DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

WATER-SUPPLY PAPER 431

SURFACE WATER SUPPLY OF THE UNITED STATES

1916

PART I. NORTH ATLANTIC SLOPE DRAINAGE BASINS

NATHAN C. GROVER, Chief Hydraulic Engineer
C. C. COVERT, C. H. PIERCE, and G. C. STEVENS, District Engineers

Prepared in cooperation with the States of
MAINE, VERMONT, MASSACHUSETTS, and NEW YORK

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SURFACE WATER SUPPLY OF NORTH ATLANTIC SLOPE BASINS, 1916.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of 14 reports presenting results of measurements of flow made on streams in the United States during the year ending September 30, 1916.

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

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

Annual appropriations for the fiscal years ending June 30, 1895–1917.

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

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 14.

Measurements of stream flow have been made at about 4,100 points in the United States and also at many points in Alaska and the Hawaiian Islands. In July, 1916, 1,290 gaging stations were being maintained by the Survey and the cooperating organizations. Many miscella-

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

DEFINITION OF TERMS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups—(1) those that represent a rate of flow, as second-feet, gallons per minute, miner's inches, and discharge in second-feet per square mile, and (2) those that represent the actual quantity of water, as run-off in depth of inches, acre-feet, and millions of cubic feet. The principal terms used in this series of reports are second-feet, second-feet per square mile, run-off in inches, 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 by the use of the factors given in the tables of convenient equivalents (p. 9).

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

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

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

"Millions of cubic feet" is applied to quantities of water stored in reservoirs, most frequently in connection with studies of flood control.

The following terms not in common use are here defined:

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

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

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

CONVENIENT EQUIVALENTS.

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

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

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

NOTE.—For part of a month multiply the run-off for 1 day by the number of days.

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

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

NOTE.—For part of a month multiply the run-off for 1 day by the number of days.

Table for converting discharge in second-feet into run-off in millions of cubic feet.

Discharge (second-feet).	Run-off (millions of cubic feet).				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	0.0864	2.419	2.506	2.592	2.678
2.....	.1728	4.838	5.012	5.184	5.356
3.....	.2592	7.257	7.518	7.776	8.034
4.....	.3456	9.676	10.02	10.37	10.71
5.....	.4320	12.10	12.53	12.96	13.39
6.....	.5184	14.51	15.04	15.55	16.07
7.....	.6048	16.93	17.54	18.14	18.75
8.....	.6912	19.35	20.05	20.74	21.42
9.....	.7776	21.77	22.55	23.33	24.10

NOTE.—For part of a month multiply the run-off for 1 day by the number of days.

Table for converting discharge in second-feet into run-off in millions of gallons

Discharge (second-feet).	Run-off (millions of gallons).				
	1 day.	28 days.	29 days.	30 days.	31 days.
1	0.6463	18.10	18.74	19.39	20.04
2	1.293	36.20	37.48	38.78	40.08
3	1.939	54.30	56.22	58.17	60.12
4	2.585	72.40	74.96	77.56	80.16
5	3.232	90.50	93.70	96.95	100.2
6	3.878	108.6	112.4	116.3	120.2
7	4.524	126.7	131.2	135.7	140.3
8	5.171	144.8	149.9	155.1	160.3
9	5.817	162.9	168.7	174.5	180.4

NOTE.—For part of a month multiply the run-off for 1 day by the number of days.

Table for converting velocity in feet per second into velocity in miles per hour.

[1 foot per second=0.681818 mile per hour, or two-thirds mile per hour, very nearly; 1 mile per hour=1.4666 feet per second. In computing the table the figures 0.68182 and 1.4667 were used.]

Feet per second (units).	Miles per hour for tenths of foot per second.									
	0	1	2	3	4	5	6	7	8	9
0	0.000	0.068	0.136	0.205	0.273	0.341	0.409	0.477	0.545	0.614
1	.682	.750	.818	.886	.995	1.02	1.09	1.16	1.23	1.30
2	1.36	1.43	1.50	1.57	1.64	1.70	1.77	1.84	1.91	1.98
3	2.05	2.11	2.18	2.25	2.32	2.39	2.45	2.52	2.59	2.66
4	2.73	2.80	2.86	2.93	3.00	3.07	3.14	3.20	3.27	3.34
5	3.41	3.48	3.55	3.61	3.68	3.75	3.82	3.89	3.95	4.02
6	4.09	4.16	4.23	4.30	4.36	4.43	4.50	4.57	4.64	4.70
7	4.77	4.84	4.91	4.98	5.05	5.11	5.18	5.25	5.32	5.39
8	5.45	5.52	5.59	5.66	5.73	5.80	5.86	5.93	6.00	6.07
9	6.14	6.20	6.27	6.34	6.41	6.48	6.55	6.61	6.68	6.75

Table for converting discharge in second-feet into theoretical horsepower per foot of fall.

[1 second-foot=0.1136 theoretical horsepower per foot of fall. Weight of 1 cubic foot of water=62.5 pounds.]

Tens.	Units.									
	0	1	2	3	4	5	6	7	8	9
0	0.00	0.114	0.227	0.341	0.454	0.568	0.682	0.795	0.909	1.02
1	1.14	1.25	1.36	1.48	1.59	1.70	1.82	1.93	2.04	2.16
2	2.27	2.39	2.50	2.61	2.73	2.84	2.95	3.07	3.18	3.29
3	3.41	3.52	3.64	3.75	3.86	3.98	4.09	4.20	4.32	4.43
4	4.54	4.66	4.77	4.88	5.00	5.11	5.23	5.34	5.45	5.57
5	5.68	5.79	5.91	6.02	6.13	6.25	6.36	6.48	6.59	6.70
6	6.82	6.93	7.04	7.16	7.27	7.38	7.50	7.61	7.72	7.84
7	7.95	8.07	8.18	8.29	8.41	8.52	8.63	8.75	8.86	8.97
8	9.09	9.20	9.32	9.43	9.54	9.66	9.77	9.88	10.0	10.1
9	10.2	10.3	10.5	10.6	10.7	10.8	10.9	11.0	11.1	11.2

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

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

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

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

1 second-foot for one year (365 days) covers 1 square mile 1.131 feet, or 13.572 inches deep.

1 second-foot for one year (365 days) equals 31,536,000 cubic feet.

