10,800	1,550	1,330	990	380
23	990	1,860	12,900	6,500	8,210	2,370	3,350	12,700	1,620	1,260	925	380
24	1,120	1,780	16,100	9,050	10,300	2,370	2,840	7,570	2,460	1,260	800	425
25	1,550	1,700	13,600	12,700	9,910	2,280	2,550	6,070	2,840	1,190	740	470
26	1,940	1,620	8,540	12,900	9,050	2,280	4,010	5,250	3,140	1,060	680	520
27	2,370	1,400	7,730	11,700	8,710	2,840	3,140	17,200	11,000	925	625	520
28	2,740	1,260	5,510	8,210	9,220	7,410	2,640	9,910	6,210	800	625	520
29	4,610	1,860	4,370	6,650	.....	11,700	3,350	8,050	4,010	740	680	470
30	5,790	1,620	4,010	5,650	.....	11,000	4,010	7,570	3,140	680	680	470
31	25,800	.....	3,680	4,610	.....	9,050	.....	6,070	.....	680	740	.....
1919–20.												
1	425	2,460	6,210	1,320	4,860	6,650	4,010	3,680	2,840	2,550	1,160	3,620
2	380	2,370	6,070	1,310	4,490	5,930	24,600	3,790	2,840	2,460	1,120	2,890
3	380	2,940	5,250	1,300	3,790	4,990	34,300	4,010	2,840	3,090	1,060	2,460
4	340	11,700	4,010	1,290	8,210	4,990	34,300	4,010	2,840	4,730	1,300	2,190
5	340	8,210	2,840	1,280	14,600	5,120	28,900	4,010	2,840	4,130	1,400	2,020
6	380	4,990	2,190	1,270	15,300	6,210	23,200	4,010	6,650	3,140	1,480	1,860
7	380	3,460	3,680	1,260	11,700	7,890	17,800	2,940	14,600	2,990	1,190	1,780
8	425	2,840	7,890	1,330	8,050	9,050	13,600	2,940	10,800	2,550	1,220	1,660
9	425	2,550	19,200	1,860	6,650	7,410	11,700	2,940	5,930	2,320	1,220	1,660
10	380	2,550	23,000	2,460	5,250	5,250	11,700	2,940	4,010	3,840	2,320	1,620
11	380	2,460	19,600	2,550	4,610	4,990	9,910	3,240	3,460	2,550	3,400	1,580
12	425	2,460	15,700	2,640	4,010	6,650	8,210	3,240	2,940	2,190	5,560	1,550
13	1,260	2,550	10,400	2,740	4,010	15,700	6,650	3,240	2,940	1,940	11,500	3,140
14	2,840	2,550	11,700	2,740	4,010	41,800	5,930	3,240	2,840	1,740	7,330	4,550
15	6,210	2,460	17,800	2,640	3,790	43,800	5,930	3,240	2,840	1,820	10,600	7,100
16	6,070	2,370	23,500	2,550	3,790	25,800	5,650	3,240	2,840	1,620	18,900	5,380
17	6,350	2,370	17,200	2,740	3,790	18,900	5,250	3,240	2,840	1,820	19,700	6,580
18	4,990	2,280	9,910	3,350	3,460	17,800	4,610	3,240	2,840	2,190	12,500	5,060
19	6,070	2,100	7,410	4,990	3,460	20,000	4,010	3,240	2,940	2,100	8,130	4,800
20	4,990	2,020	6,070	4,010	3,140	28,200	4,010	2,940	4,610	1,780	9,140	2,890
21	3,460	1,940	5,250	3,680	15,700	29,400	4,010	2,840	11,700	1,740	7,410	2,420
22	2,640	1,860	4,250	4,990	23,200	25,800	3,680	2,840	9,910	1,820	7,020	2,100
23	2,550	1,780	3,570	13,600	23,200	14,600	3,460	2,840	9,910	1,900	8,710	1,900
24	3,350	1,780	2,840	40,000	22,500	10,800	3,460	2,840	7,410	2,100	8,050	1,740
25	5,930	1,700	2,460	51,800	19,600	8,210	3,460	2,840	5,930	1,740	10,300	1,620
26	11,700	1,620	2,020	37,600	14,600	7,410	3,460	2,840	4,010	1,480	7,330	1,550
27	12,100	1,860	1,860	24,600	10,800	6,210	3,460	2,840	3,460	1,300	5,580	1,480
28	7,100	2,940	1,700	14,600	9,050	5,250	3,460	2,840	3,460	1,900	4,310	1,510
29	5,120	4,990	1,550	9,910	6,650	5,120	3,460	2,840	3,460	1,590	3,790	1,660
30	3,680	6,650	1,400	7,410	.....	4,730	3,680	2,840	3,460	1,440	4,430	1,820
31	2,840	.....	1,330	5,250	.....	4,010	.....	2,840	.....	1,260	3,460	.....

NOTE.—River frozen over at gage Jan. 1–7, 1920; discharge estimated by comparison with records for Clinch River at Lone Mountain, Tenn.

Monthly discharge of Clinch River at Clinton, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 3,090 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	25,800	425	1,930	0.624	0.72
November	39,200	1,260	4,760	1.54	1.72
December	18,300	1,260	5,890	1.91	2.20
January	56,800	3,570	11,800	3.82	4.40
February	10,300	2,190	4,550	1.47	1.53
March	18,900	2,280	8,180	2.65	3.06
April	6,500	2,190	3,740	1.21	1.35
May	17,200	4,610	6,980	2.26	2.61
June	11,000	1,330	2,680	.867	.97
July	2,740	680	1,190	.385	.44
August	1,330	625	990	.320	.37
September	680	380	493	.160	.18
The year	56,800	380	4,450	1.44	19.55
1919–20.					
October	12,100	340	3,350	1.08	1.24
November	11,700	1,620	3,160	1.02	1.14
December	23,500	1,330	8,000	2.59	2.99
January	51,800	1,260	8,360	2.71	3.12
February	23,200	3,140	9,180	2.97	3.20
March	43,800	4,010	13,200	4.27	4.92
April	34,300	3,460	10,000	3.24	3.62
May	4,010	2,840	3,180	1.03	1.19
June	14,600	2,840	5,000	1.62	1.81
July	4,730	1,260	2,250	.728	.84
August	19,700	1,060	6,150	1.99	2.29
September	7,100	1,480	2,740	.887	.99
The year	51,800	340	6,210	2.01	27.35

POWELL RIVER NEAR ARTHUR, TENN.

LOCATION.—At bridge on Dixie Highway 3½ miles east of Arthur, Claiborne County, Tenn., and 7 miles north of New Tazewell. Engine Creek enters 1½ miles above gage.

DRAINAGE AREA.—685 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 1, 1919, to September 30, 1920. Gage heights have been obtained by United States Weather Bureau since September 1, 1904.[1]

GAGE.—Chain gage attached to plank railing on upstream side of bridge. Previous to August 6, 1920, gage was a vertical staff fastened to a large sycamore tree on left bank 100 feet downstream from bridge. The two gages are set to the same datum. Read by B. M. Richardson.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Right bank slopes gradually; left bank is steep up to gage height 20 feet, then flattens out. Banks subject to overflow above gage height of 20 feet. Control is a rock and gravel shoal 500 feet downstream.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1920, 16.5 feet January 24 (discharge, 15,000 second-feet); minimum stage, 0.2 feet October 11 (discharge, 110 second-feet).

1904–1920: Maximun stage recorded 27.2 feet January 29, 1918; minimum stage, −0.1 foot December 1–6, 1909.

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

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

[1] Published by U. S. Weather Bureau as Powell River at Tazewell, Tenn.

ACCURACY.—Stage-discharge relation fairly permanent. Rating curve fairly well defined between 160 and 6,000 second-feet. Gage read once daily to tenths prior to August 6, and to half-tenths after that date; readings previous to August 6, 1920, are not fully reliable as little attention was paid to reading gage when river was at low and medium stages. Daily discharge ascertained by applying gage height to rating table. Records poor previous to August 6, 1920; good after that date.

Discharge measurements of Powell River near Arthur, Tenn., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 15	King and Condron	7.02	5,470
June 28	W. R. King	1.10	544
Aug. 6	do	.54	253

Daily discharge, in second-feet, of Powell River near Arthur, Tenn., for the year ending Sept. 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	185	885	2,660	480	885	1,080	1,820	705	535	645	375	590
2	185	2,660	2,060	480	705	885	5,850	1,080	535	950	375	508
3	145	6,450	1,820	425	480	705	11,200	1,020	480	2,140	325	480
4	145	4,190	1,500	425	2,660	590	9,450	950	590	1,430	480	425
5	145	3,560	1,220	375	3,110	480	6,250	885	1,080	1,080	535	415
6	145	2,750	950	375	2,840	1,290	4,950	825	3,560	885	425	400
7	145	1,980	1,430	325	2,480	1,430	3,920	825	3,020	1,080	275	375
8	145	1,500	4,460	325	1,980	1,820	2,840	765	1,360	1,020	480	375
9	145	1,150	6,750	325	1,150	1,580	2,480	765	1,080	885	885	365
10	145	1,020	7,450	275	1,080	1,360	2,300	705	1,020	765	1,150	375
11	110	950	6,450	275	950	1,290	2,140	645	950	645	1,580	350
12	825	950	3,560	275	825	3,560	1,980	590	885	590	2,930	825
13	2,480	885	2,480	230	705	11,000	2,300	535	825	535	2,260	1,260
14	3,110	885	8,450	230	590	14,400	2,660	535	765	480	4,420	3,200
15	1,580	825	7,450	230	535	6,850	2,480	535	705	480	5,550	1,740
16	1,290	825	5,450	230	480	4,010	2,220	480	645	480	7,950	3,200
17	1,150	765	3,560	765	425	4,010	2,060	480	590	645	4,460	1,900
18	1,080	765	2,750	950	425	6,250	1,660	480	535	950	2,800	1,220
19	1,020	705	2,060	885	425	5,850	1,360	535	480	825	2,750	885
20	950	645	1,660	825	425	6,450	1,080	535	480	645	1,820	705
21	885	645	1,080	705	425	4,010	950	535	1,580	535	1,500	590
22	825	590	950	3,560	5,450	3,110	825	535	3,110	480	2,140	535
23	765	535	825	11,800	6,450	2,660	825	480	2,140	480	1,540	480
24	2,660	535	705	15,000	5,750	2,220	825	480	1,500	425	1,500	452
25	5,250	480	645	12,000	4,950	1,820	825	765	885	425	1,360	425
26	3,560	480	590	7,350	3,380	1,660	765	1,360	765	425	1,120	425
27	3,380	1,080	590	3,830	2,570	1,500	765	2,060	705	425	918	480
28	2,060	3,740	590	2,660	1,820	1,430	765	1,660	705	425	825	535
29	1,430	3,830	535	1,820	1,360	1,290	765	1,430	645	375	735	425
30	1,080	3,380	535	1,430	.....	1,150	765	1,080	645	375	705	425
31	950	.....	535	1,080	.....	950	.....	645	.....	375	618	.....

Monthly discharge of Powell River near Arthur, Tenn., for the year ending Sept. 30, 1920.

[Drainage area, 685 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
October	5,250	110	1,220	1.78	2.05
November	6,450	480	1,650	2.41	2.69
December	8,450	535	2,640	3.85	4.44
January	15,000	230	2,260	3.30	3.80
February	6,450	425	1,910	2.79	3.01
March	14,400	480	3,120	4.55	5.25
April	11,200	765	2,640	3.85	4.30
May	2,060	480	803	1.17	1.35
June	3,560	480	1,090	1.59	1.77
July	2,140	375	706	1.03	1.19
August	7,950	325	1,770	2.58	2.97
September	3,200	350	812	1.19	1.33
The year	15,000	110	1,720	2.51	34.15

EMERY RIVER AT DEERMONT, TENN.

LOCATION.—At county highway bridge at Deermont siding on the Cincinnati, New Orleans & Texas Pacific Railway, 3.2 miles north of Oakdale, Morgan County, and 8 miles northwest of Harriman, Tenn. Crab Orchard Creek enters 500 feet below and Obed River enters 5 miles above station.

DRAINAGE AREA.—702 square miles (measured on topographic maps).

RECORDS AVAILABLE.—July 15 to September 30, 1920.

GAGE.—Chain gage bolted to upstream railing of bridge.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed of river at gage is composed of boulders. Right bank subject to overflow at gage height of about 10 feet, flooding land for 400 feet back from river. Left bank not subject to overflow. Control consists of a series of boulder shoals, the location depending upon the stage. These shoals are subject to change during extremely high water.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 9.7 feet at 3.30 p. m., August 11 (estimated discharge, 12,800 second-feet); minimum stage, 0.27 feet at 3.15 p. m., August 1 (discharge, 8 second-feet).

ACCURACY.—Stage-discharge relation fairly permanent. Rating curve well defined between 20 and 6,000 second-feet; extended above 6,000 second-feet. Gage read to hundredths once daily. Daily discharge ascertained by applying gage height to rating table. Records good below 6,000 second-feet; fair above that stage.

Discharge measurements of Emery River at Deermont, Tenn., during the year ending Sept. 30, 1920.

[Made by W. R. King.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
July 15	0.91	79
Aug. 4	.42	18.9

Daily discharge, in second-feet, of Emery River at Deermont, Tenn., for the year ending Sept. 30, 1920.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1	.....	8	570	11	.....	11,800	1,150	21	412	2,510	612
2	.....	17	557	12	.....	11,000	1,300	22	258	4,610	481
3	.....	19	457	13	.....	7,460	2,920	23	176	2,440	412
4	.....	22	172	14	.....	8,700	3,500	24	103	1,780	325
5	.....	13	335	15	92	6,180	3,960	25	101	1,260	285
6	.....	20	186	16	77	10,400	4,120	26	88	929	335
7	.....	216	276	17	60	5,730	2,260	27	46	740	267
8	.....	220	267	18	103	6,270	2,210	28	39	640	481
9	.....	2,670	640	19	212	3,880	945	29	39	570	499
10	.....	4,580	865	20	725	2,850	929	30	30	544	320
								31	19	598	.....

NOTE.—Gage not read July 31; discharge interpolated.

Monthly discharge of Emery River at Deermont, Tenn., for the year ending Sept. 30, 1920.

[Drainage area, 702 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
July 15–31	725	19	161	0.229	0.14
August	11,800	8	3,180	4.53	5.22
September	4,120	172	1,050	1.50	1.67

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; October 27, 1918, to September 30, 1920.

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 of sand, gravel, and boulders. Low-water control is formed by a gravel and boulder riffle, only slightly shifting; high-water control is formed partly by masonry piers of railroad bridge, partly by sand bars which form about piers, and partly by the riffles below. Stage-discharge relation subject to slight changes due largely to shifting of sand bar between right bank and first pier of railroad bridge from right bank.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 14.15 feet at 5 p. m. December 22 (discharge, 14,400 second-feet); minimum stage 5.0 feet at 8 a. m. and 5 p. m. September 25–30 (discharge, 225 second-feet).

Maximum stage recorded during year ending September 30, 1920, 14.6 feet at 7 a. m. April 2 (discharge, 15,100 second-feet); minimum stage recorded, 5.0 feet from 7 a. m. October 1 to 5 p. m. October 2 (discharge, 225 second-feet).

1896–1920: 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 changed during period July 1, 1917, to October ber 26, 1918, when station was not in operation; permanent after October 26, 1918. Rating curve well defined below 7,000 second-feet; extended above that point. Below 500 second-feet curve is confirmed by measurements made subsequent to September 30, 1920. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except for stages above 7,000 second-feet.

Discharge measurements of Hiwassee River at Murphy, N. C., during the years ending Sept. 30, 1919 and 1920.

[Made by A. H. Condron.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1918.	*Feet.*	*Sec.-ft.*	1919.	*Feet.*	*Sec.-ft.*	1920.	*Feet.*	*Sec.-ft.*
Oct. 27	6.68	1,700	Jan. 15	6.06	1,030	Jan. 25	7.93	3,960
31	7.99	3,890	Apr. 4	6.05	1,020	Mar. 31	6.84	1,960
Nov. 7	5.80	796	1920.			Apr. 13	6.86	2,010
1919.			Jan. 22	6.06	1,030	16	6.80	2,040
Jan. 11	6.20	1,150	24	9.62	6,650			

Daily discharge, in second-feet, of Hiwassee River at Murphy, N. C., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	.....	2,040	795	1,620	1,170	1,500	1,070	1,170	630	885	630	475
2	.....	1,500	710	4,110	1,070	1,380	1,070	975	630	795	630	405
3	.....	1,170	710	4,0.0	1,070	1,270	975	885	630	710	630	372
4	.....	975	630	2,540	1,170	1,170	1,070	885	550	630	630	340
5	.....	885	630	2,040	1,070	2,710	1,070	.795	550	630	550	340
6	.....	885	550	1,620	975	3,050	975	885	550	2,540	550	340
7	.....	795	630	1,500	975	2,040	975	1,070	475	1,380	550	340
8	.....	710	550	1,380	975	1,620	975	1,890	475	1,170	475	340
9	.....	710	550	1,380	975	2,220	975	1,170	475	975	475	310
10	.....	630	550	1,270	975	2,370	885	1,170	710	795	475	310
11	.....	630	630	1,170	975	1,890	1,500	1,070	550	795	550	340
12	.....	630	630	1,070	885	1,620	1,270	975	475	710	550	405
13	.....	550	630	1,070	1,170	1,270	1,070	975	475	710	475	310
14	.....	550	795	975	1,750	1,380	1,070	975	475	710	475	280
15	.....	550	2,040	975	1,380	1,270	975	975	475	630	475	280
16	.....	630	3,390	975	1,170	1,380	1,750	795	475	630	550	280
17	.....	885	2,200	1,070	1,070	1,500	1,620	795	630	630	475	280
18	.....	975	1,500	1,380	1,070	1,620	1,380	795	710	630	475	252
19	.....	795	1,270	1,170	975	1,380	1,170	795	630	1,170	405	252
20	.....	710	1,070	1,070	975	1,270	1,170	795	475	885	405	280
21	.....	630	1,620	975	1,170	1,170	975	795	550	1,170	405	280
22	.....	630	13,100	975	2,880	1,170	975	795	550	885	550	280
23	.....	630	3,900	1,890	2,540	1,170	975	710	630	795	475	280
24	.....	630	3,220	1,890	1,750	1,070	975	710	1,170	710	475	280
25	.....	630	2,540	1,500	1,890	975	885	795	1,380	630	475	252
26	.....	630	1,890	2,880	1,750	975	885	795	2,040	710	405	225
27	1,620	550	1,620	2,040	1,500	2,200	885	710	1,890	630	372	225
28	1,620	1,270	1,500	1,620	1,380	1,620	795	710	1,170	630	372	225
29	5,090	1,170	1,380	1,380	.....	1,380	795	795	1,620	630	372	225
30	8,320	975	1,270	1,380	.....	1,270	795	710	1,070	550	885	225
31	3,560	.....	1,170	1,270	.....	1,170	.....	630	.....	630	630	.....
1919–20.												
1	225	340	475	550	1,170	885	2,370	1,270	795	630	550	975
2	225	550	405	550	1,170	885	13,100	1,170	795	630	550	885
3	280	405	405	475	795	795	5,090	1,380	795	975	475	1,380
4	405	372	405	475	2,540	795	7,300	1,170	885	630	475	1,270
5	280	340	405	405	1,890	2,370	4,580	1,170	1,070	630	475	885
6	280	340	475	475	1,620	1,380	3,390	1,170	885	630	475	885
7	280	340	550	475	1,380	1,170	2,880	1,070	795	630	475	795
8	252	340	975	885	1,170	975	2,540	1,380	795	630	630	885
9	280	340	6,280	885	1,170	975	2,880	1,170	795	550	975	1,270
10	280	340	4,920	795	1,070	975	2,370	1,070	710	550	1,890	1,380
11	280	475	2,040	710	1,170	975	2,200	975	710	550	1,750	1,070
12	280	630	1,380	630	1,070	1,620	2,040	975	630	630	2,370	975
13	475	630	1,170	630	1,070	2,370	1,890	1,380	630	550	2,880	1,500
14	340	475	1,270	630	1,070	1,620	1,750	1,270	630	475	4,070	1,270
15	310	475	975	550	975	1,380	1,620	1,170	630	550	3,560	1,170
16	280	405	885	975	795	1,380	1,750	1,070	630	795	3,050	975
17	405	405	795	1,890	795	2,200	1,750	975	630	710	2,200	795
18	340	340	795	1,380	885	1,750	1,500	1,170	710	795	2,040	795
19	340	340	975	1,170	885	2,540	1,380	1,170	795	2,200	2,710	795
20	280	340	975	885	795	2,880	1,380	1,070	1,500	2,200	2,040	710
21	280	340	975	885	795	2,200	1,890	975	975	1,380	2,540	710
22	405	340	710	1,070	2,040	1,620	1,500	975	795	1,270	1,890	630
23	1,270	340	795	1,070	1,750	1,380	1,500	975	1,380	975	1,500	710
24	795	340	710	5,090	1,380	1,270	1,380	975	1,070	885	1,380	710
25	630	340	630	3,560	1,170	1,170	1,270	1,170	885	795	1,170	630
26	475	405	630	4,070	1,070	1,890	1,620	1,170	795	710	1,070	630
27	405	405	630	3,220	975	1,270	1,750	975	710	630	1,620	630
28	372	340	630	2,540	975	2,200	1,620	975	710	630	1,170	550
29	340	340	550	1,890	975	4,070	1,500	885	795	630	1,070	550
30	340	630	550	1,620	.....	2,540	1,380	885	630	550	1,070	550
31	340	.....	550	1,380	.....	2,040	.....	795	.....	550	975	.....