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

1 second-foot for one year (365 days) equals 724 acre-feet.
1 second-foot for one day equals 86,400 cubic feet.
1,000,000,000 (1 United States billion) cubic feet equals 11,570 second-feet for one day.
1,000,000,000 cubic feet equals 414 second-feet for one 28-day month.
1,000,000,000 cubic feet equals 399 second-feet for one 29-day month.
1,000,000,000 cubic feet equals 386 second-feet for one 30-day month.
1,000,000,000 cubic feet equals 373 second-feet for one 31-day month.
100 California miner's inches equals 18.7 United States gallons per second.
100 California miner's inches for one day equals 4.96 acre-feet.
100 Colorado miner's inches equals 2.60 second-feet.
100 Colorado miner's inches equals 19.5 United States gallons per second.
100 Colorado miner's inches for one day equals 5.17 acre-feet.
100 United States gallons per minute equals 0.223 second-foot.
100 United States gallons per minute for one day equals 0.442 acre-foot.
1,000,000 United States gallons per day equals 1.55 second-feet.
1,000,000 United States gallons equals 3.07 acre-feet.
1,000,000 cubic feet equals 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equals about 1 kilowatt.
To calculate water power quickly: $\frac{\text{Second-feet} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

EXPLANATION OF DATA.

The data presented in this report cover the year beginning October 1, 1915, and ending September 30, 1916. At the beginning of January in most parts of the United States much of the precipitation in the preceding three months is stored as ground water in the form of snow or ice, or in ponds, lakes, and swamps, and this stored water passes off in the streams during the spring break-up. At the end of September, on the other hand, the only stored water available for run-off is possibly a small quantity in the ground; therefore the run-off for the year beginning October 1 is practically all derived from precipitation within that year.

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

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

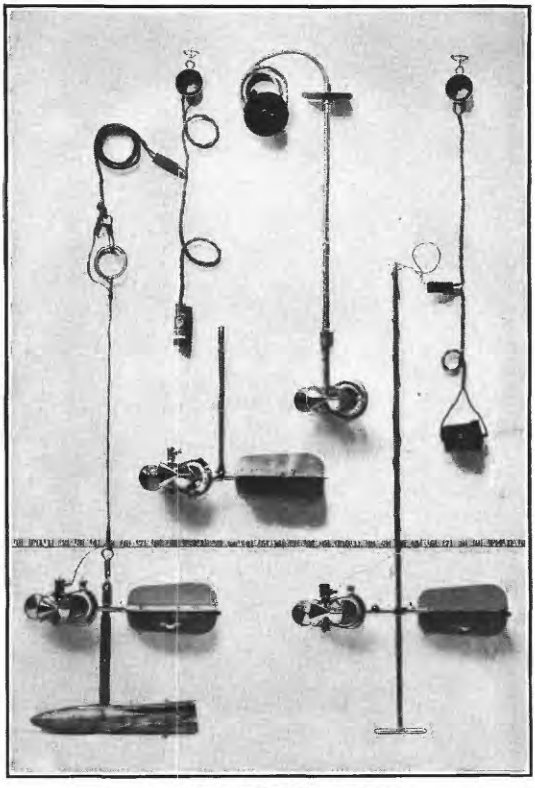
The data presented for each gaging station in the area covered by this report comprise a description of the station, a table giving results of discharge measurements, a table showing the daily discharge of the stream, and a table of monthly and yearly discharge and run-off.

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

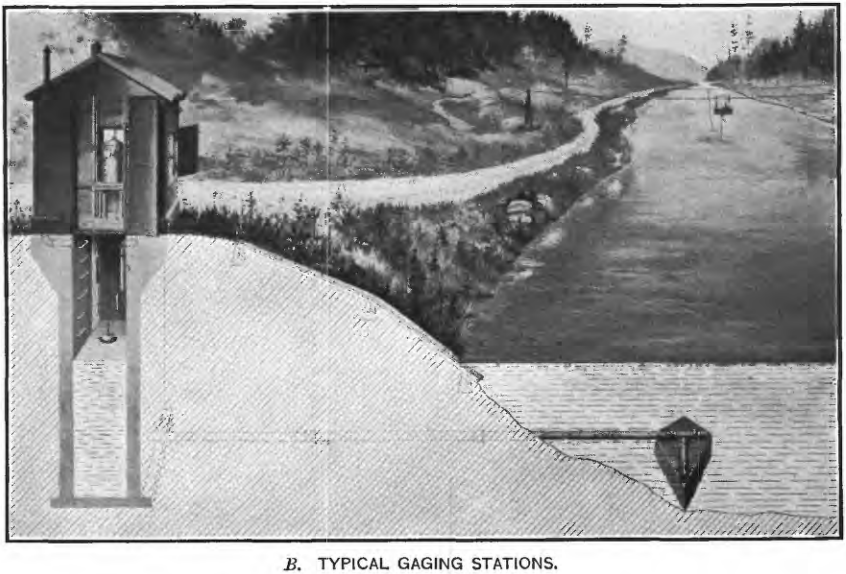
The description of the station gives, in addition to statements regarding location and equipment, information in regard to any conditions that may affect the constancy of the stage-discharge relation, covering such subjects as the occurrence of ice, the use of the stream for log driving, shifting of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

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

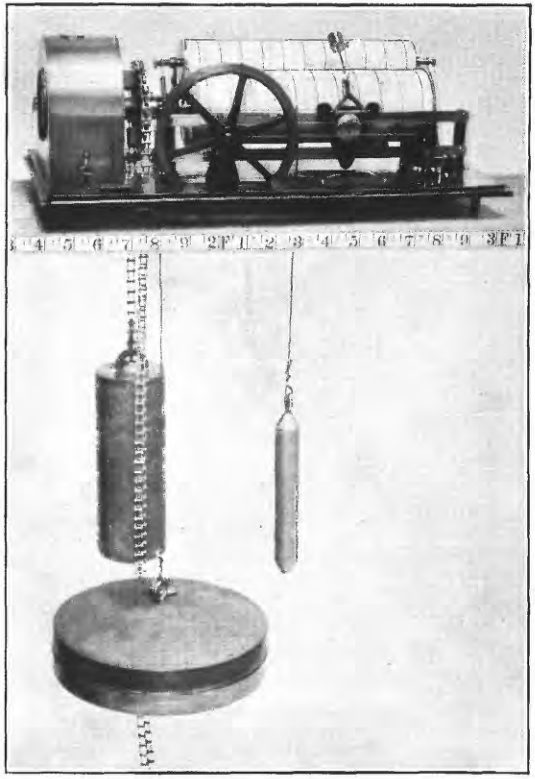
In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest. As the gage height is the mean for the day it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge was consequently larger than given in the maximum column. Likewise, in the column headed "Minimum" the quantity given is the mean flow for the day when the mean



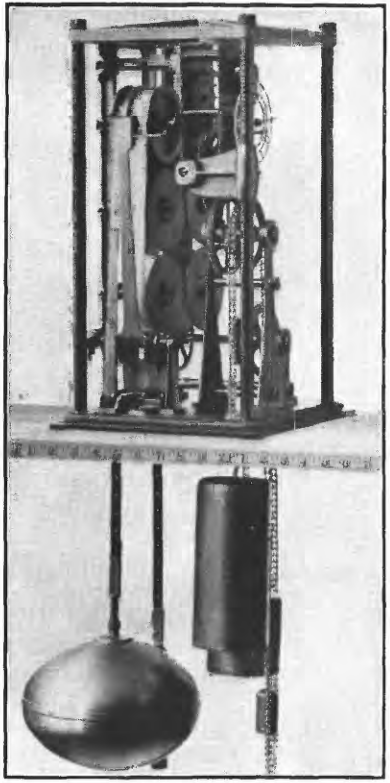
A. PRICE CURRENT METERS.



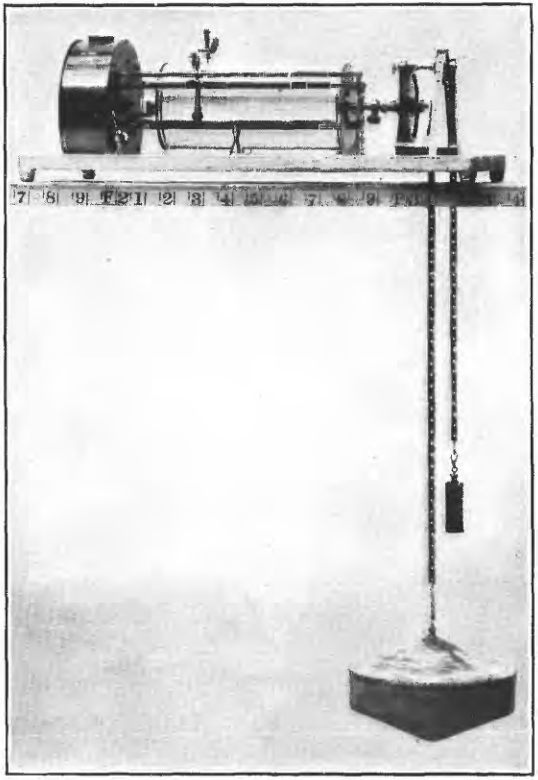
B. TYPICAL GAGING STATIONS.



A. STEVENS.



B. GURLEY PRINTING.



C. FRIEZ.

WATER-STAGE RECORDERS.

gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this average flow computations recorded in the remaining columns, which are defined on page 8, are based.

The deficiency table presented for some of the gaging stations shows the number of days in each year on which the mean daily discharge was less than the discharge given in the table. By subtraction the table gives the number of days each year that the mean daily discharge was between the discharges given in the table and, also by subtraction, the number of days that the mean daily discharge was equal to or greater than the discharge given. If one discharge rating table was used throughout the period covered by the deficiency table, gage heights that correspond to the discharges are also given. For convenience the theoretical horsepower per foot of fall corresponding to the discharge is given in the table on page 10. In using the table for studies of power, allowance should be made for the various losses, the most important being wheel loss and head loss.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

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

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

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

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

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

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

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

COOPERATION.

The hydrometric work in Maine was carried on in cooperation with the Public Utilities Commission, Benjamin F. Cleaves, chairman, and Paul L. Bean, chief engineer.

In Vermont the work was carried on in cooperation with the State, which was represented by Gov. Charles W. Gates.

The work in Massachusetts was carried on in cooperation with the Commonwealth, David I. Walsh, governor, and with the commission on waterways and public lands, John N. Cole, chairman.

The station on Pomperaug River at Bennetts Bridge, Conn., was maintained in cooperation with the State of Connecticut.

Financial assistance has been rendered by the New England Power Co., the Turners Falls Power & Electric Co., the Connecticut Valley Lumber Co., the Holyoke Water Power Co., the International Paper Co., the Connecticut Power Co., the W. H. McElwain Co., the Potomac Electric Power Co., the Spottsylvania Power Co., and other power companies in connection with records on streams which they are utilizing.

Work in the State of New York has been conducted under cooperative agreements with the State engineer and surveyor and, since July 1, 1911, with the Division of Waters of the State Conservation Commission.

The water-stage recorder on Hudson River at Spier Falls, N. Y., was inspected by an employee of the Adirondack Electric Power Corporation, Glen Falls, N. Y.

DIVISION OF WORK.

The data for stations in New England were collected and prepared for publication under the direction of C. H. Pierce, district engineer. The work in Maine was under the immediate supervision of G. C. Danforth, assistant engineer of the public utilities commission, who was assisted by W. G. Hill, and E. W. Conners. The other assistants in New England were H. J. Dean, Hardin Thweatt, H. W. Fear, R. S. Barnes, G. F. Adams, W. A. Elwood, and Hope Hearn.

Data for stations in New York were collected and prepared for publication under the direction of C. C. Covert, district engineer, who was assisted by O. W. Hartwell, E. D. Burchard, A. H. Davison, W. A. James, and Helen Kimmey.

For stations in New Jersey, Maryland, and Virginia the data were collected and prepared for publication under the direction of G. C. Stevens, district engineer, who was assisted by H. J. Jackson, H. J. Dean, Lasley Lee, B. J. Peterson, James E. Stewart, M. I. Walters, and H. W. Fear.

The manuscript was assembled and reviewed by H. J. Dean.

GAGING-STATION RECORDS.

ST. JOHN RIVER BASIN.

ST. JOHN RIVER AT FORT KENT, MAINE.

LOCATION.—At suspension footbridge in Fort Kent, Aroostook County, a short distance above mouth of Fish River, and about 15 miles below mouth of St. Francis River.

DRAINAGE AREA.—4,880 square miles. (Does not include 270 square miles of Chamberlain Lake drainage area, which is partly tributary to Penobscot basin. See Water-Supply Paper 281, p. 28.)

RECORDS AVAILABLE.—October 13, 1905, to December 31, 1915, when station was discontinued. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Inclined staff 22 feet long, in two sections; attached to new concrete pier nearest New Brunswick shore of river. Lower part of gage is placed in a groove in the side of the pier; upper part is fastened to downstream end of same pier. Read by F. L. Hamilton.

DISCHARGE MEASUREMENTS.—Made from footbridge.

CHANNEL AND CONTROL.—Practically permanent. Banks high, rocky, cleared, and not subject to overflow except in extreme freshets.