Monthly discharge of Hiwassee River at Murphy, N. C., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October 27–31	8,320	1,620	4,040	9.85	1.83
November	2,040	550	832	2.03	2.26
December	13,100	550	1,730	4.22	4.86
January	4,110	975	1,620	3.95	4.55
February	2,880	885	1,310	3.20	3.33
March	3,050	975	1,580	3.85	4.44
April	1,750	795	1,070	2.61	2.91
May	1,890	630	903	2.20	2.54
June	2,040	475	770	1.88	2.10
July	2,540	550	838	2.04	2.35
August	885	405	511	1.25	1.44
September	475	225	301	.734	.82
1919–20.					
October	1,270	225	380	.93	1.07
November	630	340	401	.98	1.09
December	6,280	405	1,090	2.66	3.07
January	5,090	405	1,350	3.29	3.79
February	2,540	795	1,190	2.90	3.13
March	4,070	795	1,660	4.05	4.67
April	13,100	1,270	2,640	6.44	7.18
May	1,380	795	1,100	2.68	3.09
June	1,500	630	819	2.00	2.23
July	2,200	475	805	1.96	2.26
August	4,070	475	1,580	3.85	4.44
September	1,500	550	899	2.19	2.44
The year	13,100	225	1,160	2.83	38.46

HIWASSEE RIVER AT RELIANCE, TENN.

LOCATION.—At Louisville & Nashville Railroad bridge at Reliance, Polk County, Tenn., 1 mile below mouth of Lost Creek and 2 miles above mouth of Spring Creek.

DRAINAGE AREA.—1,180 square miles.

RECORDS AVAILABLE.—August 17, 1900, to December 31, 1913, and February 1, 1919, to September 30, 1920.

GAGE.—Staff gage; low-water section attached to hickory tree on right bank at Higdons boat landing, 150 feet above railroad bridge; high-water section attached to a 6-inch walnut tree about 100 feet inshore from low-water section. Gage read by C. V. Higdon.

DISCHARGE MEASUREMENTS.—Made from downstream side of 5-span highway bridge 1,000 feet below gage. Section is good for stages above 2 feet but is too rocky and shallow for accurate measurements at lower stages.

CHANNEL AND CONTROL.—Control is a rock dike extending diagonally across river about 800 feet below gage. This dike has been built up of loose rock to divert water to a small mill and is subject to slight changes. At low stages there is a slight riffle between this main control and gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period February 1, 1919, to September 30, 1920, 13.9 feet April 2, 1920 (discharge, 56,000 second-feet); minimum stage recorded 0.90 foot October 1–3, 1919 (discharge, 585 second-feet.)

1900–1913; 1919–20: Maximum stage recorded, 15.2 feet November 19, 1906; minimum stage, discharge, 380 second feet October 19–26, 1904.

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

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined between 600 and 6,000 second-feet; fairly well defined between 6,000 and 25,000 second-feet; extended above 25,000 second-feet. Gage read to half-tenths twice a day. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

22926—24—WSP 503——15

Discharge measurements of Hiwassee River at Reliance, Tenn., during the years ending Sept. 30, 1917–1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1917.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Aug. 25	L. J. Hall	1.19	927	Mar. 2	C. G. Paulsen	2.65	3,770
Sept. 18	do	1.30	1,070	June 15	A. H. Condron	1.45	1,660
Oct. 20	do	2.39	3,160	1920.			
1918.				Mar. 11	King and Condron	2.14	2,720
Feb. 12	do	2.20	2,620				

Daily discharge, in second-feet, of Hiwassee River at Reliance, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	.....	.....	.....	.....	3,180	4,220	3,300	3,610	1,740	2,460	1,400	1,450
2	.....	.....	.....	.....	2,950	3,780	3,060	3,710	1,620	2,050	1,400	1,180
3	.....	.....	.....	.....	2,950	3,540	2,900	2,840	1,530	1,800	1,450	1,060
4	.....	.....	.....	.....	3,060	3,370	2,900	2,540	1,530	1,670	1,500	957
5	.....	.....	.....	.....	2,950	6,100	3,130	2,400	1,530	1,560	1,290	930
6	.....	.....	.....	.....	2,840	13,600	2,770	2,460	1,450	3,470	1,240	905
7	.....	.....	.....	.....	2,610	6,870	2,720	2,540	1,450	4,780	1,620	905
8	.....	.....	.....	.....	2,610	5,370	2,610	5,620	1,360	4,220	1,290	830
9	.....	.....	.....	.....	2,610	11,600	2,500	4,300	1,450	3,060	1,140	805
10	.....	.....	.....	.....	2,500	7,930	2,400	3,470	1,620	2,500	1,400	805
11	.....	.....	.....	.....	2,500	5,940	3,420	2,950	1,500	2,190	1,290	930
12	.....	.....	.....	.....	2,400	5,070	4,220	2,720	1,400	1,930	2,460	1,240
13	.....	.....	.....	.....	6,600	4,500	3,470	2,610	1,360	1,740	1,800	1,140
14	.....	.....	.....	.....	5,460	4,220	3,000	3,000	1,360	1,850	1,210	830
15	.....	.....	.....	.....	4,300	3,960	2,680	2,540	1,290	1,620	1,210	805
16	.....	.....	.....	.....	3,420	3,660	3,960	2,400	1,360	1,740	1,210	805
17	.....	.....	.....	.....	3,180	4,170	4,660	2,330	1,620	3,860	1,290	748
18	.....	.....	.....	.....	3,000	4,780	3,960	2,290	1,800	3,370	1,210	713
19	.....	.....	.....	.....	2,770	4,040	3,540	2,130	1,890	2,290	1,090	690
20	.....	.....	.....	.....	2,680	3,710	3,230	2,400	1,500	3,060	957	690
21	.....	.....	.....	.....	3,420	3,540	3,000	2,610	1,400	2,130	905	713
22	.....	.....	.....	.....	5,160	3,230	2,840	2,250	1,360	2,080	1,330	748
23	.....	.....	.....	.....	7,710	3,060	2,720	2,190	1,560	2,290	1,290	748
24	.....	.....	.....	.....	6,010	2,900	2,610	2,190	1,740	1,990	1,290	713
25	.....	.....	.....	.....	5,460	2,950	2,500	2,050	4,040	1,670	1,330	748
26	.....	.....	.....	.....	5,620	2,770	2,460	1,850	4,390	1,670	1,240	690
27	.....	.....	.....	.....	4,860	5,070	2,290	2,050	5,160	1,800	1,240	690
28	.....	.....	.....	.....	4,220	6,270	2,290	1,930	4,440	1,530	1,140	690
29	.....	.....	.....	.....	.....	4,170	2,290	1,890	4,440	1,450	1,060	669
30	.....	.....	.....	.....	.....	3,660	2,460	1,850	4,300	1,360	2,190	638
31	.....	.....	.....	.....	.....	3,470	.....	1,800	.....	1,290	2,190	.....
1919–20.												
1	606	998	1,700	1,360	3,370	2,500	7,640	3,710	2,290	1,620	1,360	2,950
2	585	1,140	1,330	1,360	3,180	2,250	55,400	3,660	2,290	1,740	1,360	2,610
3	638	1,330	1,180	1,290	3,180	2,080	25,500	3,780	2,290	2,290	1,330	3,060
4	748	1,140	1,140	1,210	7,460	2,330	23,500	3,540	2,460	1,850	1,290	3,060
5	930	1,060	1,090	1,210	6,270	5,680	17,000	3,180	2,840	1,560	1,210	2,720
6	748	998	1,180	1,330	4,500	4,390	10,700	3,910	2,610	1,530	1,210	2,720
7	748	930	1,500	1,530	3,860	3,370	8,740	3,960	2,400	1,530	1,210	2,400
8	805	930	2,080	1,620	3,470	3,060	7,220	3,780	2,130	1,670	1,240	2,610
9	805	930	10,100	1,890	3,230	2,770	7,120	3,540	1,990	1,400	2,570	4,040
10	805	930	17,600	2,250	3,000	2,540	6,770	3,060	1,890	1,450	9,900	7,360
11	805	1,180	6,770	1,800	2,950	2,540	6,340	2,950	1,890	1,500	6,940	3,910
12	805	1,740	4,170	1,700	2,950	3,910	5,780	2,840	1,740	1,800	7,120	2,840
13	957	1,740	3,230	1,530	2,900	6,120	5,250	3,620	1,700	1,500	11,600	4,580
14	1,360	1,500	4,660	1,500	2,770	5,310	4,950	4,300	1,650	1,360	16,300	5,620
15	998	1,290	3,470	1,360	2,610	4,170	4,720	3,300	1,620	1,360	16,100	4,040
16	930	1,210	2,680	1,560	2,190	3,660	4,720	3,000	1,530	2,290	13,300	3,470
17	1,800	1,140	2,330	5,250	2,080	8,300	5,620	2,840	1,560	2,130	9,320	2,840
18	1,140	1,060	2,130	3,710	2,190	5,680	4,660	3,000	2,080	2,720	7,290	2,540
19	930	1,060	2,080	2,840	2,290	8,000	4,390	3,420	2,080	5,460	7,010	2,330
20	905	998	2,610	2,250	2,130	9,120	4,120	3,060	3,420	7,460	8,930	2,130
21	830	930	2,190	2,250	2,080	5,940	6,770	2,840	3,910	3,780	5,940	1,990
22	1,740	930	1,930	3,060	4,950	4,860	5,160	2,720	2,610	1,990	8,560	1,930
23	8,180	930	1,890	3,180	7,120	4,120	4,860	2,540	2,680	2,290	5,940	1,890
24	4,040	930	1,850	8,180	4,720	3,710	4,300	2,500	3,610	2,330	4,720	1,850
25	2,460	930	1,670	12,400	3,860	3,470	4,120	2,840	2,400	2,190	4,040	1,740
26	1,670	957	1,530	9,040	3,300	4,170	4,170	3,620	2,190	2,050	3,540	1,700
27	1,330	1,090	1,530	9,320	2,950	4,170	5,310	2,840	1,890	1,850	3,660	1,700
28	1,210	1,060	1,530	7,220	2,720	4,660	4,860	2,540	1,740	1,620	3,910	1,700
29	1,090	1,060	1,530	5,620	2,720	17,300	4,300	2,500	1,700	1,530	3,540	1,700
30	1,060	1,450	1,450	4,440	.....	8,180	3,960	2,500	1,700	1,450	3,060	1,700
31	1,040	.....	1,360	3,910	.....	5,880	.....	2,330	.....	1,360	3,000	.....

Monthly discharge of Hiwassee River at Reliance, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,180 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1919.					
February	7,710	2,400	3,820	3.24	3.37
March	13,600	2,770	4,890	4.14	4.77
April	4,660	2,290	3,000	2.54	2.83
May	5,620	1,800	2,630	2.23	2.57
June	5,160	1,290	2,110	1.79	2.00
July	4,780	1,290	2,270	1.92	2.21
August	2,460	905	1,380	1.17	1.35
September	1,450	638	849	.719	.80
1920.					
October	8,180	585	1,380	1.17	1.35
November	1,740	930	1,120	.95	1.06
December	17,600	1,090	2,950	2.50	2.88
January	12,400	1,210	3,460	2.93	3.38
February	7,460	2,080	3,480	2.95	3.18
March	17,300	2,080	4,990	4.23	4.88
April	55,400	3,960	8,930	7.57	8.45
May	4,300	2,330	3,170	2.69	3.10
June	3,910	1,530	2,230	1.89	2.11
July	7,460	1,360	2,150	1.82	2.10
August	16,300	1,210	5,690	4.82	5.56
September	7,360	1,700	2,860	2.42	2.70
The year	55,400	585	3,530	2.99	40.75

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 upsteam from Rodgers Creek, and 1 mile downstream from Colvards Creek.

DRAINAGE AREA.—106[1] square miles (measured on topographic map).

RECORDS AVAILABLE.—June 29, 1904, to December 31, 1909; January 21, 1914, to April 30, 1917; October 29, 1918, to September 30, 1920.

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 10.0 feet, is a vertical rod bolted to timber on old bridge pier. The lower section is the same gage which was in use when station was discontinued in 1909. When gage was repaired November 1, 1918, the inclined section below 2.6 feet was set incorrectly, the error increasing with decrease in stage. As all gage heights since that date and the rating curve refer to gage as actually set, no errors from this source are introduced into the records of discharge. Gage read by J. T. Hayes.

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

CHANNEL AND CONTROL.—Bed of channel composed of gravel which remains permanent for ordinary stages but shifts during big floods. Control is at a rock ledge just below bridge. Formation of gravel bars changes control occasionally.

EXTREMES OF DISCHARGE.—Owing to erroneous extension of rating curve the discharge corresponding to maximum stages recorded for the years ending September 30, 1915 to 1917 has been revised as follows:

Maximum stage recorded during year ending September 30, 1915, 11.0 feet at 4 p. m. December 25 (discharge, 4,000 second-feet); year ending September 30, 1916, 10.2 feet at 7 a. m. December 18 and 29 (discharge, 3,650 second-feet); period October 1, 1916, to April 30, 1917, 15.9 feet at noon March 4 (discharge, 6,500 second-feet).

Maximum stage recorded October 29, 1918, to September 30, 1919, 11.0 feet at 8 a. m. December 22 (discharge. 4,050 second-feet); minimum stage, 0.6 foot at 6.30 p. m. September 18 and 7 a. m. and 6.30 p. m. September 19–20, 26–30 (discharge, 40 second-feet).

[1] Figure published in Water-Supply Papers 383, 403, 433, and 453 is in error.

Maximum stage recorded during year ending September 30, 1920, 14.6 feet at 8.30 a. m. April 2 (discharge, 5,950 second-feet); minimum stage, 0.55 foot at 7 a. m. and 5 p. m. October 2 (discharge, 34 second-feet).

1904–1909, 1914–1917, and 1918–1920: Maximum stage recorded, 17.3 feet November 19, 1906 (discharge, 7,780 second-feet; discharge previously published is in error); minimum discharge, 22 second-feet October 28 to November 2, 1904.

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

DIVERSIONS.—None.

REGULATION.—Negligible.

ACCURACY.—Stage-discharge relation not permanent as floods cause changes in gravel bars at the control; fairly permanent between shifts. Owing to erroneous high-water extensions of rating curves, the records of discharge 1905 to 1909 and December, 1914, to April, 1917, have been revised as shown in following tables. Records for 1904 and January to November, 1914, not revised. Rating curve used for revision of records for 1905 well defined between 60 and 3,500 second-feet; curve used for 1906 well defined between 150 and 3,500 second-feet; curve used January 1, 1907, to December 31, 1909, well defined between 70 and 3,500 second-feet; curve used January 21 to December 31, 1914, well defined between 45 and 600 second-feet; and extended above 600 second-feet parallel to curve defined by high-water measurements made in 1920; curve used January 1 to December 28, 1915, fairly well defined between 50 and 300 second-feet and extended above 300 second-feet; curve used December 29, 1915, to April 30, 1917, well defined between 60 and 3,500 second-feet; curve used October 29, 1918, to January 23, 1920, well defined between 77 and 3,500 second-feet; curve used January 24 to September 30, 1920, well defined between 64 and 3,500 second-feet and extended above 3,500 second-feet. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except for extremely low and high stages for which they are fair,

Discharge measurements of Valley River at Tomotla, N. C., during the years ending Sept. 30, 1919 and 1920.

[Made by A. H. Condron.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1918.	*Feet.*	*Sec.-ft.*	1919.	*Feet.*	*Sec.-ft.*	1920.	*Feet.*	*Sec.-ft.*
Oct. 30	4.60	1,130	Jan. 12	1.95	284	Jan. 24	8.75	3,020
Nov. 1	2.37	381	Apr. 3	1.70	233	Mar. 31	3.02	645
8	1.30	137	3	1.70	232	Apr. 14	2.53	490

NOTE.—See paragraph under "Gage" relative to datum of gage below 2.6 feet.

Daily discharge, in second-feet, of Valley River at Tomotla, N. C., for the periods July 1, 1904, to Dec. 31, 1909; Jan. 21, 1914, to Apr. 30, 1917; and Oct. 29, 1918, to Sept. 30, 1920.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1904.				1904.				1904.			
1	72	166	72	11	57	88	57	21	57	88	50
2	57	72	72	12	88	72	57	22	126	88	44
3	50	72	72	13	57	72	57	23	72	270	44
4	57	72	72	14	57	72	50	24	72	126	44
5	88	72	72	15	50	1,000	50	25	72	106	44
6	57	126	72	16	50	270	50	26	72	106	44
7	57	72	72	17	57	126	50	27	57	106	44
8	57	126	72	18	57	106	50	28	88	106	44
9	106	88	57	19	50	88	50	29	57	88	44
10	72	88	57	20	50	88	50	30	57	88	44
								31	57	72	.....