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

REGULATIONS.—A few dams on the headwaters are used for log driving; the operation of these dams only slightly affects the flow past the gage. No corrections applied.

ACCURACY.—Stage-discharge relation practically permanent; occasionally affected by backwater due to jamming of logs on bridge piers, and during the winter by ice. Gage read to tenths twice daily. Rating curve well defined below 15,000 second-feet and poorly defined between 15,000 and 90,000 second-feet. Daily discharge ascertained by applying rating table to mean daily gage heights. Results good.

Daily discharge, in second-feet, of St. John River at Fort Kent, Maine, for the period Oct. 1 to Dec. 31, 1915.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	12,100	7,500	5,040	11	4,900	4,110	3,030	21	3,610	4,370	2,510
2	10,300	7,660	5,320	12	4,370	4,110	2,140	22	4,110	4,370	2,320
3	9,040	8,340	4,240	13	4,110	4,370	2,140	23	5,770	4,370	2,320
4	8,000	7,660	4,900	14	3,610	4,900	2,140	24	5,470	4,370	2,510
5	8,340	7,330	4,900	15	3,490	4,760	2,510	25	5,180	3,860	2,710
6	10,300	6,690	4,760	16	3,490	4,500	2,510	26	4,370	3,490	2,710
7	11,100	6,070	4,630	17	3,860	4,370	2,610	27	4,370	3,140	2,710
8	10,500	5,320	4,630	18	3,490	4,370	3,030	28	4,370	3,610	2,700
9	7,830	4,900	4,110	19	3,370	4,110	2,920	29	4,630	3,740	2,700
10	6,070	4,500	3,740	20	3,610	3,860	2,510	30	5,920	4,500	2,700
								31	6,380	.....	2,700

NOTE.—Stage-discharge relation probably affected by ice for a few days in December; discharge estimated Dec. 28–31.

Monthly discharge of St. John River at Fort Kent, Maine, for the period Oct. 1 to Dec. 31, 1915.

[Drainage area, 4,880 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	12,100	3,370	6,000	1.23	1.42
November	8,340	3,140	4,980	1.02	1.14
December	5,320	2,140	3,240	.664	.77

ST. JOHN RIVER AT VAN BUREN, MAINE.

LOCATION.—At new international bridge at Van Buren, Aroostook County, about 14 miles above Grand Falls.

DRAINAGE AREA.—8,270 square miles.

RECORDS AVAILABLE.—May 4, 1908, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Gage used since May 6, 1912, painted vertically on second pier from Van Buren end of bridge; zero of gage, 407.69 feet above sea level; daily gage heights 1908 to 1911 read on a vertical rod attached to pier of sawdust carrier of Hammond's mill, about 700 feet below international bridge, but as published they are reduced to the datum of the bridge gage. Gage read by W. H. Scott.

DISCHARGE MEASUREMENTS.—Made from international bridge.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 21.6 feet at 6 p. m. April 26 and 6 a. m. April 27 (discharge, 84,900 second-feet); minimum stage recorded, 1.45 feet at 6.30 p. m. September 1 and 6.10 a. m. September 2 (discharge, 1,820 second-feet).

ICE.—Stage-discharge relation seriously affected by ice, usually from December to March; estimates based on gage heights at Grand Falls and rating curve derived from measurements at Van Buren.

REGULATION.—The little storage above for log driving probably does not affect the flow.

ACCURACY.—Stage-discharge relation practically permanent except when affected by ice. Rating curve well defined. Gage read to tenths twice daily. Daily discharge ascertained by applying rating table to mean daily gage heights. Results good.

COOPERATION.—Winter gage heights at Grand Falls furnished by H. S. Ferguson, consulting engineer.

The following discharge measurement was made by W. G. Hill:

February 10, 1916: Gage height 6.20 feet; discharge 4,620 second-feet; stage-discharge relation affected by ice.

Daily discharge, in second-feet, of St. John River at Van Buren, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	20,300	12,300	11,200	6,970	4,700	4,160	8,790	65,100	27,600	12,900	7,720	1,890
2	17,900	13,500	11,000	6,970	4,890	4,510	9,790	61,600	28,800	11,500	6,880	1,890
3	16,000	13,600	10,800	6,970	5,090	4,990	9,960	61,600	27,200	10,600	5,820	1,890
4	14,400	13,500	10,500	6,840	5,090	5,290	10,500	61,400	24,200	11,500	5,250	1,960
5	13,000	12,600	10,700	6,840	5,090	5,720	10,800	56,800	22,900	13,900	5,030	2,360
6	12,800	12,100	11,200	6,700	5,090	6,190	12,300	51,200	21,200	18,800	5,360	2,200
7	15,700	11,500	10,300	6,440	5,190	6,190	13,900	46,800	20,800	19,200	6,640	2,200
8	16,000	10,700	9,790	6,320	5,090	6,190	14,700	46,500	21,000	17,100	7,240	2,440
9	15,200	10,200	9,450	6,190	4,890	6,320	16,100	44,800	19,700	14,600	7,360	2,530
10	13,200	9,630	8,790	5,950	4,700	6,700	17,200	41,300	17,900	13,000	7,360	2,530
11	11,400	9,240	7,250	5,610	4,600	6,700	18,500	37,700	16,600	11,900	7,000	2,200
12	9,500	8,980	5,840	5,500	4,510	6,570	19,400	33,900	16,500	11,100	6,760	2,530
13	9,240	9,500	4,510	5,500	4,330	6,440	20,100	31,500	15,400	9,890	6,160	2,440
14	9,240	9,760	5,500	5,500	4,080	6,190	20,300	29,200	14,600	8,980	5,360	2,200
15	8,980	9,500	5,500	5,400	3,990	5,720	21,600	27,000	13,900	7,970	4,590	2,040
16	8,980	9,760	5,720	5,400	3,820	5,400	22,800	24,700	12,800	6,880	4,160	2,200
17	8,720	9,630	5,400	5,090	3,660	5,290	24,100	23,400	11,800	6,640	3,840	2,040
18	8,470	9,370	5,840	4,890	3,660	5,290	28,300	25,100	11,100	6,160	3,540	1,890
19	8,470	8,850	6,440	4,700	3,660	5,090	46,000	27,800	11,400	5,820	3,540	2,440
20	8,400	8,220	6,700	4,700	3,350	4,700	52,500	27,800	11,100	5,700	3,250	2,360
21	8,470	8,850	7,400	4,510	3,280	4,600	58,300	30,200	12,500	5,940	3,060	2,200
22	8,980	9,370	5,950	4,330	3,200	4,330	60,800	28,600	13,300	6,520	3,250	2,360
23	9,370	9,110	5,610	4,330	3,200	3,990	67,800	26,000	14,100	6,880	2,880	2,360
24	9,370	8,600	5,500	4,510	3,200	3,500	74,400	23,600	13,900	7,840	2,620	2,280
25	9,500	8,790	5,190	4,510	4,800	3,350	79,800	22,000	12,800	8,470	2,280	2,200
26	9,110	8,310	6,190	4,510	4,800	3,050	84,200	22,400	12,500	21,300	2,120	2,530
27	8,850	7,840	6,440	4,420	3,200	3,820	84,600	24,000	13,000	15,800	2,360	2,440
28	8,720	7,690	7,840	4,330	3,350	4,510	81,300	21,700	13,300	11,800	2,280	2,360
29	8,720	9,620	8,100	4,240	3,660	5,950	76,200	21,000	13,600	10,200	2,530	2,200
30	9,110	10,700	7,540	4,240	.....	6,700	70,500	20,600	13,200	9,240	2,280	2,040
31	10,400	.....	6,840	4,330	.....	8,100	.....	24,200	.....	8,600	2,040	.....

NOTE.—Stage-discharge relation affected by ice from about Nov. 25 to Apr. 18; discharge ascertained by use of gage heights at Grand Falls. No records Oct. 13–19; discharge estimated.

Monthly discharge of St. John River at Van Buren, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 8,270 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	20,300	8,400	11,200	1.35	1.56
November	13,600	7,690	10,000	1.21	1.35
December	11,200	4,510	7,580	.917	1.06
January	6,970	4,240	5,380	.651	.75
February	5,190	3,200	4,210	.509	.55
March	8,100	3,050	5,340	.646	.74
April	84,600	8,790	37,900	4.58	5.11
May	65,100	20,600	35,200	4.26	4.91
June	28,800	11,100	16,600	2.01	2.24
July	21,300	5,700	10,900	1.32	1.52
August	7,720	2,040	4,530	.548	.63
September	2,530	1,890	2,240	.271	.30
The year	84,600	1,890	12,600	1.52	20.72

MACHIAS RIVER BASIN.

MACHIAS RIVER AT WHITNEYVILLE, MAINE.

LOCATION.—At a wooden highway bridge in the town of Whitneyville, Washington County, 200 feet below a storage dam, 4 miles above Machias.

DRAINAGE AREA.—465 square miles.

RECORDS AVAILABLE.—October 17, 1903, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Chain installed on the wooden highway bridge October 10, 1911; prior to October 3, 1905, chain gage on the Washington County railroad bridge, three-fourths of a mile downstream; October 3, 1905, to October 9, 1911, staff gage on highway bridge at datum of present chain gage. Gage read by I. S. Albee.

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

CHANNEL AND CONTROL.—Practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 8.8 feet at 2.30 p. m. May 18 (discharge, 4,380 second-feet); minimum stage recorded during year, 3.3 feet on October 28, 29, 30, 31, and November 1 (discharge, 178 second-feet).

ICE.—River usually remains open at the gage, but ice farther downstream occasionally affects the stage-discharge relation.

REGULATION.—Opening and closing of gates in storage dam immediately above station each day during low stages of the river cause considerable fluctuation; some log driving every year and jams of short duration occasionally occur.

ACCURACY.—Stage-discharge relation practically permanent except when affected by ice. Rating curve well defined between 100 and 4,000 second-feet. Gage read to half-tenths once daily. Daily discharge ascertained by applying rating table to mean daily gage heights. Results fair.

Discharge measurements of Machias River at Whitneyville, Maine, during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 21	W. G. Hill	3.60	302	Mar. 14	W. G. Hill	[a] 4.00	444
Mar. 1	do	[a] 5.20	1,050	Apr. 18	G. C. Danforth	5.41	1,500

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Machias River at Whitneyville, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	267	178	654	1,230	412	1,050	2,530	1,360	1,780	1,040	626	626
2	267	221	626	1,100	412	800	2,440	1,430	1,710	1,100	571	626
3	314	221	626	981	387	740	2,360	1,430	1,640	1,230	517	626
4	362	267	626	860	387	682	2,270	1,490	1,560	1,430	517	626
5	362	267	571	682	412	626	2,180	1,430	1,490	1,560	517	598
6	517	267	517	626	412	626	2,100	1,430	1,430	1,360	517	571
7	517	267	517	571	412	626	1,940	1,430	1,230	1,100	464	517
8	464	267	490	517	412	571	1,780	1,490	1,040	981	464	517
9	464	244	464	412	314	517	1,780	1,640	1,040	920	517	517
10	464	244	412	362	314	490	1,640	1,710	1,100	860	464	464
11	412	221	362	362	362	490	1,560	1,780	1,780	800	412	464
12	362	221	314	362	362	490	1,560	1,860	2,360	740	362	464
13	314	221	267	362	412	438	1,640	2,020	2,100	626	314	464
14	267	221	221	387	412	438	1,670	2,020	1,780	517	412	464
15	267	267	221	412	412	438	1,710	2,020	1,290	464	412	464
16	267	314	221	412	362	464	1,640	2,020	800	412	412	517
17	267	314	221	412	314	464	1,560	2,100	682	800	412	981
18	267	314	221	387	314	490	1,490	4,380	1,430	800	314	860
19	314	517	1,290	362	314	490	2,530	3,880	2,360	740	267	740
20	362	740	1,360	362	314	517	2,800	3,280	2,360	682	221	682
21	412	800	1,360	314	314	571	2,440	2,890	2,020	626	314	626
22	412	800	1,170	314	314	598	1,940	2,620	1,560	571	362	571
23	412	800	981	314	338	626	1,490	2,440	1,360	517	314	571
24	362	770	860	314	362	626	1,490	2,800	1,040	1,230	314	682
25	314	740	800	338	362	626	1,560	2,890	682	2,620	267	860
26	267	740	860	362	517	682	1,430	2,620	1,040	1,940	267	860
27	221	740	2,180	362	860	800	1,290	2,180	1,040	1,780	267	740
28	178	682	2,100	387	1,290	920	1,230	2,020	1,100	1,430	464	682
29	178	682	1,780	412	1,170	1,230	1,230	1,940	1,170	981	800	626
30	178	682	1,490	412	.....	1,640	1,290	1,860	1,100	860	740	517
31	178	.....	1,360	412	.....	2,100	.....	1,780	.....	682	682	.....

NOTE.—Stage-discharge relation affected by ice from about Feb. 1 to Mar. 19; discharge ascertained by means of gage heights, discharge measurements, observer's notes, and weather records.