Daily discharge, in second-feet, of Valley River at Tomotla, N. C., for the periods July 1, 1904, to Dec. 31, 1909; Jan. 21, 1914, to Apr. 30, 1917; and Oct. 29, 1918, to Sept. 30, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1904–5.												
1	44	22	192	118	100	290	218	398	192	350	118	138
2	44	22	192	118	118	290	218	335	169	320	118	118
3	44	44	388	118	118	260	218	275	169	205	100	118
4	44	44	169	118	138	230	192	245	148	205	100	118
5	44	57	298	138	180	230	192	218	148	158	100	118
6	44	57	270	230	380	230	218	218	128	260	100	100
7	44	44	217	230	290	205	218	305	128	205	118	100
8	38	44	169	180	638	205	275	275	128	158	205	100
9	38	44	169	138	2,610	450	365	245	109	158	138	100
10	38	44	169	158	844	530	275	245	109	205	260	100
11	38	44	169	205	570	415	218	218	109	290	205	100
12	38	57	147	2,430	570	350	398	218	91	3,430	350	82
13	32	57	147	844	916	320	275	218	91	1,030	450	82
14	32	57	126	490	706	290	245	218	109	450	672	82
15	32	44	106	415	490	260	218	305	109	380	290	82
16	32	44	88	290	450	260	305	672	109	320	530	82
17	32	44	106	230	380	230	218	398	109	380	320	82
18	32	44	88	180	320	218	218	335	109	320	205	82
19	27	44	88	180	490	205	218	275	109	290	158	82
20	27	57	88	158	2,470	320	192	245	109	260	158	82
21	27	57	88	158	1,500	740	192	275	128	205	138	66
22	27	57	88	158	916	415	245	275	128	205	158	66
23	27	57	88	138	638	320	218	365	169	180	205	66
24	27	57	243	118	570	350	218	365	128	180	570	66
25	27	57	169	100	490	350	218	275	109	180	205	66
26	27	57	147	82	415	290	275	245	128	158	180	66
27	27	57	327	66	350	290	245	218	128	158	158	66
28	22	57	452	66	320	260	218	218	128	138	158	50
29	22	57	270	66	.....	350	550	218	550	138	138	66
30	22	357	169	82	.....	290	672	218	550	138	138	66
31	22	.....	169	118	.....	230	.....	192	.....	138	118	.....
1905–6.												
1	58	74	128	242	360	242	405	270	123	205	315	255
2	58	58	158	270	330	270	345	255	440	205	672	230
3	148	58	2,560	1,180	330	672	315	242	156	192	472	230
4	109	58	808	1,260	300	390	375	375	156	180	405	230
5	91	58	470	638	300	330	536	285	134	205	315	217
6	74	58	365	536	300	300	405	285	134	205	345	570
7	74	91	245	422	270	300	315	285	123	255	375	472
8	74	74	740	360	270	360	345	255	112	205	315	315
9	74	74	1,180	330	242	300	1,180	255	112	180	315	285
10	109	74	510	330	242	270	740	242	102	180	285	255
11	432	74	398	330	242	242	536	230	102	168	285	230
12	192	74	365	390	242	242	472	230	285	168	285	217
13	109	74	365	360	217	270	405	217	285	156	285	205
14	74	58	365	360	217	422	405	217	440	1,260	285	180
15	74	58	365	360	217	880	405	205	1,100	952	315	156
16	74	58	365	360	192	536	375	192	672	604	255	180
17	74	58	335	390	192	422	375	180	604	808	255	472
18	58	58	305	422	192	360	360	168	405	1,140	230	405
19	91	74	305	390	192	740	360	168	345	706	255	285
20	74	148	305	360	217	638	345	156	285	604	315	315
21	74	109	510	360	360	472	345	156	440	405	285	375
22	74	91	365	390	270	422	315	145	285	345	255	375
23	74	74	880	1,590	217	360	300	145	285	345	230	672
24	74	74	808	1,030	217	330	300	134	604	315	230	536
25	74	128	510	740	192	300	285	134	405	285	217	405
26	218	109	365	472	192	300	285	180	285	255	230	375
27	148	91	335	472	242	330	285	156	255	405	604	405
28	91	109	305	422	242	422	375	145	230	285	472	472
29	74	192	305	422	.....	422	315	145	230	230	345	536
30	74	169	275	390	.....	880	285	134	180	440	285	1,340
31	74	.....	275	360	.....	740	.....	134	.....	345	255	.....

Daily discharge, in second-feet, of Valley River at Tomotla, N. C., for the periods July 1, 1904, to Dec. 31, 1909; Jan. 21, 1914, to Apr. 30, 1917; and Oct. 29, 1918, to Sept. 30, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1906-7.												
1	604	205	315	808	604	706	322	266	740	266	162	120
2	604	205	315	672	570	952	322	266	672	225	140	130
3	604	205	285	638	536	880	238	238	412	212	140	140
4	536	192	285	604	472	844	238	294	294	199	120	140
5	604	192	315	604	990	844	212	266	238	186	238	130
6	1,760	180	536	536	880	604	442	238	238	186	151	120
7	952	168	405	504	808	536	442	382	212	174	140	120
8	740	168	315	472	672	442	294	294	294	162	120	120
9	604	156	315	472	604	536	294	266	266	162	111	120
10	472	156	536	472	504	774	266	266	238	140	102	111
11	405	156	472	442	472	740	294	774	266	174	102	151
12	345	180	405	442	442	706	266	442	412	322	102	111
13	315	180	375	412	412	604	238	294	352	472	111	102
14	300	205	345	412	382	536	238	266	238	266	130	86
15	285	230	375	412	322	412	294	442	238	252	199	86
16	285	230	440	382	294	382	266	382	238	199	186	86
17	315	230	990	412	294	352	266	294	212	186	212	86
18	536	1,140	672	412	280	337	238	266	212	199	238	86
19	405	7,780	808	412	266	322	266	266	238	186	174	86
20	345	1,760	604	504	266	322	266	238	238	186	140	86
21	315	952	570	472	266	294	294	238	212	174	140	102
22	285	808	536	472	294	294	294	212	212	162	266	294
23	285	672	472	442	294	294	604	212	294	212	308	952
24	255	604	472	442	322	280	570	212	266	140	252	322
25	255	570	440	412	352	266	536	212	294	199	186	130
26	230	536	440	412	322	322	382	442	238	186	140	120
27	230	504	536	412	294	266	352	294	238	162	130	120
28	218	472	952	442	352	252	322	266	212	151	140	252
29	218	440	952	472	.....	238	294	238	442	212	140	337
30	205	405	808	472	.....	225	294	212	266	352	120	199
31	205	.....	880	504	.....	322	.....	504	.....	252	120	.....
1907-8.												
1	186	102	186	536	672	322	322	308	174	102	94	102
2	162	174	186	412	472	352	308	294	162	102	102	102
3	151	130	174	367	412	367	294	280	162	130	102	111
4	140	120	162	604	337	367	280	266	280	252	111	120
5	212	102	162	808	322	367	322	294	199	186	120	225
6	140	102	162	604	367	322	308	266	186	212	130	174
7	140	102	140	536	322	308	322	536	186	151	266	72
8	186	102	186	442	294	294	252	412	186	308	140	72
9	140	102	412	382	294	294	238	337	162	199	111	72
10	120	536	294	352	352	294	238	308	151	352	102	58
11	120	472	238	604	352	672	238	280	140	199	111	58
12	120	294	238	952	352	504	212	252	162	174	102	58
13	111	212	225	536	352	442	212	238	186	162	86	58
14	102	186	472	472	382	412	212	238	186	140	86	58
15	102	162	412	472	1,710	412	412	212	162	151	86	58
16	102	162	337	472	740	337	412	212	162	151	86	58
17	102	162	322	472	604	308	536	212	162	151	111	58
18	102	199	294	412	472	308	472	238	280	120	86	58
19	102	174	266	382	472	672	442	294	199	120	79	58
20	102	162	238	352	412	442	367	238	186	111	72	58
21	94	266	212	337	382	442	337	199	140	102	86	58
22	86	266	212	337	352	442	308	186	120	102	225	58
23	86	740	412	322	322	1,260	294	186	120	102	308	58
24	102	774	352	308	322	1,500	266	212	120	111	238	58
25	86	472	322	266	322	1,180	706	252	120	111	130	58
26	94	308	294	280	367	740	536	252	120	102	266	58
27	151	280	266	308	322	472	472	252	120	102	238	58
28	162	252	266	266	294	412	382	212	120	111	120	58
29	102	238	294	266	294	382	337	186	102	120	111	58
30	102	225	1,500	252	.....	382	367	199	102	102	102	58
31	102	.....	774	294	.....	352	.....	186	.....	102	102	.....

Daily discharge, in second-feet, of Valley River at Tomotla, N. C., for the periods July 1, 1904, to Dec. 31, 1909; Jan. 21, 1914, to Apr. 30, 1917; and Oct. 29, 1918, to Sept. 30, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1908–9.												
1	58	72	120	266	120	472	412	740	322	252	186	111
2	58	72	199	266	120	504	382	570	294	238	186	102
3	58	72	94	174	120	504	367	367	672	238	186	102
4	58	86	86	225	120	412	352	294	1,540	238	252	102
5	58	72	86	472	120	367	322	294	808	238	186	102
6	58	72	102	352	412	412	322	280	570	367	199	102
7	58	72	1,890	280	382	536	412	266	472	880	186	102
8	58	72	1,100	252	266	472	322	266	412	706	186	102
9	65	72	672	238	472	382	308	294	952	604	186	102
10	130	72	322	212	1,760	844	294	472	472	382	186	162
11	72	72	162	199	740	1,260	280	280	442	322	186	151
12	72	86	162	212	536	952	266	266	412	322	186	140
13	58	111	212	212	672	740	266	266	412	412	252	130
14	58	130	212	238	536	2,520	308	266	412	352	266	120
15	58	102	186	322	2,110	1,380	294	225	337	294	238	120
16	58	86	174	808	2,110	916	266	212	294	266	212	140
17	58	72	162	916	952	740	238	212	294	238	199	120
18	58	72	174	570	672	472	225	212	337	225	186	130
19	58	72	162	322	672	472	212	294	280	212	186	238
20	58	72	442	294	570	536	212	536	266	199	162	238
21	58	72	212	308	472	472	212	808	266	186	162	367
22	58	72	162	266	880	412	352	1,710	322	238	162	880
23	120	72	186	252	1,140	352	280	1,260	352	536	162	706
24	94	72	162	238	1,100	294	266	952	412	252	140	604
25	72	72	162	225	844	604	266	672	412	212	140	382
26	72	72	162	212	604	880	266	472	412	199	140	174
27	140	79	174	199	536	808	266	442	472	186	120	102
28	140	72	212	199	472	774	238	412	352	186	120	86
29	111	79	151	199	.....	570	337	367	294	186	120	86
30	86	72	212	186	.....	472	952	322	266	186	130	86
31	72	.....	322	151	.....	412	.....	322	.....	186	120	.....

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1909.				1909.				1909.			
1	86	86	86	11	72	86	151	21	120	86	151
2	86	86	86	12	352	86	140	22	102	86	140
3	86	86	86	13	442	86	672	23	102	86	140
4	86	86	86	14	266	86	472	24	102	111	140
5	94	86	86	15	238	86	294	25	102	102	140
6	102	86	86	16	186	86	212	26	102	86	140
7	86	86	604	17	174	86	174	27	94	86	140
8	72	86	536	18	151	86	162	28	86	86	140
9	72	86	352	19	120	86	162	29	86	86	140
10	72	86	162	20	120	86	162	30	86	86	162
								31	86	.....	151

Daily discharge, in second-feet, of Valley River at Tomotla, N. C., for the periods July 1, 1904, to Dec. 31, 1909; Jan. 21, 1914, to Apr. 30, 1917; and Oct. 29, 1918, to Sept. 30, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1914.												
1					92	214	590	157	78	54	65	65
2					107	204	590	157	78	107	54	65
3					107	184	397	157	78	72	54	65
4					123	175	302	224	78	72	72	54
5					184	166	224	290	85	65	72	54
6					397	194	224	224	78	65	65	54
7					447	268	204	349	140	54	54	54
8					385	224	194	214	100	54	60	72
9					373	184	279	194	78	54	100	60
10					349	175	246	184	78	54	157	54
11					385	214	194	166	78	54	148	60
12					361	690	175	157	78	60	107	54
13					337	447	214	140	78	60	85	54
14					373	314	434	140	92	72	235	54
15					314	290	500	140	78	140	115	54
16					268	268	447	140	72	279	92	54
17					257	246	373	123	72	290	78	54
18					279	235	349	123	132	235	65	54
19				78	760	214	500	123	85	132	65	54
20				85	970	204	830	123	78	100	72	54
21				85	397	184	500	123	72	85	148	45
22				78	314	175	410	107	65	65	92	45
23				92	302	175	385	107	65	65	65	45
24				132	361	175	337	100	65	54	65	45
25				140	325	235	268	92	65	54	72	72
26				123	257	214	214	92	60	54	72	60
27				107	224	214	175	78	85	54	72	54
28				92	235	235	166	78	115	60	166	54
29				107	.....	325	157	78	72	92	123	54
30				123	.....	373	157	85	54	65	85	54
31				107	.....	620	.....	85	.....	65	65	.....
1914-15.												
1	45	65	214	341	1,160	226	202	116	136	90	82	90
2	78	65	157	301	970	226	202	98	126	126	82	75
3	132	65	373	275	690	214	202	136	116	107	68	56
4	60	65	1,440	262	532	760	202	126	98	116	68	62
5	54	65	1,080	226	480	620	190	116	98	725	68	98
6	54	65	434	415	430	480	179	116	98	275	68	90
7	54	65	325	532	370	430	179	116	98	179	68	75
8	54	72	290	400	355	341	179	620	98	168	68	68
9	54	132	246	341	301	301	179	370	98	146	68	68
10	85	204	235	288	288	275	179	301	82	226	68	68
11	72	107	214	288	275	275	179	226	82	214	68	68
12	54	85	257	370	250	238	327	238	82	136	68	56
13	54	85	279	341	250	226	179	214	82	126	75	68
14	65	85	214	301	238	226	179	202	126	107	82	56
15	830	78	194	314	288	202	157	168	314	168	68	56
16	447	78	175	288	341	262	157	157	168	157	68	56
17	204	78	157	430	314	226	146	168	107	116	62	51
18	184	78	148	415	275	202	136	146	126	146	62	46
19	140	100	157	400	250	202	136	136	98	98	90	46
20	115	92	224	370	250	202	136	107	98	146	136	51
21	107	85	166	314	238	202	136	107	90	116	75	400
22	100	78	175	301	226	214	136	107	82	82	68	90
23	92	78	194	314	250	202	136	107	75	82	68	75
24	78	78	235	970	445	202	116	126	68	90	68	68
25	78	78	3,200	830	355	202	116	116	68	82	62	62
26	78	78	1,870	620	314	179	116	136	68	68	56	56
27	78	78	1,000	480	288	202	146	98	68	68	68	56
28	72	85	397	400	238	190	202	107	98	68	107	56
29	65	175	500	341	.....	179	157	107	98	68	82	56
30	65	257	410	301	.....	226	157	107	90	68	75	126
31	65	.....	302	301	.....	250	.....	116	.....	68	68	.....

Daily discharge, in second-feet, of Valley River at Tomotla, N. C., for the periods July 1, 1904, to Dec. 31, 1909; Jan. 21, 1914, to Apr. 30, 1917; and Oct. 29, 1918, to Sept. 30, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915–16.												
1	202	98	107	595	385	262	225	155	155	175	262	115
2	136	82	98	520	2,130	550	225	155	145	155	288	155
3	98	82	98	460	970	520	275	155	165	155	238	125
4	98	82	98	340	690	430	225	155	155	155	225	115
5	498	82	98	325	550	370	225	145	135	125	238	115
6	262	82	98	385	490	340	225	135	200	115	200	105
7	126	75	98	490	430	385	250	135	225	125	200	95
8	116	68	90	430	385	355	275	135	165	225	225	95
9	98	75	82	400	430	355	250	125	145	595	212	115
10	90	68	82	385	370	355	250	115	145	625	325	95
11	68	68	90	415	340	340	250	115	155	565	275	95
12	68	75	136	385	325	300	238	115	355	460	275	95
13	68	126	136	1,040	400	275	225	115	212	340	250	95
14	75	168	126	690	355	275	212	125	238	300	238	95
15	107	415	126	625	312	275	200	115	690	262	212	85
16	116	226	250	595	300	275	200	115	760	415	200	75
17	90	168	462	490	275	262	212	115	625	415	200	95
18	82	136	2,400	445	275	225	188	105	415	355	165	95
19	116	214	760	400	262	225	175	115	300	430	155	95
20	126	202	430	355	250	225	175	105	262	370	155	95
21	107	179	327	355	250	225	238	95	225	655	155	95
22	341	157	301	625	225	225	188	250	200	505	155	85
23	238	157	250	535	250	212	175	795	188	460	155	75
24	168	157	238	460	312	200	188	725	225	430	135	60
25	146	126	341	415	275	175	175	312	225	400	135	60
26	126	116	327	370	275	262	175	238	188	370	115	60
27	116	146	262	355	250	400	175	188	175	505	115	75
28	107	126	301	325	238	340	175	175	175	490	115	115
29	98	116	3,200	325	275	288	165	188	155	445	115	175
30	98	116	1,040	325	.....	262	155	225	155	325	115	85
31	98	.....	625	325	.....	225	.....	188	.....	288	115	.....
1916–17.												
1	75	95	200	355	2,040	2,490	625	.....	.....	.....	.....	.....
2	75	85	165	312	970	1,480	595	.....	.....	.....	.....	.....
3	75	75	145	625	535	3,450	520	.....	.....	.....	.....	.....
4	75	75	135	690	535	5,200	520	.....	.....	.....	.....	.....
5	75	75	188	725	505	4,050	1,000	.....	.....	.....	.....	.....
6	75	75	145	795	475	.....	900	.....	.....	.....	.....	.....
7	75	75	135	625	400	.....	625	.....	.....	.....	.....	.....
8	75	75	135	385	385	.....	690	.....	.....	.....	.....	.....
9	75	85	288	370	340	.....	565	.....	.....	.....	.....	.....
10	75	105	212	312	300	.....	550	.....	.....	.....	.....	.....
11	75	75	200	300	300	565	520	.....	.....	.....	.....	.....
12	75	95	212	250	275	625	490	.....	.....	.....	.....	.....
13	68	125	188	225	250	565	520	.....	.....	.....	.....	.....
14	60	250	155	625	250	625	460	.....	.....	.....	.....	.....
15	60	200	135	595	400	535	400	.....	.....	.....	.....	.....
16	60	145	135	725	300	535	370	.....	.....	.....	.....	.....
17	75	115	135	595	325	970	355	.....	.....	.....	.....	.....
18	85	105	135	690	1,040	760	340	.....	.....	.....	.....	.....
19	165	95	135	625	1,440	625	325	.....	.....	.....	.....	.....
20	105	95	135	550	2,490	550	300	.....	.....	.....	.....	.....
21	75	95	165	490	1,240	1,040	300	.....	.....	.....	.....	.....
22	75	75	275	1,360	760	865	300	.....	.....	.....	.....	.....
23	75	385	212	795	690	760	275	.....	.....	.....	.....	.....
24	75	175	200	625	830	2,360	275	.....	.....	.....	.....	.....
25	75	135	188	460	690	1,360	275	.....	.....	.....	.....	.....
26	75	135	175	415	565	1,560	300	.....	.....	.....	.....	.....
27	75	135	188	370	535	2,670	250	.....	.....	.....	.....	.....
28	75	188	1,000	340	1,860	1,320	250	.....	.....	.....	.....	.....
29	75	212	690	565	.....	1,000	300	.....	.....	.....	.....	.....
30	165	200	445	520	.....	795	250	.....	.....	.....	.....	.....
31	105	.....	325	445	.....	690	.....	.....	.....	.....	.....	.....