Monthly discharge of Machias River at Whitneyville, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 465 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	517	178	329	0.708	0.82
November	800	178	440	.946	1.06
December	2,180	221	811	1.74	2.01
January	1,230	314	487	1.05	1.21
February	1,290	314	448	.964	1.04
March	2,100	438	705	1.52	1.75
April	2,800	1,230	1,820	3.91	4.36
May	4,380	1,360	2,140	4.60	5.30
June	2,360	682	1,440	3.10	3.46
July	2,620	412	1,010	2.17	2.50
August	800	221	436	.938	1.08
September	981	464	617	1.33	1.48
The year	4,380	178	890	1.91	26.07

UNION RIVER BASIN.

WEST BRANCH OF UNION RIVER AT AMHERST, MAINE.

LOCATION.—At highway bridge three-fourths of a mile west of Amherst post office, Hancock County, on road to Bangor, about a mile below highway bridge at old tannery dam.

DRAINAGE AREA.—140 square miles.

RECORDS AVAILABLE.—July 25, 1909, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Chain, installed June 2, 1910, at same datum as old vertical gage nailed to log abutment; read by Mrs. Emma Sumner.

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

CHANNEL AND CONTROL.—Gravel; unlikely to change except in unusual flood.

EXTREMES OF DISCHARGE.—Maximum open-water stage recorded during year, 10.1 feet at 8 a. m. April 2 (discharge, 1,110 second-feet); a stage of 10.6 feet was recorded at 8 a. m. and 4 p. m. January 9, but the stage-discharge relation was affected by ice at the time; minimum open-water stage recorded during year, 5.2 feet August 22, 23, and September 2, 3, 4 (discharge, 28 second-feet). Minimum discharge estimated as 23 second-feet on February 21, 22, 23; stage-discharge relation affected by ice at the time.

ICE.—Surface ice forms to a considerable thickness and anchor ice is found at the measuring section; stage-discharge relation seriously affected.

REGULATION.—Regimen of stream only slightly affected by the operation of the few log-driving dams above the station.

ACCURACY.—Stage-discharge relation practically permanent except as affected by backwater from ice and occasional log jams. Rating curve well defined below 1,100 second-feet. Gage read to half-tenths twice daily except from January 10 to March 31, when it was read twice daily three days a week. Daily discharge ascertained by applying rating table to mean daily gage heights. Results fair.

Discharge measurements of West Branch of Union River at Amherst, Maine, during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 25	W. G. Hill	[a] 9.08	171	Mar. 21	W. G. Hill	[a] 7.77	97
Mar. 2	do	[a] 8.71	239	Sept. 20	E. W. Conners	6.40	159

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of West Branch of Union River at Amherst, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	78	72	190	669	190	264	984	461	284	217	96	31
2	59	72	173	656	190	236	1,020	438	245	208	90	28
3	47	72	173	643	182	140	830	415	190	226	83	28
4	44	72	156	630	173	72	724	392	190	264	72	28
5	37	63	156	380	173	96	682	369	190	304	63	37
6	40	59	156	347	156	125	630	347	173	304	63	34
7	44	55	156	336	140	125	605	336	156	254	55	34
8	72	55	148	325	110	125	580	325	140	226	55	34
9	72	51	148	304	90	132	556	304	125	208	72	47
10	68	226	173	304	78	140	532	294	125	190	72	40
11	68	164	208	304	72	148	508	284	132	182	63	40
12	68	125	226	294	63	140	592	226	125	156	55	34
13	63	110	226	294	55	140	630	190	164	125	55	34
14	63	110	245	284	47	132	682	190	156	110	55	31
15	59	140	226	264	44	125	656	190	148	110	47	31
16	59	125	226	245	40	118	605	190	140	125	40	284
17	55	118	226	226	34	118	618	190	125	156	40	140
18	51	118	304	208	31	110	682	274	284	156	37	125
19	51	156	347	190	26	118	798	404	369	140	34	190
20	51	208	304	190	26	125	862	369	415	132	34	156
21	47	254	304	190	23	103	814	336	392	125	31	140
22	47	254	304	190	23	90	768	304	336	118	28	125
23	47	264	304	182	23	96	738	294	304	125	28	125
24	51	264	314	182	28	103	630	325	284	173	47	125
25	44	245	347	173	34	110	580	325	245	190	40	110
26	44	208	484	173	40	132	605	314	226	208	40	90
27	51	173	738	182	110	156	592	314	226	208	40	83
28	68	173	738	182	284	226	556	304	217	190	40	72
29	72	190	724	190	264	314	532	284	245	148	40	63
30	78	190	710	190	.....	605	484	284	245	125	37	59
31	78	.....	879	190	.....	783	.....	325	.....	110	34	.....

NOTE.—Stage-discharge relation affected by ice Dec. 10–15, 26–29, and Jan. 1 to Apr. 2; discharge for these periods ascertained by means of gage heights, 3 discharge measurements, observer's notes, and weather records.

Monthly discharge of West Branch of Union River at Amherst, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 140 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	78	37	57	0.407	0.47
November	264	51	146	1.04	1.16
December	879	148	323	2.31	2.66
January	669	173	294	2.10	2.42
February	284	23	95	.678	.73
March	783	72	176	1.26	1.45
April	1,020	484	669	4.78	5.33
May	461	190	309	2.21	2.55
June	415	125	220	1.57	1.75
July	304	110	178	1.27	1.46
August	96	28	51	.364	.42
September	284	28	80	.571	.64
The year	1,020	23	217	1.55	21.04

PENOBSCOT RIVER BASIN.

WEST BRANCH OF PENOBSCOT RIVER AT MILLINOCKET, MAINE.

LOCATION.—At Quakish Lake dam and Millinocket mill of Great Northern Paper Co., at Millinocket, Penobscot County.

DRAINAGE AREA.—1,880 square miles.

RECORDS AVAILABLE.—January 11, 1901, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGES.—Water-stage recorder at Quakish Lake dam and gages in forebay and tailrace at mill.

CHANNEL AND CONTROL.—Crest of concrete dam.

DISCHARGE.—Flow computed by considering the flow over the dam, the flow through the wheels, and the water used through the log sluices and filters. The wheels were rated at Holyoke, Mass., before being placed in position and were tested later by numerous tube-float and current-meter measurements. When the flow of the river is less than 2,500 sceond-feet, all the water generally flows through the wheels of the mill.

ICE.—Determination of discharge not seriously affected by ice; Ferguson Pond, just above entrance to canal, eliminates effect from anchor ice.