Daily discharge, in second-feet, of Valley River at Tomotla, N. C., for the periods July 1, 1904, to Dec. 31, 1909; Jan. 21, 1914, to Apr. 30, 1917; and Oct. 29, 1918, to Sept. 30, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	.....	368	198	396	278	410	220	410	140	188	98	84
2	.....	303	188	1,640	242	382	220	316	136	154	98	77
3	.....	231	168	1,160	242	368	209	278	131	140	91	77
4	.....	198	158	702	290	329	220	231	122	126	84	77
5	.....	178	144	544	254	900	209	231	109	131	77	77
6	.....	158	140	469	242	1,000	198	220	106	266	77	77
7	.....	158	122	396	220	670	198	329	106	220	77	64
8	.....	140	122	382	231	544	178	514	106	209	77	58
9	.....	136	122	355	231	830	158	396	106	198	77	52
10	.....	122	140	316	231	670	140	303	106	158	91	52
11	.....	122	178	290	209	544	559	254	91	140	91	70
12	.....	122	154	266	209	469	355	231	91	131	242	70
13	.....	109	140	242	454	424	290	254	91	122	98	52
14	.....	106	454	242	499	424	266	231	91	114	91	52
15	.....	106	638	231	396	355	231	209	106	106	91	52
16	.....	158	454	220	342	342	499	198	106	106	91	52
17	.....	198	368	368	290	368	410	198	109	140	77	52
18	.....	178	316	382	266	329	329	188	91	209	77	46
19	.....	168	254	316	254	303	290	178	91	168	77	40
20	.....	158	242	290	254	266	254	220	91	158	70	40
21	.....	149	382	266	355	242	242	188	91	140	98	77
22	.....	149	3,250	242	734	242	220	178	91	122	98	64
23	.....	149	970	499	702	242	198	178	98	122	77	52
24	.....	140	702	454	514	220	198	178	220	122	77	52
25	.....	140	469	410	606	220	198	158	290	114	77	52
26	.....	122	368	638	529	220	178	158	454	131	77	40
27	.....	122	342	514	454	469	178	154	439	106	77	40
28	.....	424	303	439	424	355	178	140	316	106	64	40
29	935	303	266	368	.....	290	188	158	484	98	98	40
30	1,160	231	242	342	.....	254	209	140	266	91	114	40
31	798	.....	242	303	.....	242	.....	140	.....	91	98	.....
1919–20.												
1	40	91	168	149	448	275	736	448	171	122	122	260
2	34	149	140	149	448	246	4,910	416	160	275	122	232
3	52	114	131	131	512	232	1,670	400	171	219	122	352
4	58	103	119	122	464	260	2,440	352	206	131	109	246
5	52	91	122	122	416	512	1,430	352	232	122	106	232
6	64	91	149	140	400	432	1,040	320	171	140	106	232
7	58	84	342	168	368	352	940	352	160	131	106	206
8	50	77	368	290	320	290	768	320	150	122	140	352
9	70	77	900	382	290	260	768	305	140	122	206	368
10	54	77	1,440	303	290	260	672	290	140	131	975	305
11	50	149	544	242	275	275	608	260	140	171	1,080	275
12	114	114	410	178	260	448	560	260	126	140	704	260
13	106	106	342	178	320	640	528	512	122	160	1,190	1,230
14	114	106	469	178	260	512	464	305	122	150	1,940	640
15	91	106	368	178	232	448	448	275	122	150	2,030	560
16	98	106	329	410	206	448	496	275	122	160	1,120	480
17	158	106	278	670	232	1,350	512	260	119	150	905	400
18	106	98	242	454	206	800	416	336	150	400	672	336
19	91	91	342	355	206	1,080	400	290	136	905	592	305
20	91	91	316	303	206	975	384	260	368	704	608	275
21	70	91	254	529	182	704	512	260	275	448	560	246
22	158	91	242	514	768	592	400	232	194	384	640	232
23	544	84	242	559	592	528	576	206	219	290	528	232
24	514	77	209	2,260	528	464	448	206	194	219	464	260
25	484	77	158	1,350	464	400	400	206	150	182	400	232
26	188	122	158	1,150	384	528	512	260	136	160	352	219
27	188	114	158	975	352	400	544	206	131	160	320	182
28	168	106	158	835	320	704	512	206	122	144	320	182
29	131	114	154	704	320	1,350	464	182	131	140	320	160
30	106	220	140	592	.....	835	400	182	122	140	290	160
31	98	.....	140	512	.....	672	.....	182	.....	140	305	.....

NOTE.—Discharge, January, 1905, to December, 1909, and December, 1914, to April, 1917, differs from record published in previous water-supply papers, owing to revision of rating curves. See "Accuracy."

Monthly discharge of Valley River at Tomotla, N. C., for the periods July 1, 1904, to Dec. 31, 1909; Jan. 19, 1914, to Apr. 30, 1917; and Oct. 29, 1918, to Sept. 30, 1920.

[Drainage area, 106 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1904.					
July	126	50	65.6	0.619	0.71
August	1,000	72	133	1.25	1.44
September	72	44	55.2	.521	.58
1904–5.					
October	44	22	32.9	.31	.36
November	357	22	59.5	.56	.63
December	452	88	181	1.71	1.97
January	2,430	66	262	2.47	2.85
February	2,610	100	642	6.06	6.31
March	740	205	312	2.94	3.39
April	672	192	265	2.50	2.79
May	672	192	281	2.65	3.06
June	550	91	154	1.45	1.62
July	3,430	138	361	3.41	3.93
August	672	100	221	2.08	2.40
September	138	50	86.4	.815	.91
The year	3,430	22	236	2.23	30.22
1905–6.					
October	432	58	102	.962	1.11
November	192	58	85.2	.804	.90
December	2,560	128	502	4.74	5.46
January	1,590	242	514	4.85	5.59
February	360	192	250	2.36	2.46
March	880	242	425	4.01	4.62
April	1,180	285	403	3.80	4.24
May	375	134	204	1.92	2.21
June	1,100	102	310	2.92	3.26
July	1,260	156	395	3.73	4.30
August	672	217	322	3.04	3.50
September	1,340	156	373	3.52	3.93
The year	2,560	58	325	3.07	41.58
1906–7.					
October	1,760	205	442	4.17	4.81
November	7,780	156	663	6.25	6.97
December	990	285	521	4.92	5.67
January	808	382	483	4.56	5.26
February	990	266	449	4.24	4.42
March	952	225	480	4.53	5.22
April	604	212	321	3.03	3.38
May	774	212	306	2.89	3.33
June	740	212	297	2.80	3.12
July	472	140	211	1.99	2.29
August	308	102	160	1.51	1.74
September	952	86	168	1.58	1.76
The year	7,780	86	375	3.54	47.97
1907–8.					
October	212	86	123	1.16	1.34
November	774	102	253	2.39	2.67
December	1,500	140	323	3.05	3.52
January	952	252	432	4.08	4.70
February	1,710	294	437	4.12	4.44
March	1,500	294	495	4.67	5.38
April	706	212	347	3.27	3.65
May	536	186	259	2.44	2.81
June	280	102	162	1.53	1.71
July	352	102	150	1.42	1.64
August	308	72	133	1.25	1.44
September	225	58	75.6	.713	0.80
The year	1,710	58	265	2.50	34.10

Monthly discharge of Valley River at Tomotla, N. C., for the periods July 1, 1904, to Dec. 31, 1909; Jan. 19, 1914, to Apr. 30, 1917; and Oct. 29, 1918, to Sept. 30, 1920.—Con.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1908–9.					
October	140	58	73.9	0.697	0.80
November	130	72	78.1	.737	.82
December	1,890	86	285	2.69	3.10
January	916	151	299	2.82	3.25
February	2,110	120	697	6.58	6.85
March	2,520	294	676	6.38	7.36
April	952	212	316	2.98	3.32
May	1,710	212	463	4.37	5.04
June	1,540	266	452	4.26	4.75
July	880	186	308	2.91	3.36
August	266	120	178	1.68	1.94
September	880	86	203	1.92	2.14
The year	2,520	58	334	3.15	42.73
1909.					
October	442	72	130	1.23	1.42
November	111	86	87.4	.825	.92
December	672	86	205	1.93	2.22
1914.					
January 19–31	140	78	104	.981	.47
February	970	92	332	3.13	3.26
March	690	166	259	2.44	2.81
April	830	157	334	3.15	3.51
May	349	78	147	1.39	1.60
June	140	54	81.1	.765	.85
July	290	54	89.9	.848	.98
August	235	54	91.6	.864	1.00
September	72	45	55.7	.525	.59
1914–15.					
October	830	45	120	1.13	1.30
November	257	65	93.3	.880	.98
December	3,200	148	492	4.64	5.35
January	970	226	389	3.67	4.23
February	1,160	226	381	3.59	3.87
March	760	179	270	2.55	2.94
April	327	116	168	1.58	1.76
May	620	98	165	1.56	1.80
June	314	68	105	.991	1.11
July	725	68	143	1.35	1.56
August	136	56	73.7	.695	.80
September	400	46	78.3	.739	.82
The year	3,200	45	206	1.94	26.52
1915–16.					
October	498	68	138	1.30	1.50
November	415	68	133	1.25	1.40
December	3,200	82	422	3.98	4.59
January	1,040	325	458	4.32	4.98
February	2,130	225	423	3.99	4.30
March	550	175	304	2.87	3.31
April	275	155	210	1.98	2.21
May	795	95	191	1.80	2.08
June	760	135	252	2.38	2.66
July	655	115	362	3.42	3.94
August	325	115	192	1.81	2.09
September	175	60	97.8	.923	1.03
The year	3,200	60	265	2.50	34.09
1916–17.					
October	165	60	81.4	.768	.89
November	385	75	128	1.21	1.35
December	1,000	135	231	2.18	2.51
January	1,360	225	541	5.10	5.88
February	2,490	250	740	6.98	7.27
April	1,000	250	448	4.23	4.72

Monthly discharge of Valley River at Tomotla, N. C., for the periods July 1, 1904, to Dec. 31, 1909; Jan. 19, 1914, to Apr. 30, 1917; and Oct. 29, 1918, to Sept. 30, 1920.—Con.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October 29–31	1,160	798	964	9.10	1.01
November	424	106	178	1.68	1.87
December	3,250	122	395	3.73	4.30
January	1,640	220	441	4.16	4.80
February	734	209	355	3.35	3.49
March	1,000	220	417	3.93	4.53
April	559	140	247	2.33	2.60
May	514	140	231	2.18	2.51
June	484	91	162	1.53	1.71
July	266	91	143	1.35	1.56
August	242	64	90.5	.854	.98
September	84	40	57.3	.541	.60
1919–20.					
October	544	34	135	1.27	1.46
November	220	77	104	.981	1.09
December	1,440	119	307	2.90	3.34
January	2,260	122	487	4.59	5.29
February	768	182	354	3.15	3.40
March	1,350	232	557	5.25	6.05
April	4,910	384	832	7.85	8.76
May	448	182	288	2.72	3.14
June	368	119	163	1.54	1.72
July	905	122	226	2.13	2.46
August	2,030	106	563	5.31	6.12
September	1,230	160	322	3.04	3.39
The year	4,910	34	362	3.42	46.22

NOTE.—See footnote to daily-discharge table.

NOTTELY RIVER NEAR RANGER, N. C.

LOCATION.—At highway bridge 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; October 20, 1918, to September 30, 1920.

GAGE.—Chain gage fastened to middle of downstream side of steel bridge; installed October 28, 1918. Gage used 1901–1905 was a graduated staff spiked to bent of old wooden bridge which was burned in 1913 and later was replaced by a modern steel bridge. Gage used January 22, 1914, to April 30, 1917, and October 20–27, 1918, was a new rod fastened to a birch tree, 75 feet upstream from bridge. All three gages referred to same datum. Gage read by A. D. Kilpatrick.

DISCHARGE MEASUREMENTS.—Made from downstream side of the bridge. 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 ending September 30, 1919, 19.5 feet at 10 p. m. December 22, 1918 (discharge, not determined); minimum stage recorded, 2.58 feet at 7 a. m. and 4 p. m. September 29, 1919 (discharge, 170 second-feet).

Maximum stage recorded during year ending September 30, 1920, 20.0 feet at 10 a. m. April 2, 1920 (discharge not determined); minimum stage recorded, 2.53 feet at 4 p. m. October 2, 1919 (discharge, 160 second-feet).

1901–1905, 1914–1917, and 1918–1920: Maximum stage recorded, 21.0 feet February 28, 1902 (discharge not determined); minimum stage recorded, 2.1 feet July 2 and 3, August 9, September 9–11, 14–16, 29–30 and October 1–4, 1914 (discharge, 89 second-feet).

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

DIVERSIONS.—None.

REGULATION.—The operation of small mills upstream may cause slight diurnal fluctuation, but not enough to affect accuracy of determinations.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve fairly well defined from 150 to 2,200 second-feet; extended above 2,200 second-feet. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records for stages below 2,500 second-feet fairly good, for those above, only fair.

Discharge measurements of Nottely River near Ranger, N. C., during the years ending Sept. 30, 1919 and 1920.

[Made by A. H. Condron.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1918.	*Feet.*	*Sec.-ft.*	1919.	*Feet.*	*Sec.-ft.*	1920.	*Feet.*	*Sec.-ft.*
Oct. 19	2.59	164	Jan. 10	4.60	742	Jan. 22	3.83	477
28	5.44	986	Apr. 2	4.60	739	25	7.54	1,910
Nov. 8	3.59	422	3	4.55	727	Mar. 30	6.38	1,380
						Apr. 12	5.73	1,160
						18	5.28	994

Daily discharge, in second-feet, of Nottely River near Ranger, N. C., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	.....	1,180	508	846	744	954	778	778	418	448	338	338
2	.....	880	478	2,350	744	812	744	642	418	418	418	288
3	.....	642	418	1,700	608	710	744	574	418	390	364	264
4	.....	574	364	1,330	642	744	778	574	418	364	338	240
5	.....	744	364	1,100	812	1,920	744	540	390	338	313	217
6	.....	478	364	954	710	2,150	676	574	390	2,250	300	228
7	.....	448	364	880	642	1,250	676	676	364	1,250	338	228
8	.....	418	313	846	642	1,410	676	2,150	338	880	300	217
9	.....	418	313	778	574	2,550	642	1,030	418	608	288	217
10	.....	390	313	744	642	1,490	608	676	448	574	288	228
11	.....	390	364	710	574	1,030	1,250	778	418	508	313	217
12	.....	390	364	676	540	1,060	954	710	364	448	364	478
13	.....	364	313	642	812	991	812	710	364	418	338	252
14	.....	364	608	642	1,250	954	744	710	338	418	364	217
15	.....	276	1,330	608	954	880	710	642	338	418	364	206
16	.....	300	2,900	574	880	991	1,450	608	418	418	252	217
17	.....	540	1,330	642	744	954	1,060	574	364	364	276	184
18	.....	676	880	744	608	1,100	880	540	390	448	276	184
19	.....	508	744	710	642	954	812	540	390	1,210	240	184
20	217	418	676	676	642	880	744	574	338	744	228	184
21	252	390	991	608	991	812	744	574	313	608	240	217
22	217	338	6,300	574	2,100	642	710	642	478	676	338	217
23	184	390	3,900	991	1,530	744	608	608	448	608	338	206
24	276	390	1,570	1,250	1,140	710	642	508	710	448	338	195
25	1,290	390	1,250	954	1,140	676	608	508	710	418	364	184
26	991	364	1,060	2,250	1,030	642	608	540	1,030	574	288	184
27	1,100	313	954	1,370	1,030	1,030	608	540	991	540	252	184
28	991	1,250	880	1,100	880	1,250	608	508	642	390	240	174
29	2,700	1,060	744	917	.....	991	574	508	812	364	418	174
30	5,100	574	676	846	.....	880	608	448	540	338	880	174
31	2,100	.....	608	778	.....	812	.....	448	.....	313	418	.....

Daily discharge, in second-feet, of Nottely River near Ranger, N. C., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	164	264	338	313	642	540	1,570	812	574	390	338	676
2	164	390	288	313	608	508	6,100	778	608	418	338	574
3	228	276	264	300	1,030	478	2,650	812	642	478	313	508
4	313	276	228	300	3,200	508	4,850	744	744	540	300	574
5	217	264	228	288	1,570	1,290	2,300	710	778	418	288	478
6	206	252	288	300	1,180	574	1,830	1,030	778	418	313	676
7	217	240	364	338	954	508	1,450	880	642	418	313	540
8	217	217	676	364	812	608	1,410	1,100	540	364	364	540
9	228	217	3,900	418	744	574	1,490	812	508	364	846	1,330
10	240	206	3,550	418	710	574	1,410	778	478	364	2,100	1,570
11	228	195	1,250	390	676	608	1,250	744	478	418	1,920	744
12	217	418	846	338	676	1,140	954	710	478	418	1,450	608
13	313	478	676	313	744	1,570	1,140	1,100	418	364	2,400	1,330
14	264	338	744	313	676	1,140	1,250	880	418	338	2,100	676
15	217	313	608	364	574	880	1,030	812	448	418	2,800	608
16	217	300	540	448	540	778	954	744	448	676	2,100	508
17	240	276	508	991	540	1,060	991	676	478	574	2,200	508
18	206	264	478	540	540	917	991	710	508	1,450	1,570	478
19	240	264	478	478	540	1,290	917	812	478	1,610	1,650	478
20	217	252	448	418	508	1,410	880	744	880	1,100	1,700	478
21	217	240	418	390	478	1,060	1,740	676	676	846	1,530	448
22	338	240	390	418	1,450	917	1,140	676	1,030	676	1,450	418
23	1,250	206	338	448	917	846	1,030	642	778	508	1,030	418
24	880	195	313	2,800	744	778	954	676	676	478	954	418
25	418	195	300	1,740	676	744	642	676	540	448	812	390
26	313	184	288	2,400	642	1,450	1,100	954	508	418	778	418
27	276	184	338	1,780	608	1,100	1,290	744	478	418	744	338
28	276	174	338	1,650	540	2,550	991	710	448	364	846	390
29	264	174	313	1,410	608	2,550	917	676	540	313	744	390
30	264	540	313	1,060	.....	1,570	846	676	418	338	608	418
31	252	.....	313	744	.....	1,180	.....	642	.....	338	540	.....

Monthly discharge of Nottely River near Ranger, N. C., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 272 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October 20–31	5,100	184	1,280	4.71	2.10
November	1,250	276	529	1.94	2.16
December	6,300	313	1,040	3.82	4.40
January	2,350	574	961	3.53	4.07
February	2,100	540	866	3.18	3.31
March	2,550	642	1,060	3.90	4.50
April	1,450	574	760	2.79	3.11
May	2,150	448	659	2.42	2.79
June	1,030	313	481	1.77	1.98
July	2,250	313	587	2.16	2.49
August	880	228	336	1.24	1.43
September	478	174	223	.820	.91
1919–20.					
October	1,250	164	300	1.10	1.27
November	540	174	368	1.35	1.51
December	3,900	228	657	2.42	2.79
January	2,800	288	735	2.70	3.11
February	3,200	478	832	3.06	3.30
March	2,550	478	1,020	3.75	4.32
April	6,100	642	1,540	5.66	6.32
May	1,100	642	779	2.86	3.30
June	1,030	418	581	2.14	2.39
July	1,610	313	538	1.98	2.28
August	2,800	288	1,140	4.19	4.83
September	1,570	338	598	2.20	2.46
The year	6,100	164	749	2.75	37.88

TOCCOA RIVER NEAR DIAL, GA.

LOCATION.—2,600 feet above Shallow Ford, 1 mile above Stanley Creek, 2½ miles below Big Creek, 3½ miles below Noontootley Creek, 4 miles northwest of Dial, Fannin County, and 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, 1920. 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 auxiliary staff gage, 1,781.13 feet.

DISCHARGE MEASUREMENTS.—Made from cable 1,000 feet upstream from gage.

CHANNEL AND CONTROL.—Bed of stream consists of gravel and boulders; fairly smooth. Left bank subject to overflow 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 ending September 30, 1919, 7.60 feet December 22 (discharge, 6,080 second-feet); minimum stage, mean from water-stage recorder 0.75 foot October 6–8, 16, and 18 (discharge, 125 second-feet).

Maximum stage during year ending September 30, 1920, 7.20 feet at 7 a. m. April 2 (discharge, 5,560 second-feet); minimum mean daily stage, 0.80 foot October 1 and 2 (discharge, 135 second-feet).

1913–1920: Maximum stage recorded, 10.0 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).

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

REGULATION.—There are slight diurnal fluctuations owing to operation of small mills upstream.

ACCURACY.—Recent discharge measurements indicate a change in the rating curve used for 1918 below 1,500 second-feet. Curve is well defined below 3,500 second-feet. Gage-height record is obtained from a recording gage which is checked daily with staff gage readings. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except those for November and December, 1918, which are fair.

COOPERATION.—Gage-height record furnished by Tennessee Power Co.

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

June 13, 1919: Gage height, 1.60 feet; discharge, 398 second-feet.

Daily discharge, in second-feet, of Toccoa River near Dial, Ga., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	140	850	475	1,430	714	915	791	767	461	320	324	260
2	135	670	448	2,040	725	850	767	575	439	314	310	251
3	135	580	430	1,650	791	791	755	530	425	310	296	245
4	135	525	413	1,300	755	773	791	515	425	306	286	230
5	127	479	401	1,140	725	1,840	725	515	425	497	300	224
6	125	452	389	999	686	1,290	686	626	425	915	324	215
7	125	425	385	915	670	1,040	676	2,050	405	506	324	200
8	125	393	381	863	643	1,570	648	1,490	398	417	310	185
9	129	381	381	830	659	1,620	626	1,030	398	389	260	185
10	135	381	401	798	615	1,240	811	856	397	385	251	185
11	131	377	443	773	590	1,060	1,620	785	385	345	254	317
12	131	345	393	743	605	985	850	720	385	314	282	254
13	140	338	405	725	1,300	929	743	755	385	353	260	185
14	135	324	1,510	714	1,100	863	705	698	385	353	479	185
15	129	306	1,310	686	850	896	761	659	385	328	303	178
16	125	595	1,800	670	773	1,050	1,200	626	425	303	251	172
17	129	626	1,110	1,160	708	1,120	902	620	448	328	239	172
18	125	525	870	882	670	985	791	615	443	328	227	162
19	129	448	755	755	643	950	797	615	385	456	224	172
20	212	425	767	714	773	877	714	665	361	401	221	185
21	165	413	2,500	681	773	837	686	600	377	377	338	178
22	138	393	6,080	681	2,020	818	670	575	353	452	314	172
23	135	385	2,060	670	1,220	773	643	565	393	373	254	172
24	479	397	1,780	1,060	957	755	615	540	575	334	328	165
25	520	385	1,570	1,300	1,160	725	714	530	615	425	338	160
26	870	369	1,370	1,410	999	837	605	530	626	497	245	158
27	580	353	1,220	1,100	896	1,680	570	515	479	328	236	148
28	798	1,100	1,120	925	896	1,120	565	506	405	306	230	142
29	3,570	659	1,110	863	.....	950	570	497	385	289	257	140
30	2,690	535	985	798	.....	877	570	492	385	286	369	135
31	1,400	.....	1,280	1,250	.....	837	.....	470	.....	282	282	.....
1919–20.												
1	135	209	282	345	615	565	2,020	896	615	452	425	850
2	135	289	260	317	575	545	4,160	915	804	488	385	936
3	233	221	245	303	1,350	545	2,240	1,030	659	545	328	992
4	203	212	239	303	1,930	902	2,720	882	725	470	310	818
5	172	212	233	282	1,300	1,220	1,960	1,340	792	425	310	818
6	172	200	260	317	1,010	773	1,590	1,240	670	448	310	725
7	175	191	470	369	876	670	1,460	1,360	615	470	310	681
8	160	185	1,400	438	785	615	1,310	915	590	425	530	985
9	230	185	4,280	492	725	600	1,460	863	565	385	1,040	1,680
10	191	218	1,930	425	703	590	1,460	818	545	397	1,830	1,360
11	178	470	1,060	385	670	605	1,310	785	540	425	1,760	964
12	180	540	773	365	670	957	1,370	785	530	405	1,540	902
13	194	393	708	345	708	1,000	1,280	1,120	515	365	1,510	915
14	185	314	714	331	670	791	1,130	915	492	365	3,330	773
15	182	275	565	328	653	703	1,090	804	479	448	2,900	725
16	215	260	550	515	615	805	1,260	773	470	502	2,160	698
17	221	251	540	626	626	1,030	1,120	743	474	506	1,890	708
18	215	248	515	466	653	870	1,040	915	479	530	1,680	615
19	185	242	530	417	631	1,200	1,000	882	502	1,370	2,250	615
20	178	227	470	393	670	1,090	1,120	818	654	831	2,570	615
21	185	221	467	425	515	915	1,280	798	590	540	1,680	600
22	515	215	452	425	1,220	817	1,090	755	492	565	1,590	590
23	605	209	448	457	964	755	1,010	725	615	474	1,310	580
24	448	206	425	1,530	863	725	985	725	565	405	1,140	642
25	275	239	385	1,330	725	791	950	811	492	393	1,060	590
26	248	282	369	1,690	686	1,200	1,160	785	461	369	985	565
27	230	286	365	1,340	605	889	1,240	725	470	345	1,120	545
28	221	263	353	1,020	580	1,570	1,070	737	615	345	985	535
29	215	357	345	850	590	1,880	985	686	615	345	896	525
30	215	377	331	731	.....	1,280	943	659	470	345	863	515
31	215	.....	328	659	.....	1,200	.....	615	.....	338	850	.....

NOTE.—Gage-height record for July 17–23, 1920, lost; discharge estimated by comparison with records for Toccoa River near Morganton.

Monthly discharge of Toccoa River near Dial, Ga., for years ending Sept. 30, 1919 and 1920.

[Drainage area, 175 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	3,570	125	453	2.59	2.99
November	1,100	306	481	2.75	3.07
December	6,080	381	1,110	6.33	7.30
January	2,040	670	985	5.63	6.49
February	2,020	590	854	4.65	4.84
March	1,840	725	1,030	5.88	6.78
April	1,620	565	752	4.30	4.80
May	2,050	470	695	3.97	4.58
June	626	353	426	2.43	2.71
July	915	282	382	2.18	2.51
August	479	221	288	1.65	1.90
September	317	135	191	1.09	1.22
The year	6,080	125	637	3.64	49.19
1919–20.					
October	605	135	229	1.31	1.51
November	540	185	267	1.53	1.71
December	4,280	233	655	3.74	4.31
January	1,690	282	588	3.36	3.87
February	1,930	515	799	4.57	4.93
March	1,880	545	906	5.18	5.97
April	4,160	943	1,430	8.17	9.12
May	1,360	615	865	4.94	5.70
June	804	461	570	3.26	3.64
July	1,370	338	475	2.71	3.12
August	3,330	310	1,290	7.37	8.50
September	1,680	515	769	4.40	4.91
The year	4,280	135	736	4.21	57.29

TOCCOA RIVER NEAR MORGANTON, GA.

LOCATION.—At highway bridge on road from Blue Ridge, 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 Blue Ridge, 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, 1920. Records 1898 to 1903 published in Water-Supply Paper 197, under "Toccoa River near Blue Ridge, 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 1,800 feet downstream from gage.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. Banks high; left bank subject to overflow at about gage height of 15 feet; right bank is 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 ending September 30, 1919, 8.3 feet December 22 (discharge, 6,370 second-feet); minimum mean daily stage, 2.37 feet October 11 (discharge, 214 second-feet).

Maximum mean daily stage during year ending September 30, 1920, 11.9 feet April 2 (discharge, 12,100 second-feet); minimum stage, mean from water-stage recorder, 2.37 feet October 1 (discharge, 214 second-feet).

1913–1920: 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 practically permanent during years ending September 30, 1919 and 1920. Rating curve well defined between 200 and 3,000 second-feet; extended above 3,000 second-feet. The gage-height record is obtained from a recording gage which is checked daily with staff gage readings. Daily discharge ascertained by applying mean daily gage height to rating table. Records good below stages of 3,500 second-feet.

COOPERATION.—Gage-height record furnished by Tennessee Power Co.

The following discharge measurement was made by A. H. Condron:
June 13, 1919: Gage height, 3.00 feet; discharge, 479 second-feet.

Daily discharge, in second-feet, of Toccoa River near Morganton, Ga., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	250	977	505	1,680	914	1,080	956	998	552	440	390	340
2	242	798	480	2,470	900	1,030	914	765	541	426	480	308
3	236	752	465	1,980	935	970	900	713	520	408	398	300
4	236	618	445	1,460	935	940	949	700	520	403	376	292
5	228	574	430	1,320	817	1,960	900	670	541	398	362	288
6	228	530	421	1,190	778	1,550	844	758	530	1,660	372	276
7	228	515	403	1,130	765	1,260	830	2,260	530	746	398	272
8	225	505	408	1,120	817	1,720	817	1,630	530	652	381	268
9	222	430	398	1,040	817	2,200	784	1,190	530	552	349	264
10	222	421	421	984	765	1,520	977	1,030	520	505	349	268
11	214	398	470	942	765	1,340	1,560	970	520	495	340	260
12	225	385	426	928	760	1,230	1,080	865	480	505	421	568
13	239	385	416	900	1,550	1,190	956	907	465	495	376	268
14	225	376	1,430	865	1,420	1,150	900	844	455	495	336	260
15	218	362	1,280	837	1,040	1,120	1,110	798	460	490	784	256
16	225	652	1,790	817	970	1,150	1,410	765	460	430	358	250
17	225	739	1,100	1,290	900	1,340	1,120	758	629	412	340	246
18	225	602	858	1,120	851	1,190	991	732	530	525	324	239
19	225	490	758	970	830	1,100	921	706	634	1,150	308	239
20	312	455	726	886	984	1,060	900	791	460	530	300	260
21	304	430	2,700	830	1,000	1,040	865	700	440	640	296	260
22	246	416	6,370	830	2,430	984	830	670	505	525	670	256
23	225	416	2,340	1,750	1,630	970	817	652	490	640	362	246
24	720	430	2,020	1,310	1,260	935	798	652	618	465	394	242
25	739	394	1,680	1,360	1,510	900	765	640	784	390	440	236
26	921	385	1,480	1,830	1,260	970	758	640	720	886	435	232
27	752	390	1,370	1,350	1,230	1,890	739	607	851	505	316	228
28	914	1,200	1,200	1,150	1,190	1,290	720	596	552	450	300	225
29	4,210	732	1,120	1,080	.....	1,120	720	585	552	426	304	222
30	2,750	574	1,060	1,000	.....	1,150	732	585	475	403	380	218
31	1,460	.....	2,740	956	.....	1,000	.....	558	.....	430	421	.....

Daily discharge, in second-feet, of Toccoa River near Morganton, Ga., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	214	256	412	440	804	694	1,790	1,120	810	624	450	1,120
2	218	412	354	416	752	670	12,100	1,080	778	585	563	970
3	225	304	332	408	798	652	3,010	1,310	865	739	465	1,340
4	288	292	324	403	2,740	629	5,810	1,140	858	720	450	1,060
5	242	272	320	398	1,620	1,340	2,700	1,100	1,040	585	390	1,030
6	239	256	320	403	1,290	970	2,160	1,680	879	563	435	977
7	246	253	426	430	1,130	844	2,060	1,260	817	607	430	900
8	232	250	758	618	1,030	772	1,960	1,230	796	580	421	858
9	239	246	6,610	580	949	732	1,840	1,120	758	541	1,490	1,360
10	320	242	3,430	580	900	706	1,840	1,040	700	505	1,740	1,760
11	250	385	1,430	552	907	688	893	998	688	580	2,140	1,220
12	239	580	1,070	465	844	798	817	970	670	590	1,550	1,130
13	272	558	858	440	1,000	1,340	1,590	1,450	664	558	1,490	1,200
14	284	403	970	430	830	1,040	1,560	1,180	646	541	5,090	1,080
15	253	354	780	412	798	907	1,380	1,070	640	525	3,650	970
16	236	324	690	445	772	865	1,330	1,040	607	798	2,470	935
17	349	316	650	956	720	1,470	1,430	970	624	664	2,200	907
18	272	304	612	618	726	1,040	1,380	942	624	688	1,720	865
19	280	296	602	552	720	1,270	1,260	1,180	670	1,620	1,840	830
20	253	292	618	525	694	1,420	1,230	1,060	732	1,040	4,770	817
21	242	280	574	563	676	1,140	1,780	1,010	879	700	1,930	784
22	308	276	563	558	1,250	1,040	1,350	977	688	726	2,060	765
23	1,100	272	525	541	1,260	977	1,280	942	670	618	1,630	726
24	886	272	510	1,680	998	935	1,190	914	784	574	1,450	706
25	412	268	480	1,740	879	893	1,130	1,040	670	541	1,330	824
26	340	376	470	1,790	830	1,660	1,260	1,080	629	525	1,230	726
27	308	367	465	1,730	760	1,120	1,570	942	585	515	1,160	726
28	284	304	460	1,330	720	1,330	1,420	1,070	574	500	1,260	694
29	272	292	455	1,080	732	2,560	1,200	886	956	485	1,130	676
30	264	784	435	949	.....	1,590	1,150	865	640	470	1,080	670
31	260	.....	426	865	.....	1,340	.....	837	.....	460	1,060	.....

Monthly discharge of Toccoa River near Morganton, Ga., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 231 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	4,210	214	577	2.50	2.88
November	1,200	362	545	2.36	2.63
December	6,370	398	1,220	5.28	6.09
January	2,470	817	1,210	5.24	6.04
February	2,430	760	1,070	4.63	4.82
March	2,200	900	1,240	5.37	6.19
April	1,560	720	919	3.98	4.44
May	2,260	558	830	3.59	4.14
June	851	440	546	2.36	2.63
July	1,660	390	564	2.44	2.81
August	784	296	389	1.68	1.94
September	568	218	270	1.17	1.30
The year	6,370	214	780	3.38	45.91
1919–20.					
October	1,100	214	317	1.37	1.58
November	784	242	336	1.45	1.62
December	6,610	320	869	3.76	4.34
January	1,790	398	739	3.20	3.69
February	2,740	676	970	4.20	4.53
March	2,560	629	1,080	4.67	5.38
April	12,100	817	2,050	8.88	9.91
May	1,680	837	1,080	4.67	5.38
June	1,040	574	731	3.17	3.54
July	1,620	460	638	2.76	3.18
August	5,090	390	1,580	6.84	7.89
September	1,760	670	954	4.13	4.61
The year	12,100	214	944	4.08	55.75

OCOEE RIVER AT COPPER HILL, TENN.

LOCATION.—At highway bridge in Copper Hill, Polk County, half a mile above mouth of Fightingtown Creek.

DRAINAGE AREA.—374 square miles.

RECORDS AVAILABLE.—March 21, 1903, to December 31, 1913, and October 1, 1918, to September 30, 1920.

GAGE.—Chain gage attached to upstream side of bridge. Read by L. Curran.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Bed of stream is not permanent at gage. Control is practically permanent.

EXTREMES OF STAGE.—Maximum stage recorded during year ending September 30 1919, 7.15 feet at 5 a. m. December 22, minimum stage, 0.72 foot at 5 p. m. September 28.

Maximum stage recorded during year ending September 30, 1920, 11.74 feet at 5 a. m. April 2; minimum stage, 0.72 foot October 2.

1903–1913 and 1919–20: Maximum stage recorded, 18.5 feet November 19, 1906.

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

REGULATION.—There is a slight diurnal fluctuation during extremely low stages caused by operation of a few small water plants above gage.

Data inadequate for determination of discharge.