REGULATION.—Dams at outlets of North Twin and Chesuncook lakes store water on a surface of about 65 square miles, with a capacity of about 32 billion cubic feet. Except during the time (usually in August) when excess water has to be supplied for log driving on the river below Millinocket and for a short time during the spring freshet, run-off is regulated by storage. Results corrected for storage.

COOPERATION.—Records furnished by engineers of Great Northern Paper Co.

Monthly discharge of West Branch of Penobscot River at Millinocket, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 1,880 square miles.]

Month.	Discharge in second-feet.			Corrected run-off (depth in inches on drainage area).
	Observed mean.	Corrected for storage.		
		Mean.	Per square mile.	
October	2,300	1,530	0.814	0.94
November	2,270	1,390	.739	.82
December	2,280	2,080	1.11	1.28
January	2,230	1,890	1.00	1.15
February	2,230	1,370	.729	.79
March	2,590	1,390	.739	.85
April	2,970	7,640	4.06	4.53
May	2,660	6,200	3.30	3.80
June	2,880	3,830	2.04	2.28
July	3,550	3,800	2.02	2.33
August	3,040	2,430	1.29	1.49
September	2,560	1,850	.984	1.10
The year	2,630	2,950	1.57	21.36

WEST BRANCH OF PENOBSCOT RIVER NEAR MEDWAY, MAINE.

LOCATION.—Just above Nichatou Rapids, half a mile above mouth of East Branch of Penobscot River and the town of Medway, Penobscot County, and 2 miles below East Millinocket.

DRAINAGE AREA.—2,100 square miles (authority, Public Utilities Commission of Maine).

RECORDS AVAILABLE.—February 20 to September 30, 1916.

GAGES.—Chain on left bank; read by A. T. Reed; Gurley 7-day water-stage recorder on left bank installed August 4, 1916.

DISCHARGE MEASUREMENTS.—Made from cable.

CHANNEL AND CONTROL.—Channel fairly smooth at measuring section; covered with rocks and boulders above and below gage; channel divides a few hundred feet below gage, but practically entire flow passes to left of Nichatou Island. Control formed by Nichatou Island and head of Nichatou Rapids; probably permanent.

ICE.—Ice forms along both banks, but the main channel remains open; stage-discharge relation probably not seriously affected.

REGULATION.—Flow at ordinary stages completely regulated by dams and storage reservoirs above station.

ACCURACY.—Rating curve not well defined; daily discharge not determined.

Discharge measurements of West Branch of Penobscot River near Medway, Maine, during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Aug. 3	E. W. Conners	4.12	2,920	Aug. 18	T. W. Clark	4.45	3,910
8	do	4.46	3,950	Sept. 22	E. W. Conners	3.70	2,520
9	do	5.10	5,500				

PENOBSCOT RIVER AT WEST ENFIELD, MAINE.

LOCATION.—At the steel highway bridge 1,000 feet below the mouth of Piscataquis River and 3 miles west of Enfield railroad station, Penobscot County.

DRAINAGE AREA.—6,600 square miles.

RECORDS AVAILABLE.—January 1, 1902, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGES.—Friez water-stage recorder on left bank, downstream side of left bridge abutment, used since December 11, 1912; standard chain gage on upstream side of bridge, used prior to that date; gages set to same datum.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Channel at gage broken by four bridge piers; straight above and below the gage. Banks high and rocky and not subject to overflow. Control is at Passadumkeag Rips, about 5 miles below the gage; a wing dam at this point is overflowed at about gage height 5.5 feet.

ICE.—Stage-discharge relation usually affected by ice from December to April; discharge ascertained by comparison with records at Sunkhaze Rips collected by Thomas W. Clark.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 10.4 feet at 4 to 9 p. m. April 19 (discharge, 36,700 second-feet); minimum stage during year from water-stage recorder, 2.35 feet at 6 a. m. October 19 (discharge, 3,950 second-feet).

REGULATION.—Flow since 1900 largely controlled by storage, principally in the lakes tributary to the West Branch. Results not corrected for storage.

ACCURACY.—Stage-discharge relation practically permanent except as affected by ice and occasionally by logs. Rating curve well defined. Operation of water-stage recorder satisfactory throughout the year. Daily discharge ordinarily ascertained by applying rating table to average of 24 hourly gage heights; at times of serious fluctuation in stage the daily discharge is ascertained by using the average of 12 two-hour periods. Results excellent.

COOPERATION.—Gage-height record and several discharge measurements furnished by Thomas W. Clark, hydraulic engineer, Oldtown, Maine. Discharge measurements also made by students of the University of Maine, under the direction of Prof. H. S. Boardman.

Discharge measurements of Penobscot River at West Enfield, Maine, during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 7	University of Maine students	3.05	5,480	Apr. 11	T. W. Clark	[a]7.80	19,700
Apr. 6	T. W. Clark	[a]11.17	24,600	Sept. 20	do	2.91	4,830
				26	H. A. Lancaster	2.53	4,320