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

Daily gage height, in second-feet, of Ocoee River at Copper Hill, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1.05	2.35	1.50	2.65	2.06	2.40	2.20	2.56	1.48	1.34	1.21	1.12
2	.96	1.95	1.45	4.00	2.02	2.28	2.15	2.01	1.46	1.30	1.37	1.02
3	.97	1.70	1.40	3.60	2.02	2.22	2.10	1.85	1.42	1.24	1.15	1.00
4	.96	1.56	1.34	2.90	2.32	2.14	2.11	1.77	1.42	1.25	1.15	.97
5	.95	1.48	1.31	2.60	2.01	3.50	2.18	1.74	1.44	1.55	1.14	.96
6	.92	1.44	1.30	2.45	1.96	3.38	2.18	1.76	1.40	2.90	1.12	.95
7	.92	1.32	1.25	2.32	1.90	2.72	2.50	2.42	1.34	1.94	1.18	.90
8	.90	1.22	1.22	2.30	1.95	2.71	1.94	2.85	1.35	1.91	1.20	.90
9	.90	1.25	1.25	2.24	1.92	3.98	1.92	2.46	1.36	1.68	1.10	.90
10	.90	1.20	1.28	2.12	1.88	3.10	1.90	2.24	1.45	1.54	1.06	.90
11	.88	1.20	1.48	2.00	1.81	2.34	2.98	2.06	1.38	1.48	1.10	.91
12	.91	1.15	1.42	2.02	1.80	2.61	2.30	2.00	1.30	1.36	1.58	1.20
13	1.00	1.15	1.38	1.97	2.46	2.52	2.02	1.95	1.27	1.31	1.18	.91
14	.98	1.12	2.32	1.95	3.00	2.48	2.01	2.05	1.27	1.41	1.10	.97
15	.95	1.07	2.90	1.95	2.32	2.38	1.98	1.96	1.24	1.36	1.98	.88
16	.90	1.45	2.90	1.90	2.12	2.42	1.94	1.82	1.27	1.26	1.10	.86
17	.87	1.92	2.55	2.38	2.02	2.55	1.92	1.91	1.28	1.24	1.02	.82
18	.87	1.78	2.12	2.55	2.00	2.58	1.86	1.76	1.85	1.61	.96	.80
19	.90	1.48	1.88	2.16	1.90	2.36	1.78	1.71	1.44	1.28	.94	.86
20	1.20	1.38	1.78	2.06	1.91	2.31	2.08	1.98	1.30	1.45	.94	.85
21	1.35	1.28	2.95	1.98	2.40	2.25	2.01	1.78	1.28	1.55	1.04	.89
22	1.12	1.30	7.08	1.95	3.65	2.20	1.98	1.72	1.41	1.32	1.54	.89
23	.98	1.26	4.00	3.00	3.20	2.16	1.94	1.70	1.30	1.82	1.12	.86
24	1.35	1.25	3.40	2.75	2.58	2.12	1.92	1.66	1.76	1.30	1.38	.88
25	2.45	1.26	3.05	2.38	2.90	2.10	1.86	1.64	1.91	1.25	1.25	.82
26	1.64	1.21	2.75	3.35	2.65	2.05	1.78	1.67	2.40	1.65	1.08	.90
27	2.35	1.20	2.50	2.76	2.42	2.85	1.85	1.60	2.00	1.38	1.00	.72
28	1.95	2.60	2.38	2.48	2.32	2.75	1.85	1.54	1.71	1.26	.97	.74
29	4.50	2.10	2.24	2.32	.....	2.36	1.85	1.56	1.68	1.20	1.11	.72
30	5.28	1.65	2.12	2.20	.....	2.30	1.85	1.54	1.44	1.16	1.51	.78
31	3.22	.....	2.08	2.15	.....	2.26	.....	1.52	.....	1.18	1.36	.....

Daily gage height, in second-feet, of Ocoee River at Copper Hill, Tenn., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	0.74	0.87	1.25	1.10	1.76	1.68	4.02	2.32	1.70	1.39	1.20	2.08
2	.72	1.10	1.12	1.10	1.74	1.67	9.07	2.24	1.75	1.44	1.30	1.90
3	.90	.98	1.10	1.06	2.32	1.65	4.30	2.45	1.82	1.58	1.16	2.35
4	1.24	.90	1.07	1.05	3.62	1.80	5.60	2.26	1.85	1.52	1.14	2.00
5	.88	.87	1.06	1.02	2.74	2.65	4.15	2.40	1.94	1.38	1.10	1.90
6	.84	.87	1.07	1.01	2.36	1.98	3.55	2.45	1.82	1.34	1.18	1.85
7	.84	.85	1.32	1.00	2.32	1.81	2.41	2.30	1.71	1.50	1.15	1.80
8	.81	.85	2.08	1.56	2.06	1.71	2.64	2.34	1.65	1.38	1.12	2.20
9	.88	.84	4.95	1.62	1.96	1.68	3.28	2.16	1.60	1.28	2.30	2.78
10	1.02	.86	4.00	1.51	1.88	1.70	3.12	2.12	1.60	1.26	2.98	2.70
11	.84	1.20	2.60	1.27	1.88	1.70	2.86	2.10	1.56	1.40	3.11	2.18
12	.88	1.56	2.02	1.22	1.82	2.32	2.95	2.00	1.52	1.55	3.20	2.04
13	.98	1.52	1.85	1.16	2.02	2.72	2.85	2.60	1.50	1.30	3.08	2.25
14	1.12	1.11	2.20	1.17	1.84	2.22	2.68	2.24	1.48	1.26	4.50	1.98
15	.95	1.07	1.80	1.12	1.78	2.01	2.55	2.10	1.45	1.95	4.05	1.92
16	.90	1.00	1.62	1.40	1.72	1.98	2.76	1.98	1.45	1.82	4.25	1.85
17	1.12	.94	1.52	2.07	1.62	2.76	2.58	1.95	1.42	1.70	3.35	1.82
18	1.01	.96	1.48	1.61	1.64	2.21	2.50	2.18	1.62	3.40	3.08	1.74
19	1.01	.94	1.42	1.40	1.64	2.96	2.40	2.21	1.55	2.81	3.00	1.68
20	.96	.95	1.55	1.40	1.58	2.68	2.45	2.06	1.90	2.08	4.05	1.68
21	.92	.95	1.40	1.50	1.54	2.35	3.08	1.98	1.80	1.72	3.05	1.60
22	1.52	.94	1.38	1.50	3.00	2.18	2.58	1.96	1.58	1.68	3.05	1.60
23	2.35	.92	1.32	1.51	2.55	2.12	2.52	1.90	1.66	1.48	2.68	1.56
24	1.75	.90	1.28	3.35	2.12	1.98	2.38	1.90	1.82	1.38	2.45	1.92
25	1.30	.88	1.28	3.00	1.98	1.95	2.30	2.02	1.54	1.38	2.32	1.72
26	1.21	1.10	1.22	3.15	1.84	2.55	2.61	2.12	1.42	1.32	2.22	1.60
27	1.00	1.15	1.21	2.90	1.74	2.15	2.81	1.90	1.42	1.28	2.65	1.55
28	.95	1.00	1.18	2.30	1.70	3.55	2.55	1.88	1.52	1.22	2.35	1.55
29	.88	1.05	1.14	2.10	1.71	3.95	2.36	1.82	2.12	1.14	2.10	1.50
30	.90	1.72	1.14	2.00	.....	2.90	2.28	1.79	1.45	1.24	2.02	1.50
31	.85	.....	1.11	1.88	.....	2.58	.....	1.72	.....	1.18	2.42	.....

OCOEE RIVER AT McHARGE, TENN.

LOCATION.—At county bridge half a mile downstream from McHarge railroad siding, Polk County, and 2½ miles downstream from Copper Hill, Tenn. Potato Creek enters half a mile above gage.

DRAINAGE AREA.—451 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 1, 1917, to September 30, 1920.

GAGE.—Vertical staff bolted to left downstream side of concrete bridge pier on left bank; read by Miss Nellie Rogers.

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

CHANNEL AND CONTROL.—Right bank high; left bank subject to overflow at extreme stages but all water passes under bridge. Control consists of solid rock riffle about 300 feet below gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 9.6 feet at 4.45 p. m. December 22 (discharge, 10,700 second-feet); minimum stage, 0.52 foot September 28, 29, and 30 (discharge, 341 second-feet).

Maximum stage recorded during year ending September 30, 1920, 9.9 feet April 2 (discharge, 11,100 second-feet); minimum stage, 0.5 foot October 1 and 2 (discharge, 330 second-feet).

1917–1920: Maximum stage recorded, that of April 2, 1920; minimum stage, 0.5 foot December 19–25, , 1917, October 1 and 2, 1919 (discharge, 330 second-feet).

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

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 400 and 5,000 second-feet; extended above 5,000 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records below 5,000 second-feet good; above that point subject to considerable error.

Discharge measurements of Ocoee River at McHarge, Tenn., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Nov. 15	L. J. Hall	1.00	707	Mar. 11	Condron and King	1.75	1,200
1919.							
June 14	A. H. Condron	1.21	803				

Daily discharge, in second-feet, of Ocoee River at McHarge, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	.....	.....	1,030	2,250	1,630	2,030	1,680	2,790	928	905	729	617
2	.....	.....	995	4,600	1,566	1,840	1,640	1,490	898	771	860	542
3	.....	.....	905	3,760	1,520	1,760	1,590	1,320	898	729	708	510
4	.....	.....	860	2,520	1,800	1,680	1,620	1,250	890	715	687	497
5	.....	.....	815	2,190	1,560	3,560	1,660	1,220	880	1,970	631	478
6	.....	.....	757	2,010	1,490	3,170	1,520	1,260	830	3,080	659	452
7	.....	.....	771	1,890	1,420	2,390	1,470	1,930	808	2,160	701	433
8	.....	.....	750	1,850	1,420	2,320	1,440	3,186	770	1,280	785	433
9	.....	.....	722	1,800	1,380	4,630	1,410	2,030	800	1,240	610	415
10	.....	.....	743	1,660	1,350	2,810	1,370	1,710	1,010	1,110	575	415
11	.....	.....	935	1,580	1,320	2,440	2,660	1,540	920	1,020	575	421
12	.....	.....	845	1,710	1,320	2,190	1,900	1,440	845	905	1,110	701
13	.....	.....	778	1,580	2,160	2,100	1,640	1,540	815	860	722	439
14	.....	.....	2,020	1,500	2,480	2,070	1,560	1,500	743	845	673	409
15	.....	.....	2,480	1,440	1,900	1,960	1,500	1,400	743	822	1,120	397
16	.....	.....	2,090	2,830	1,660	1,960	2,520	1,310	760	785	680	385
17	.....	.....	2,060	2,410	1,550	2,120	2,050	1,280	800	750	631	385
18	.....	.....	1,630	1,990	1,490	2,190	1,710	1,230	2,560	950	575	380
19	.....	.....	1,420	1,520	1,420	1,990	1,650	1,240	965	980	556	374
20	.....	.....	1,300	1,470	1,460	1,860	1,570	1,510	890	935	530	385
21	.....	.....	3,630	1,440	1,990	1,880	1,520	1,250	815	920	652	409
22	.....	.....	10,700	1,430	4,530	1,710	1,460	1,190	920	935	995	409
23	.....	.....	4,240	1,350	2,920	1,680	1,440	1,190	875	1,560	645	385
24	.....	729	3,100	1,900	2,230	1,620	1,400	1,130	1,320	852	972	374
25	.....	736	2,550	2,160	2,590	1,590	1,340	1,090	1,470	822	860	363
26	.....	687	2,260	3,520	2,260	1,560	1,340	1,090	3,190	1,150	659	358
27	.....	687	2,020	2,420	2,020	3,790	1,280	1,070	1,560	935	562	358
28	.....	2,270	1,890	2,100	1,960	2,480	1,270	1,030	1,080	845	542	341
29	.....	1,550	1,740	1,900	.....	1,980	1,250	1,020	1,150	778	815	391
30	.....	1,190	1,650	1,770	.....	1,830	1,300	995	942	750	935	352
31	.....	.....	1,590	1,710	.....	1,780	.....	960	.....	729	845	.....
1919-20.												
1	330	549	757	708	1,300	1,160	3,720	1,870	1,220	890	687	1,720
2	330	715	645	659	1,230	1,130	11,100	1,810	1,290	935	815	1,500
3	397	589	610	617	1,940	1,100	5,220	2,080	1,340	860	866	1,960
4	562	536	575	617	3,880	1,630	7,940	1,860	1,400	868	645	1,610
5	409	504	603	624	2,400	2,260	4,730	1,760	1,690	815	631	1,520
6	409	484	575	659	1,980	1,450	3,720	2,260	1,350	860	653	1,460
7	403	478	868	701	1,740	1,300	3,200	1,920	1,220	905	638	1,380
8	385	478	1,450	958	1,610	1,170	2,890	1,940	1,150	838	631	2,460
9	421	478	7,100	1,030	1,470	1,170	3,560	1,760	1,110	722	1,720	3,150
10	484	452	4,340	942	1,460	1,150	2,880	1,660	1,090	750	2,940	2,370
11	409	852	2,160	800	1,420	1,190	2,610	1,600	1,050	890	2,920	1,630
12	415	1,070	1,590	750	1,340	1,980	2,570	1,590	995	920	3,180	1,660
13	497	972	1,400	722	1,500	2,350	2,550	2,410	965	800	2,900	1,970
14	562	743	1,680	694	1,330	1,730	2,320	1,830	935	785	5,960	1,630
15	445	673	1,340	659	1,260	1,520	2,220	1,660	928	1,520	5,020	1,550
16	421	631	1,160	920	1,170	1,470	2,480	1,590	913	1,400	3,680	1,440
17	603	575	1,090	1,610	1,130	2,320	2,260	1,560	905	1,100	3,690	1,370
18	542	562	1,000	1,070	1,160	1,710	2,120	1,870	1,090	4,040	2,880	1,320
19	556	536	1,030	935	1,130	2,800	2,070	1,870	995	2,640	2,920	1,260
20	536	510	1,010	898	1,090	2,300	2,070	1,590	1,450	1,690	2,880	1,220
21	523	497	920	920	1,010	1,900	2,960	1,560	1,290	1,280	2,860	1,190
22	2,070	478	890	995	3,040	1,690	2,300	1,530	920	1,170	2,860	1,170
23	2,430	478	868	1,060	1,960	1,590	2,300	1,440	1,490	995	2,350	1,130
24	1,420	478	815	4,240	1,620	1,500	2,050	1,420	1,290	905	2,120	1,280
25	935	497	785	2,770	1,440	1,440	1,990	1,560	1,010	943	1,920	1,350
26	757	666	764	2,920	1,380	2,380	2,370	1,630	920	898	1,780	1,170
27	673	645	757	2,620	1,250	1,690	2,540	1,430	883	785	2,500	1,160
28	631	549	729	2,140	1,210	2,860	2,120	1,420	1,140	785	1,930	1,140
29	575	582	715	1,740	1,170	4,440	2,010	1,340	1,340	730	1,730	1,070
30	549	1,010	687	1,570	.....	2,590	1,920	1,300	950	700	1,690	1,060
31	530	.....	673	1,440	.....	2,260	.....	1,250	.....	700	1,620	.....

Monthly discharge of Ocoee River at McHarge, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 451 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
November 24–30	2,270	687	1,120	2.48	0.65
December	10,700	722	1,910	4.24	4.89
January	4,600	1,350	2,070	4.59	5.29
February	4,530	1,320	1,870	4.15	4.32
March	4,630	1,560	2,220	4.92	5.67
April	2,660	1,250	1,560	3.46	3.86
May	3,180	960	1,430	3.17	3.66
June	3,190	743	1,070	2.37	2.64
July	3,080	715	1,070	2.37	2.73
August	1,120	530	729	1.62	1.87
September	701	341	427	.947	1.06
1919–20.					
October	2,420	330	652	1.45	1.67
November	1,070	452	609	1.35	1.51
December	7,100	575	1,280	2.84	3.27
January	4,240	617	1,260	2.79	3.22
February	3,880	1,010	1,570	3.48	3.75
March	4,440	1,100	1,850	4.10	4.73
April	11,100	1,920	3,160	7.01	7.82
May	2,260	1,250	1,690	3.75	4.32
June	1,690	883	1,140	2.53	2.82
July	4,040	700	1,100	2.44	2.81
August	5,960	631	2,250	4.99	5.75
September	3,150	1,060	1,530	3.39	3.78
The year	11,100	330	1,500	3.33	45.45

OCOEE RIVER AT EMF, TENN.

LOCATION.—600 feet below Tennessee Power Co.'s plant No. 2, known as "Caney Creek plant," half a mile upstream from Emf, Polk County, Tenn., 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, 1920.

GAGE.—Bristol recording gage on left bank; checked daily with a staff gage, which is bolted to a rock near the recorder. Sea-level elevation of zero of gage 830 feet. Read by Thomas Sandifer.

DISCHARGE MEASUREMENTS.—Made from suspension footbridge 1,000 feet downstream from gage.

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 a shoal and island 700 feet downstream from gage. Permanent for long periods.

EXTREMES OF DISCHARGE.—Maximum mean daily stage recorded during year ending September 30, 1919, 10.4 feet December 22 (discharge, 14,100 second-feet); minimum mean daily stage, 3.09 feet September 30 (discharge, 403 second-feet).

Maximum stage during year ending September 30, 1920, 12.40 feet at noon April 2 (discharge, 18,500 second-feet); minimum stage, mean for day, from water-stage recorder, 3.07 feet October 2 (discharge, 391 second-feet).

1913–1920: 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).

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

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 the stage of the river. Storage at diversion dam is very small. When plant is shut down water overflows the dam in a short time so that periods of fluctuation will be short.

ACCURACY.—Stage-discharge relation changed during spring of 1920, probably about May 18 as indicated by comparison of records at Morganton, McHarge, and Emf. Rating curve used before the change well defined between 400 and 8,000 second-feet; extended above 8,000 second-feet as a tangent. Curve used after the change well defined between 1,000 and 3,000 second-feet; extended beyond these limits. Operation of water-stage recorder not entirely satisfactory during 1920, but record has been corrected by use of daily readings of staff gage. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair except for April and May, 1920, for which they are poor.

COOPERATION.—Gage-height record furnished by Tennessee Power Co.

Discharge measurements of Ocoee River at Emf, during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Nov. 13	L. J. Hall	3.53	790	June 10	King and Condron	4.33	1,250
Dec. 30	do	4.55	1,900	22	L. J. Hall	4.29	1,220

Daily discharge, in second-feet, of Ocoee River at Emf, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1918-19.												
1	459	2,120	1,070	2,370	1,820	2,280	1,860	2,640	1,130	980	776	673
2	447	1,570	1,000	6,130	1,660	2,040	1,760	1,590	1,080	884	884	576
3	447	1,340	913	4,640	1,620	1,960	1,760	1,400	1,080	884	715	554
4	447	1,180	857	3,200	1,820	1,820	1,740	1,290	1,080	758	656	554
5	440	1,080	835	2,640	1,630	5,790	1,760	1,290	1,060	2,280	640	545
6	428	1,000	820	2,370	1,640	4,530	1,520	1,370	1,010	4,220	673	523
7	434	951	793	2,040	1,610	2,920	1,570	2,120	980	2,200	758	487
8	422	894	793	2,040	1,570	3,700	1,610	4,320	980	1,570	802	459
9	428	802	793	2,040	1,460	5,790	1,570	2,460	980	1,490	600	459
10	434	838	793	1,820	1,390	3,700	1,590	1,960	1,090	1,200	623	453
11	428	793	894	1,760	1,380	2,920	2,730	1,690	1,110	1,030	681	447
12	472	758	913	1,730	1,400	2,550	2,040	1,570	932	922	1,380	623
13	447	750	820	1,630	2,640	2,460	1,760	1,670	866	903	723	523
14	440	741	2,730	1,580	3,110	2,460	1,670	1,720	903	884	706	472
15	422	706	3,500	1,570	2,120	2,200	1,700	1,590	884	866	1,080	466
16	415	1,000	2,640	1,510	1,760	2,280	3,110	1,520	884	820	681	459
17	422	1,610	2,200	2,370	1,730	2,640	2,370	1,480	884	723	648	459
18	428	1,320	1,630	3,020	1,630	2,640	1,960	1,370	1,400	1,010	568	447
19	422	1,100	1,390	1,890	1,510	2,200	1,730	1,290	1,160	913	554	440
20	508	951	1,270	1,820	1,700	2,040	1,560	1,670	884	1,760	545	434
21	584	848	7,950	1,660	2,370	1,960	1,630	1,550	875	848	615	434
22	508	884	14,100	1,570	5,260	1,890	1,560	1,410	942	903	1,000	434
23	453	802	6,210	2,920	3,900	1,820	1,530	1,460	1,000	980	681	428
24	689	793	4,070	3,110	2,550	1,760	1,550	1,380	1,240	1,400	1,050	428
25	1,558	793	2,980	2,460	3,200	1,740	1,400	1,310	1,410	723	894	422
26	980	750	2,590	3,900	2,820	1,730	1,390	1,240	3,700	884	640	422
27	1,760	750	2,200	2,820	2,370	4,000	1,310	1,250	1,820	793	584	409
28	1,200	2,280	1,890	2,370	2,200	3,020	1,410	1,240	1,420	640	568	409
29	6,000	2,000	1,820	2,120	.....	2,280	1,360	1,220	1,420	607	673	409
30	9,930	1,290	1,730	2,040	.....	2,120	1,510	1,180	1,060	758	942	403
31	2,920	.....	1,730	1,890	.....	1,960	.....	1,160	.....	706	894	.....

Daily discharge, in second-feet, of Ocoee River at Emf, Tenn., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	397	494	664	706	1,320	1,180	7,730	1,760	1,790	1,050	840	1,780
2	391	673	614	664	1,240	1,120	17,000	1,630	2,010	1,140	810	1,520
3	409	592	584	516	1,890	1,080	8,280	1,920	1,990	1,160	760	1,640
4	584	523	538	584	4,110	1,080	10,200	1,730	1,910	1,080	720	1,650
5	428	466	623	545	2,770	1,320	6,420	1,770	2,140	940	740	1,680
6	434	434	631	848	2,100	2,200	4,740	2,500	2,070	960	750	1,650
7	428	453	776	848	1,760	1,510	4,320	1,730	1,920	1,030	720	1,520
8	409	447	1,430	942	1,580	1,120	3,400	1,760	1,790	1,040	700	1,960
9	422	459	7,070	1,030	1,460	1,130	3,500	1,570	1,580	940	1,770	2,770
10	459	434	4,420	1,020	1,430	1,180	3,130	1,460	1,480	890	4,180	3,410
11	530	884	2,200	884	1,440	1,240	2,730	1,460	1,540	940	3,310	2,230
12	487	1,110	1,730	793	1,380	1,800	2,620	1,460	1,490	1,330	3,560	1,960
13	459	951	1,490	776	1,430	2,370	2,410	2,060	1,490	980	3,600	2,050
14	561	689	1,660	723	1,290	1,760	2,040	1,780	1,430	930	5,880	1,880
15	459	664	1,420	706	1,180	1,630	2,200	1,510	1,370	1,010	4,800	1,760
16	681	615	1,240	990	1,120	1,510	2,480	1,420	1,370	1,440	5,020	1,710
17	732	553	1,170	1,630	1,110	2,060	2,510	1,340	1,340	1,240	4,330	1,540
18	584	545	1,050	1,170	1,160	1,850	2,170	1,780	1,200	2,480	3,560	1,460
19	545	523	1,080	1,170	1,140	2,790	2,090	2,360	1,240	3,030	3,410	1,440
20	508	523	1,110	1,120	1,100	2,690	2,040	2,200	1,600	2,010	4,080	1,430
21	784	523	980	980	1,080	1,820	4,990	2,080	1,540	1,520	2,930	1,370
22	3,700	494	903	1,080	3,110	1,510	2,550	2,100	1,240	1,370	2,820	1,330
23	3,900	523	884	1,080	2,810	1,510	2,230	2,020	1,350	1,260	2,360	1,340
24	1,510	508	838	3,170	1,760	1,490	1,890	1,960	1,550	1,160	2,050	1,450
25	951	501	750	3,240	1,420	1,490	1,760	2,180	1,240	1,010	1,830	1,380
26	932	623	750	2,880	1,290	2,070	2,230	2,290	1,120	970	1,680	1,180
27	776	640	750	3,020	1,180	1,760	2,550	2,220	1,010	890	2,240	1,200
28	631	568	732	2,390	1,170	3,700	2,060	1,960	1,060	840	2,060	1,100
29	568	600	706	1,820	1,160	5,580	1,890	1,860	1,220	810	1,740	1,060
30	508	980	723	1,570	.....	2,900	1,780	1,850	1,100	930	1,520	920
31	487	.....	706	1,460	.....	4,220	.....	1,860	.....	900	1,720	.....

Monthly discharge of Ocoee River at Emf, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 530 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	9,930	415	851	1.61	1.86
November	2,280	706	1,090	2.06	2.30
December	14,100	793	2,380	4.49	5.18
January	6,130	1,510	2,420	4.57	5.27
February	5,260	1,380	2,140	4.04	4.21
March	5,790	1,730	2,680	5.06	5.83
April	3,110	1,310	1,730	3.26	3.64
May	4,320	1,160	1,630	3.08	3.55
June	3,700	866	1,180	2.23	2.49
July	4,220	607	1,150	2.17	2.50
August	1,380	545	750	1.42	1.64
September	673	403	475	.896	1.00
The year	14,100	403	1,540	2.91	39.47
1919–20.					
October	3,900	391	795	1.50	1.73
November	1,110	434	600	1.13	1.26
December	7,070	538	1,300	2.45	2.82
January	3,240	516	1,300	2.45	2.82
February	4,110	1,080	1,620	3.06	3.30
March	5,580	1,080	1,960	3.70	4.27
April	17,000	1,760	3,860	7.28	8.12
May	2,500	1,340	1,860	3.51	4.05
June	2,140	1,010	1,510	2.85	3.18
July	3,030	810	1,200	2.26	2.61
August	5,880	700	2,470	4.66	5.37
September	3,410	920	1,650	3.11	3.47
The year	17,000	391	1,670	3.15	43.00

ELK RIVER NEAR ELKMONT, ALA.

LOCATION.—At steel highway bridge half a mile east of Wilson's store, 3 miles below Louisville & Nashville Railroad bridge (near Alabama-Tennessee boundary line), and 5 miles northwest of Elkmont, Limestone County, Ala.

DRAINAGE AREA.—1,700 square miles.

RECORDS AVAILABLE.—June 24, 1904, to February 2, 1908, and January 20, 1919, to September 30, 1920.

GAGE.—Chain gage attached to upstream side of highway bridge; read by Dr. W. E. Maples.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Bed composed chiefly of rock. Banks are subject to over-flow at stages above 16 feet. Control is well-defined rock and gravel ledge about 400 feet below gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 21.9 feet March 18 (discharge not determined); minimum stage 1.6 feet September 17–22, 29, and 30 (discharge, 360 second-feet).

Maximum stage recorded during year ending September 30, 1920, 25.5 feet April 3 (discharge not determined); minimum stage, 1.45 feet October 1 and 4 (discharge, 275 second-feet).

1904–1908; 1919–20: Maximum stage recorded, that of April 3, 1920; minimum stage, 1.2 feet September 19, October 18, 24, 27, 28, 30, 31, and November 2, 1904 (discharge, 165 second-feet).

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

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 10,000 second-feet and extended above that point. Gage read to half-tenths once daily. Daily discharge ascertained by applying gage height to rating table. Records below 10,000 second-feet good; above that point subject to error. Discharge not determined for stages above 12.0 feet (15,000 second-feet) owing to lack of discharge measurements.

Discharge measurements of Elk River near Elkmont, Ala., during the years ending Sept. 30, 1919 and 1920.

	Date.	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*
Jan. 21	L. J. Hall	6.79	6,880
22	....do	5.48	4,990
Mar. 4	C. G. Paulsen	3.58	2,460
1920.			
Apr. 29	W. R. King	5.32	5,040

Daily discharge, in second-feet, of Elk River near Elkmont, Ala., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919.												
1					2,310	3,490	3,560	1,270	3,490	1,490	1,380	1,850
2					2,150	2,970	3,230	1,320	3,100	1,060	1,610	1,380
3					2,150	2,710	2,970	1,220	2,710	1,060	950	1,160
4					2,640	2,450	2,710	1,160	9,700	850	660	850
5					2,330	.....	2,330	1,160	8,940	850	660	800
6					2,210	.....	2,270	1,220	3,490	850	660	750
7					2,090	.....	2,150	1,610	2,520	850	660	660
8					2,040	.....	2,030	1,970	2,390	1,730	575	575
9					1,970	.....	1,910	2,900	2,270	1,610	575	575
10					1,850	.....	2,900	4,180	5,160	1,270	575	538
11					1,850	11,800	2,640	2,900	3,560	1,270	500	500
12					1,830	6,770	2,640	2,090	2,450	1,270	500	500
13					4,600	5,090	2,390	1,850	1,970	1,270	950	500
14					4,180	6,770	2,210	1,610	1,610	1,060	850	500
15					3,360	5,370	2,150	1,440	1,270	900	575	500
16					2,970	4,600	4,250	1,380	1,160	850	575	480
17					2,450	.....	3,300	2,090	1,160	750	1,490	360
18					2,270	.....	2,970	1,850	1,160	700	1,490	360
19					2,030	.....	2,520	1,610	1,160	660	1,440	360
20				8,570	2,210	12,100	2,210	1,730	1,730	950	750	360
21				7,140	3,490	6,700	2,030	1,970	1,320	850	660	360
22				5,090	11,200	5,090	1,910	2,090	1,160	850	900	360
23				4,250	9,920	3,900	1,790	1,970	1,220	800	850	500
24				4,460	8,340	3,360	1,670	3,970	2,270	750	850	575
25				4,250	6,770	3,040	1,610	4,600	7,670	1,220	750	465
26				4,040	5,580	4,600	1,490	3,620	3,970	660	750	430
27				3,620	4,600	.....	1,380	.....	2,330	575	660	430
28				3,360	4,040	10,100	1,320	.....	1,970	500	660	395
29				2,970	.....	8,200	1,290	8,120	1,060	500	1,970	360
30				2,710	.....	6,470	1,270	6,400	1,380	575	5,870	360
31				2,450	.....	4,600	.....	4,460	.....	1,160	3,760	.....
1919-20.												
1	275	2,330	.....	1,550	3,230	3,180	9,470	3,300	6,920	1,060	618	1,850
2	330	4,880	10,200	1,610	2,840	3,490	.....	4,250	5,020	1,000	618	1,850
3	330	3,900	5,300	1,440	2,710	3,360	.....	5,230	.....	1,000	575	1,440
4	275	3,230	4,040	1,440	2,710	4,460	.....	4,950	.....	1,160	575	1,730
5	330	2,710	4,880	1,380	4,180	9,770	.....	3,490	.....	1,610	575	1,670
6	465	1,970	4,880	1,220	4,180	7,370	.....	3,040	.....	1,910	575	1,490
7	538	1,730	9,700	1,380	3,830	5,720	9,240	2,580	14,600	1,670	575	1,490
8	660	1,730	6,470	1,730	3,420	4,810	6,320	2,390	5,580	1,610	1,490	1,270
9	575	1,490	8,270	13,600	3,040	3,970	5,580	2,090	4,460	1,380	7,140	2,150
10	395	1,970	12,200	9,470	2,520	3,490	5,020	1,970	3,360	1,450	10,500	3,100
11	430	2,580	12,200	4,600	2,390	3,560	4,040	1,910	2,840	1,270	.....	1,970
12	660	2,840	8,870	3,420	2,330	.....	3,900	1,850	2,390	1,160	.....	3,830
13	1,220	2,450	12,600	2,900	2,390	.....	3,620	.....	2,210	1,060	.....	2,450
14	1,160	2,210	.....	2,640	2,330	.....	3,620	.....	1,970	1,000	.....	2,330
15	9,320	1,970	.....	2,520	2,090	.....	3,100	7,140	1,790	2,330	12,000	2,840
16	6,470	1,610	12,000	3,360	2,090	9,170	6,840	4,250	1,670	1,220	13,200	3,560
17	3,300	1,610	7,300	4,810	1,850	7,970	4,530	3,360	1,610	1,380	12,600	3,230
18	2,450	1,490	5,720	3,690	1,970	9,540	4,110	5,440	1,550	1,670	13,900	2,330
19	2,090	1,270	4,390	3,620	2,210	9,020	3,420	5,090	1,490	2,030	12,300	1,970
20	1,380	1,270	3,690	3,230	2,090	8,800	6,100	5,020	2,520	1,610	12,400	1,670
21	1,320	1,220	3,300	2,840	2,710	7,070	6,700	5,090	2,640	1,380	3,690	1,490
22	2,330	1,160	2,840	14,000	.....	5,440	4,880	3,830	1,910	1,270	6,540	1,490
23	10,400	1,000	2,580	.....	.....	4,600	3,900	3,560	1,970	1,160	5,800	1,270
24	9,470	1,060	2,330	.....	.....	3,900	3,230	3,560	1,790	1,000	4,880	1,160
25	6,620	1,380	2,390	.....	.....	3,490	3,620	8,420	1,440	900	3,230	1,110
26	5,090	8,040	2,270	.....	.....	6,100	12,000	4,250	1,490	800	2,640	1,060
27	2,840	13,800	2,090	9,320	5,870	5,870	13,700	3,360	1,380	750	2,330	1,160
28	2,520	12,600	2,090	6,770	4,320	5,370	8,940	2,710	1,270	1,160	2,210	1,000
29	2,090	11,500	1,910	5,090	3,830	4,180	4,670	2,390	1,160	660	1,970	950
30	1,850	.....	1,850	4,180	.....	4,320	4,110	2,210	1,220	750	1,910	900
31	1,350	.....	1,730	3,420	.....	9,620	.....	3,160	.....	618	1,910	.....

NOTE.—Stage was above 12 feet on days for which discharge is not given; discharge not determined because of lack of current-meter measurements at high stages.

Monthly discharge of Elk River near Elkmont, Ala., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,700 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1919.					
January 20-31	8,570	2,450	4,410	2.59	1.16
February	11,200	1,830	3,690	2.17	2.26
March		2,450			
April	4,250	1,270	2,300	1.35	1.51
May		1,160			
June	9,700	1,060	2,840	1.67	1.86
July	1,730	500	959	.564	.65
August	5,870	500	1,130	.665	.77
September	1,850	360	591	.347	.39
1919-20.					
October	10,400	275	2,550	1.50	1.73
November		1,000			
December		1,730			
January		1,220			
February		1,850			
March		3,180			
April		3,100			
May		1,850			
June		1,160			
July	2,330	618	1,260	.741	.85
August		575			
September	3,830	900	1,860	1.09	1.22

NOTE.—See footnote to daily-discharge table.

BEAR CREEK[1] 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, edition of 1912; scale 1:500,000).

RECORDS AVAILABLE.—August 24, 1913, to May 31, 1920, when station was discontinued.

GAGE.—Vertical staff attached to sweet-gum tree on left bank, 25 feet upstream from bridge; installed April 10, 1918. Read by Ed. Bullen. See Water-Supply Papers 453 and 473 for history of gages used prior to April 10, 1918.

DISCHARGE MEASUREMENTS.—Made from the bridge.

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 period October 1, 1918, to May 31, 1920, 14.3 feet March 13, 1920 (discharge, 4,310 second-feet); minimum stage, 1.3 feet October 7 and 8, 1918 (discharge, 20 second-feet).

1913-1920: Maximum stage recorded, 14.2 feet at 7 p. m., July 9, 1916, referred to original datum of gage installed in 1913, or 14.86 feet referred to datum of gage installed April 10, 1918 (discharge, 4,700 second-feet); minimum discharge, 10 second-feet August 15-17 and September 17, 1918.

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

ACCURACY.—Stage-discharge relation practically permanent during 1919 and 1920. Rating curve well defined between 80 and 4,000 second-feet. Gage read to tenths once daily. Daily discharge ascertained by applying gage height to rating table. Records good.

The following discharge measurement was made by W. R. King:

May 1, 1920: Gage height, 5.10 feet; discharge, 791 second-feet.

[1] Published in previous reports as Big Bear River near Red Bay, Ala.

Daily discharge, in second-feet, of Bear Creek near Red Bay, Ala., for the period Oct. 1, 1918, to May 31, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	95	598	347	347	326	774	527	243	722	284	243	481
2	62	391	284	1,310	284	646	435	223	879	223	326	305
3	46	284	243	3,300	263	550	413	204	987	185	223	243
4	32	223	223	1,840	347	481	391	204	1,220	166	185	204
5	32	185	204	1,070	391	622	435	204	2,060	148	413	166
6	32	166	185	879	347	3,960	391	223	1,220	130	326	130
7	20	166	185	800	326	3,440	347	243	550	148	223	130
8	20	148	185	748	326	3,120	326	263	481	204	185	130
9	32	148	166	696	326	4,060	305	284	413	435	148	112
10	32	166	166	646	305	3,760	347	1,070	504	326	130	112
11	32	148	166	598	284	1,980	879	696	774	305	112	112
12	62	130	185	527	284	1,250	722	481	481	243	95	112
13	166	130	223	481	347	906	550	347	347	263	458	95
14	112	112	413	435	1,010	774	458	305	305	504	284	95
15	78	112	2,230	413	879	748	413	263	284	326	185	95
16	62	95	1,160	391	550	696	906	263	243	223	622	95
17	62	326	722	413	435	2,260	1,370	284	223	185	204	78
18	112	2,020	504	504	391	3,810	826	243	204	148	305	78
19	166	748	435	458	369	2,370	598	223	369	130	413	78
20	326	481	369	435	391	1,430	481	413	326	166	305	78
21	263	369	481	413	550	987	413	458	305	148	204	78
22	243	504	550	391	598	748	369	347	223	148	148	95
23	204	550	504	391	1,610	598	347	243	284	130	130	263
24	185	391	481	413	1,010	504	326	263	305	130	413	185
25	622	326	550	413	987	481	305	284	284	112	2,370	148
26	504	284	646	369	2,120	481	263	263	326	95	879	130
27	284	243	527	391	1,070	671	243	722	550	95	435	112
28	166	223	458	413	879	1,810	243	800	1,010	112	326	95
29	148	504	391	391	.....	987	223	748	550	148	284	78
30	550	435	347	369	.....	671	223	774	369	185	263	62
31	1,100	.....	326	347	.....	574	.....	800	.....	223	1,130	.....
1919-20.												
1	46	263	2,730	347	598	369	622	826	.....	.....	.....	.....
2	46	671	1,780	347	550	347	4,110	748	.....	.....	.....	.....
3	46	671	1,190	326	527	369	4,260	696	.....	.....	.....	.....
4	62	458	826	326	504	391	2,690	646	.....	.....	.....	.....
5	62	391	722	326	481	646	2,770	622	.....	.....	.....	.....
6	95	326	671	347	458	550	1,340	646	.....	.....	.....	.....
7	112	284	1,130	369	435	646	933	800	.....	.....	.....	.....
8	95	263	2,610	391	413	598	852	933	.....	.....	.....	.....
9	130	263	1,920	2,340	391	574	1,430	826	.....	.....	.....	.....
10	130	284	3,570	1,980	391	574	1,160	722	.....	.....	.....	.....
11	112	1,220	3,440	1,190	413	598	1,040	646	.....	.....	.....	.....
12	130	1,220	1,740	852	458	3,760	960	622	.....	.....	.....	.....
13	204	748	1,340	722	413	4,310	906	852	.....	.....	.....	.....
14	326	550	2,060	622	413	3,570	671	2,490	.....	.....	.....	.....
15	391	481	1,670	574	391	2,020	598	1,250	.....	.....	.....	.....
16	527	391	1,430	774	391	1,190	1,670	800	.....	.....	.....	.....
17	347	347	1,220	2,530	369	2,260	1,880	748	.....	.....	.....	.....
18	305	326	1,010	1,780	369	3,080	987	1,370	.....	.....	.....	.....
19	263	305	852	1,310	347	2,160	774	3,520	.....	.....	.....	.....
20	204	284	1,700	1,070	347	3,520	696	2,260	.....	.....	.....	.....
21	185	284	1,340	987	326	2,160	3,160	1,610	.....	.....	.....	.....
22	347	263	879	1,370	347	1,430	1,780	1,070	.....	.....	.....	.....
23	1,920	263	748	1,520	369	1,070	1,040	800	.....	.....	.....	.....
24	1,840	243	622	1,950	413	826	722	671	.....	.....	.....	.....
25	960	263	550	2,230	369	748	852	826	.....	.....	.....	.....
26	646	960	527	1,700	347	906	2,690	960	.....	.....	.....	.....
27	435	3,340	504	1,340	347	1,430	3,910	671	.....	.....	.....	.....
28	347	2,850	481	1,010	347	800	2,300	550	.....	.....	.....	.....
29	305	2,690	435	852	369	671	1,430	481	.....	.....	.....	.....
30	284	3,860	391	722	.....	598	1,040	458	.....	.....	.....	.....
31	263	.....	369	646	.....	527	.....	800	.....	.....	.....	.....

Monthly discharge of Bear Creek near Red Bay, Ala., for the period Oct. 1, 1918, to May 31, 1920.

[Drainage area, 254 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918–19.					
October	1,100	20	189	0.744	0.86
November	2,020	95	354	1.39	1.55
December	2,230	166	447	1.76	2.03
January	3,300	347	664	2.61	3.01
February	2,120	263	607	2.39	2.49
March	4,060	481	1,490	5.87	6.77
April	1,370	223	469	1.85	2.06
May	1,070	204	399	1.57	1.81
June	2,060	204	560	2.20	2.46
July	504	95	202	.795	.92
August	2,370	95	386	1.52	1.75
September	481	62	139	.547	.61
The year	4,060	20	492	1.94	26.32
1919–20.					
October	1,920	46	360	1.42	1.64
November	3,860	243	825	3.25	3.63
December	3,570	369	1,310	5.16	5.95
January	2,530	326	1,060	4.17	4.81
February	598	326	410	1.61	1.74
March	4,310	347	1,380	5.43	6.26
April	4,260	598	1,640	6.46	7.21
May	3,520	458	997	3.93	4.53

DUCK RIVER AT COLUMBIA, TENN.

LOCATION.—At highway bridge two blocks north of public square at Columbia, Maury County, and three-quarters of a mile below Mount Pleasant Electric Co.'s dam.

DRAINAGE AREA.—1,210 square miles (measured on map compiled by United States Geological Survey; scale, 1:500,000.)

RECORDS AVAILABLE.—October 21, 1904, to December 31, 1908, and April 27 to September 30, 1920. Intermittent gage-height record furnished by United States Weather Bureau since 1886.

GAGE.—United States Weather Bureau's Mott tape gage bolted to downstream side of bridge; adjusted to correct datum April 28, 1920. The original Weather Bureau gage, a vertical staff bolted to downstream end of bridge pier near right bank (still in place) was used October 21, 1904, to June 16, 1905. June 17, 1905, to December 31, 1908, a United States Geological Survey chain gage attached to downstream side of bridge was used. Gages referred to same datum.

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

CHANNEL AND CONTROL.—Banks high and fringed with trees. Right bank subject to overflow during extreme floods. Current is sluggish above and swift below the gage. Bed of stream is composed of rock and gravel; free from vegetation and fairly permanent. Low-water control is a rocky shoal, 1,000 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period April 28 to September 30, 1920, 24.85 feet June 5 (discharge, 20,400 second-feet; minimum stage recorded, 0.05 foot July 6 (discharge, 72 second-feet).

1904–1908; 1920: Maximum stage recorded, 30.2 feet at 6 p. m. May 24, 1905 (discharge not determined); minimum stage, that of July 6, 1920. The United States Weather Bureau reports a stage of 45.6 feet March 30, 1902.

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

REGULATION.—Operation of power plant at the dam three-quarters of a mile above gage causes diurnal fluctuation in stage during low water.

ACCURACY.—Stage-discharge relation changed during high water June 5, 1920. Rating curve used April 28 to June 5 is based on three discharge measurements made during that period and several measurements made in previous years and is fairly well defined between 300 and 10,000 second-feet; curve used June 6 to September 30, 1920, fairly well defined between 200 and 2,000 second-feet and extended above 2,000 second-feet parallel to the previous curve. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair except those for stages above 10,000 second-feet which are subject to error owing to lack of discharge measurements, and those for low stages which are subject to error owing to diurnal fluctuation in stage caused by operation of power plant above the station.

Discharge measurements of Duck River at Columbia, Tenn., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Nov. 23	L. J. Hall	2.70	1,630	Apr. 28	W. R. King	7.20	5,420
				29	do	4.97	3,500
1919.				Sept. 23	do	1.40	524
Jan. 17	do	3.63	2,460				

Daily discharge, in second-feet, of Duck River at Columbia, Tenn., for the year ending Sept. 30, 1920.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1		2,140	1,690	285	120	600	16		2,300	375	280	6,550	5,870
2		2,140	1,310	262	105	471	17		2,200	435	363	4,670	4,240
3		2,050	2,630	130	100	287	18		2,090	284	156	2,870	2,000
4		1,500	12,000	231	84	217	19		2,030	266	224	1,920	1,250
5		1,840	20,300	150	96	238	20		1,410	245	287	1,890	471
6		1,410	17,200	150	125	231	21		1,410	138	180	1,120	315
7		938	8,130	204	100	308	22		2,580	1,410	120	1,500	180
8		682	3,540	120	80	757	23		2,350	2,610	105	1,580	471
9		830	2,400	204	458	2,510	24		1,580	1,010	96	995	653
10		830	1,290	298	1,880	3,540	25		3,530	826	100	896	387
11		830	1,860	204	3,720	2,730	26		2,520	444	125	596	308
12		695	995	217	10,300	2,420	27	8,220	1,350	195	100	298	308
13		1,010	692	359	6,960	2,210	28	5,130	1,210	444	130	204	156
14		2,750	616	280	4,040	3,320	29	5,550	1,070	335	137	245	145
15		2,640	604	145	6,820	5,420	30	2,260	930	308	128	228	138
							31		795		102	204	

NOTE.—Gage not read May 29 and July 1. discharge interpolated.

Monthly discharge of Duck River at Columbia, Tenn., for the year ending Sept. 30, 1920.

[Drainage area, 1,210 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
April 27-30	8,220	2,260	5,290	4.37	0.65
May	3,530	682	1,670	1.38	1.59
June	20,300	138	2,820	2.33	2.60
July	363	96	189	.156	.18
August	10,300	80	1,960	1.62	1.87
September	5,870	138	1,410	1.17	1.30

DUCK RIVER AT CENTERVILLE, TENN.

LOCATION.—At old county highway bridge half a mile from courthouse at Centerville, Hickman County, Tenn., three-quarters of a mile above new highway bridge and 1 mile above Nashville, Chattanooga & St. Louis Railroad bridge. Swan Creek enters from south 5 miles above gage.

DRAINAGE AREA.—2,070 square miles (measured on State Geological map).

RECORDS AVAILABLE.—March 6, 1919, to September 30, 1920.

GAGE.—Chain gage bolted to floor on downstream side of old county highway bridge; installed March 2, 1920. A chain gage bolted to new highway bridge three-quarters of a mile downstream from present location was used March 6 to December 31, 1919; datum not the same as that of present gage. Gage read by I. L. Brown.

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

CHANNEL AND CONTROL.—Stream bed uniform and smooth. Right bank high, steep and wooded; left bank low and fringed with trees, subject to overflow at stages above 22 feet covering the flat to a distance of 400 feet. Control is a gravel and rock shoal 600 feet below gage. During low water an island is formed here and at extremely low stages all water flows to right bank. Control is reasonably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of records 33.0 feet April 2, 1920, determined from high-water marks (discharge, 55,900 second-feet); minimum discharge, about 198 second-feet September 20, 1919.

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

REGULATION.—There may be very slight regulation during extreme low water caused by two small water-power plants near the head waters.

ACCURACY.—Stage-discharge relation not permanent at site used March 6 to December 31, 1919; practically permanent at site used after March 2, 1920, except for a slight change which was probably caused by high stage on April 2, 1920. Rating curve used March 6 to December 31, 1919, fairly well defined between 5,800 and 16,000 second-feet, and extended beyond these limits; curve used April 2 to September 30, 1920, well defined between 1,000 and 35,000 second-feet, and extended beyond those limits; curve used March 2 to April 1, 1920, based on one discharge measurement and drawn parallel to curve used after April 1. Gage read to hundredths once daily in 1919 and twice daily in 1920. Daily discharge in 1919 ascertained by applying daily gage height and in 1920 by applying mean daily gage height to rating table. Records for 1919 poor; records for 1920 good except for low stages.

Discharge measurements of Duck River at Centerville, Tenn., during the years ending Sept. 30, 1919 and 1920.

Gage.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919		*Feet.*	*Sec.-ft.*	1920		*Feet.*	*Sec.-ft.*
Jan. 18	L. J. Hall	7.7	11,400	Mar. 4	W. R. King	2.86	2,860
Mar. 7	C. G. Paulsen	10.88	16,000	Apr. 22	do	7.03	8,820
7	do	10.86	16,100	May 28	do	2.38	2,020
20	do	9.34	13,800	Sept. 1	do	1.29	1,080
20	do	7.96	11,900				
21	do	5.76	8,020				
21	do	5.37	7,930				
22	do	4.42	5,860				

NOTE.—Measurements during 1919 were made at station half a mile downstream from gage used in 1920.

Daily discharge, in second-feet, of Duck River at Centerville, Tenn., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919.												
1							3,430	832	3,760	1,050	1,000	1,180
2							2,960	1,230	3,340	940	4,480	762
3							2,600	988	2,600	892	1,690	650
4							2,470	924	2,660	846	1,340	590
5							2,200	776	7,280	776	972	542
6						10,900	2,030	762	2,550	940	860	542
7						15,400	1,850	1,120	1,850	804	790	530
8						13,700	1,720	4,960	1,570	2,100	678	494
9						34,500	1,570	8,880	1,470	1,000	530	440
10						29,100	3,310	9,040	2,100	790	470	460
11						15,400	8,620	4,560	1,910	776	450	390
12						9,220	5,120	3,520	1,450	924	494	370
13						6,560	3,670	2,630	1,270	1,870	494	340
14						6,480	2,880	2,150	1,080	818	450	238
15						6,000	2,470	1,740	940	720	482	214
16						6,080	4,320	1,650	825	638	2,440	270
17						37,100	4,640	2,670	924	734	1,150	246
18						32,500	3,130	2,170	846	614	972	238
19						23,200	2,770	1,800	1,650	650	720	246
20						13,300	2,240	2,100	1,430	713	678	198
21						7,600	1,760	1,650	1,230	692	578	290
22						5,760	1,690	1,510	1,070	554	542	300
23						4,480	1,600	1,450	1,130	590	518	320
24						3,760	1,450	1,430	3,020	590	530	270
25						3,280	1,290	2,370	3,310	470	1,020	246
26						2,940	1,230	3,310	3,640	470	846	290
27						5,600	1,180	26,800	2,470	470	638	270
28						11,600	1,070	16,100	1,720	480	554	290
29						7,940	1,070	11,100	1,450	480	554	300
30						5,920	1,040	7,120	1,230	482	2,770	262
31						4,240	.....	4,560	.....	518	1,610	.....
1919-20.												
1	290	3,310	26,600	1,670	.....	.....	11,300	4,240	1,990	683	378	1,020
2	262	13,000	14,800	.....	.....	3,090	43,700	3,250	2,550	661	423	1,120
3	280	10,500	8,960	.....	.....	2,800	39,300	3,250	3,010	606	387	800
4	330	6,480	6,000	.....	.....	2,680	36,500	3,030	7,790	585	369	671
5	330	4,480	4,720	.....	.....	5,120	33,100	3,000	21,400	633	400	705
6	530	3,340	4,240	.....	.....	9,000	10,800	2,670	24,400	734	374	776
7	566	2,390	9,810	.....	.....	6,380	7,540	2,260	19,000	1,450	475	1,180
8	470	2,440	9,980	.....	.....	4,700	5,750	2,120	6,880	1,060	644	628
9	410	2,220	13,900	.....	.....	3,680	4,670	1,640	4,420	788	638	671
10	380	2,120	15,300	.....	.....	3,180	3,960	1,540	3,280	677	812	3,040
11	450	3,640	13,200	.....	.....	3,020	3,380	1,310	2,560	650	4,160	3,280
12	650	3,730	14,200	.....	.....	15,700	3,100	1,160	2,080	628	6,310	3,030
13	720	3,490	14,900	.....	.....	28,000	2,730	4,160	1,670	606	12,300	3,420
14	1,900	3,020	19,100	.....	.....	30,900	2,370	5,910	1,500	661	6,640	3,680
15	6,320	2,570	21,200	.....	.....	32,600	2,150	5,080	1,350	688	8,130	3,220
16	9,900	2,220	14,200	.....	.....	17,000	1,920	3,320	1,080	628	8,040	4,450
17	7,770	2,000	8,960	.....	.....	8,230	3,250	2,180	967	606	6,880	5,750
18	4,400	1,800	6,640	.....	.....	10,900	4,570	5,670	1,020	1,980	5,040	4,740
19	2,880	1,720	5,360	.....	.....	8,690	3,220	7,210	941	1,540	4,020	2,490
20	1,970	1,470	4,560	.....	.....	10,700	10,300	4,670	862	1,190	3,160	2,030
21	1,830	1,410	3,980	.....	.....	7,930	23,600	3,260	862	915	2,120	1,650
22	2,150	1,310	3,460	.....	.....	5,550	8,560	2,790	1,700	934	1,520	1,330
23	9,470	1,220	3,100	.....	.....	4,450	5,700	3,590	2,240	688	2,040	1,190
24	17,800	1,200	2,600	.....	.....	3,610	4,000	2,970	2,560	595	1,660	1,020
25	12,900	1,160	2,520	.....	.....	3,280	3,620	4,420	1,510	575	1,340	788
26	6,640	23,200	2,340	.....	.....	3,820	13,600	3,780	1,200	555	1,200	445
27	4,560	26,900	2,120	.....	.....	4,240	19,600	2,620	974	535	1,020	595
28	3,340	16,500	2,080	.....	.....	3,650	12,700	1,950	888	500	794	545
29	2,680	15,100	1,960	.....	.....	3,180	7,820	1,600	800	475	1,740	515
30	2,200	31,800	1,830	.....	.....	2,640	5,510	1,420	705	427	1,640	450
31	1,910	.....	1,740	.....	.....	2,340	.....	1,650	.....	392	800	.....

NOTE.—Gage not read July 27-29, 1919; discharge estimated. No record Jan. 1 to Mar. 1, 1920.

Monthly discharge of Duck River at Centerville, Tenn., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 2,070 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1919.					
March 6–31	37,100	2,940	12,400	5.99	5.79
April	8,620	1,040	2,580	1.25	1.40
May	26,800	762	4,250	2.05	2.36
June	7,280	825	2,060	.995	1.11
July	2,100	470	787	.380	.44
August	4,480	450	1,010	.487	.56
September	1,180	198	393	.190	.21
1919–20.					
October	17,800	262	3,430	1.66	1.91
November	31,800	1,160	6,520	3.15	3.51
December	26,600	1,740	8,530	4.12	4.75
March 2–31	32,600	2,340	8,370	4.04	4.66
April	43,700	1,920	11,300	5.45	6.08
May	7,210	1,160	3,150	1.52	1.75
June	24,400	705	4,070	1.97	2.20
July	1,980	392	763	.369	.43
August	12,300	359	2,760	1.33	1.53
September	5,750	445	1,840	.889	.99

BUFFALO RIVER NEAR FLATWOODS, TENN.

LOCATION.—At Belsha's farm, 1½ miles northwest of Flatwoods, Wayne County, 1 mile north of Wayne-Perry county line, 10 miles south of Linden, and 22 miles west of Hohenwald. Little Opossum Creek enters half a mile above gage.

DRAINAGE AREA.—439 square miles (measured on map compiled by United States Geological Survey; scale, 1:500,000).

RECORDS AVAILABLE.—May 29 to September 30, 1920.

GAGE.—Vertical staff in two sections spiked to large trees on right bank, 300 feet downstream from ranch house of W. N. Belsha and a quarter of a mile upstream from county bridge on Flatwoods-Linden road. Gage read by Mrs. W. N. Belsha.

DISCHARGE MEASUREMENTS.—Made from highway bridge a quarter of a mile below gage, or by wading.

CHANNEL AND CONTROL.—Control is a gravel bar a third of a mile downstream from gage; may change somewhat. Water is at right side of channel at control section and some brush and willows have grown up on the gravel bar at the other side.

EXTREMES OF DISCHARGE.—Maximum stage during period of records not recorded as water was over top of gage (10 feet) on June 5: minimum stage 1.24 feet at 7 p. m., August 9 (discharge, 200 second-feet).

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

ACCURACY.—Stage-discharge relation probably fairly permanent. Rating curve fairly well defined between 200 and 1,200 second-feet; extended beyond these limits. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except those for stages above 1,200 and below 200 second-feet, which may be subject to considerable error.

The following discharge measurement was made by W. R. King:

May 29, 1920: Gage height, 2.22 feet; discharge, 528 second-feet.

Daily discharge, in second-feet, of Buffalo River near Flatwoods, Tenn., for the year ending Sept. 30, 1920.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1		850	292	230	258	16		396	410	1,070	277
2		875	283	225	262	17		379	322	640	277
3		918	289	220	248	18		399	382	490	260
4		2,830	304	210	255	19		385	399	406	248
5		9,000	283	210	396	20		373	331	358	242
6		3,300	396	210	286	21		364	295	331	260
7		1,740	532	210	262	22		406	322	322	228
8		1,250	416	215	252	23		402	277	550	222
9		924	331	210	385	24		355	265	392	225
10		740	295	268	755	25		328	255	337	232
11		640	310	307	640	26		307	245	355	230
12		560	292	337	434	27		292	235	286	230
13		504	277	532	367	28		283	230	268	220
14		458	265	542	319	29	494	280	228	283	212
15		424	260	1,160	298	30	476	286	225	280	208
						31	486		220	268	

NOTE.—Discharge for June 5 estimated, as river was over top of gage for both morning and evening readings.

Monthly discharge of Buffalo River near Flatwoods, Tenn., for the year ending Sept. 30, 1920.

[Drainage area, 439 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
May 29-31	494	476	485	1.10	0.12
June	9,000	280	1,010	2.30	2.57
July	532	220	305	.695	.80
August	1,160	210	378	.861	.99
September	755	208	300	.683	.76

MISCELLANEOUS MEASUREMENTS.

Miscellaneous discharge measurements in Ohio River basin during the years ending September 30, 1919 and 1920.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
1919.				*Feet.*	*Sec.-ft.*
Sept. 23	French Broad River	Tennessee River	Alexander, N. C.	−0.55	862
1920.					
Jan. 23	Tuckasegee River	Little Tennessee River	Bryson, N. C.	2.44	2,490

INDEX.