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Penobscot River at West Enfield, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	6,390	6,520	9,570	13,900	6,020	7,710	19,700	16,800	14,600	11,100	9,270	5,650
2	5,890	6,260	9,880	12,300	6,140	7,440	24,700	17,400	13,200	9,880	9,270	5,770
3	5,770	6,140	8,980	10,800	6,020	7,300	26,300	17,400	12,600	9,720	8,680	5,190
4	5,190	5,770	8,680	10,800	6,260	7,040	27,100	16,200	11,100	14,600	8,260	5,190
5	5,420	5,420	8,260	10,500	6,390	6,520	25,200	16,200	10,200	20,400	8,260	5,080
6	5,540	5,190	7,840	10,000	6,140	5,770	24,700	16,800	11,800	20,800	7,710	5,190
7	5,540	4,960	7,840	9,570	5,650	5,770	23,000	16,400	12,000	18,200	7,300	5,300
8	5,540	4,840	7,580	8,830	5,770	6,140	21,300	15,400	10,800	16,600	7,840	4,960
9	5,540	4,840	7,300	8,120	5,890	6,140	21,100	15,800	10,200	16,200	10,500	4,960
10	5,420	4,730	6,650	7,710	6,020	6,390	20,200	15,400	10,500	14,600	11,100	5,080
11	5,540	4,730	5,890	7,980	5,770	6,390	19,300	13,900	12,000	13,000	9,880	5,300
12	5,190	4,730	5,190	7,980	5,540	6,140	20,800	13,500	12,600	13,200	8,830	5,300
13	5,190	4,730	4,730	7,580	5,540	5,420	21,300	12,600	14,800	12,600	8,120	5,080
14	5,080	4,730	5,420	7,300	5,300	5,770	22,500	11,000	14,600	12,300	7,840	4,730
15	4,840	4,730	5,890	6,910	5,080	6,140	23,000	9,570	14,100	12,000	7,040	4,730
16	4,730	5,650	5,770	6,520	4,840	6,140	22,500	9,420	12,800	10,800	7,300	4,730
17	4,620	6,390	5,650	6,390	4,730	6,020	22,700	9,420	12,300	11,000	7,300	5,080
18	4,280	6,140	6,260	6,140	4,730	5,770	27,600	14,200	13,000	12,300	7,170	4,960
19	4,060	5,770	6,650	6,390	4,840	5,540	36,100	23,200	14,600	11,800	6,780	4,960
20	4,620	6,780	6,910	6,390	4,620	5,080	34,100	20,600	15,000	10,700	6,020	5,190
21	4,620	9,720	7,710	6,520	4,280	5,300	31,900	17,800	13,700	9,570	6,020	4,960
22	4,730	10,200	7,710	6,390	4,390	5,540	29,800	16,000	13,900	8,830	5,420	4,730
23	4,960	9,570	7,040	6,260	4,840	5,540	28,400	15,000	12,500	9,120	5,540	4,620
24	4,620	8,680	7,040	5,650	4,730	5,420	29,600	15,400	10,700	8,830	5,890	4,280
25	4,170	8,260	6,910	6,260	4,730	5,540	29,000	15,800	9,720	8,980	5,420	4,280
26	4,170	7,580	8,260	6,520	4,840	5,540	26,500	16,200	10,200	8,830	5,770	4,390
27	4,960	7,300	13,000	6,390	5,650	6,020	25,000	15,000	10,800	10,800	5,770	4,390
28	5,890	7,040	18,600	6,390	6,260	7,580	23,000	14,100	11,100	12,800	5,540	4,280
29	6,390	6,910	17,600	6,390	7,710	9,270	20,800	12,600	12,300	11,800	5,650	4,170
30	6,260	7,840	16,400	6,260	.....	11,800	18,600	13,400	12,100	11,500	5,770	4,170
31	6,520	.....	14,800	6,140	.....	15,800	.....	14,400	.....	10,300	5,770	.....

NOTE.—Stage-discharge relation affected by ice Dec. 10 to Apr. 11; discharge ascertained by means of comparison with records at Sunkhaze Rips, using a reduction factor obtained by comparing records representing normal conditions.

Monthly discharge of Penobscot River at West Enfield, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 6,600 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	6,520	4,060	5,220	0.791	0.91
November	10,200	4,730	6,400	.970	1.08
December	18,600	4,730	8,580	1.30	1.50
January	13,900	5,650	7,780	1.18	1.36
February	7,710	4,280	5,470	.829	.89
March	15,800	5,080	6,710	1.02	1.18
April	36,100	18,600	24,900	3.77	4.21
May	23,200	9,420	15,100	2.29	2.64
June	15,000	9,720	12,300	1.86	2.08
July	20,800	8,830	12,400	1.88	2.17
August	11,100	5,420	7,320	1.11	1.28
September	5,770	4,170	4,890	.741	.83
The year	36,100	4,060	9,750	1.48	20.13

EAST BRANCH OF PENOBSCOT RIVER AT GRINDSTONE, MAINE.

LOCATION.—At Bangor & Aroostook Railroad bridge half a mile south of railroad station at Grindstone, Penobscot County, one-eighth mile above Grindstone Falls, and about 8 miles above confluence with West Branch at Medway.

DRAINAGE AREA.—1,100 square miles; includes 270 square miles of Chamberlain Lake drainage.

RECORDS AVAILABLE.—October 23, 1902, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Chain attached to railroad bridge; read by R. D. Porter.

DISCHARGE MEASUREMENTS.—Made from railroad bridge.

CHANNEL AND CONTROL.—Practically permanent; stream confined by abutments of bridge and broken by one pier at ordinary stages; velocity of current medium at moderate and high stages but sluggish at low water.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 8.7 feet at 1 p. m. July 5 (discharge, 6,890 second-feet); minimum stage recorded during year, 4.3 feet October 14 to 21 (discharge, 275 second-feet).

ICE.—Ice forms to a considerable thickness at the gage and down to the head of Grindstone Falls, and although the falls usually remain open during the greater part of the winter, the stage-discharge relation is somewhat affected.

REGULATION.—Several dams maintained at outlets of a number of lakes and ponds near source of river are regulated for log driving; during the summer and fall gates are generally left open. The basin of the East Branch since about 1840 includes about 270 square miles of territory draining into Chamberlain Lake that formerly drained into the St. John River basin, the diversion being made through what is known as the Telos Canal. Results not corrected for storage and diversions.

ACCURACY.—Stage-discharge relation occasionally affected by backwater from log jams at station and at Grindstone Falls immediately below, and by ice during winter. Rating curve well defined between 400 and 8,000 second-feet. Gage read to tenths twice daily from October 1 to December 13; three times a week from December 14 to March 31; and once daily from April 1 to September 30. Daily discharge ascertained by applying rating table to mean daily gage heights. Results probably fair for moderate and high stages but uncertain for low stages.

Discharge measurements of East Branch of Penobscot River at Grindstone, Maine, during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 26	W. G. Hill	a 5.50	829	Mar. 20	W. G. Hill	a 5.80	709
Feb. 18	do	a 5.12	514	Sept. 21	E. W. Conners	4.60	383

a Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of East Branch of Penobscot River at Grindstone, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	620	650	1,250	1,810	830	1,590	2,880	3,700	2,620	4,090	1,380	560
2	560	620	1,250	1,660	830	1,520	3,700	3,890	2,960	4,290	1,380	533
3	505	560	1,590	1,520	790	1,520	5,120	4,090	3,510	4,490	1,380	533
4	455	505	1,320	1,380	790	1,450	5,120	3,510	3,800	4,910	1,380	560
5	455	505	1,130	1,250	750	1,250	4,490	3,700	4,090	6,660	1,380	505
6	455	455	1,130	1,250	715	1,080	3,890	3,510	4,290	4,700	1,250	505
7	455	455	1,020	1,250	680	920	3,320	3,510	2,450	5,550	1,250	505
8	455	405	1,020	1,250	680	970	3,320	3,510	2,280	5,550	1,250	505
9	455	405	970	1,190	680	970	3,230	3,320	2,280	4,090	1,960	505
10	382	360	920	1,130	680	970	3,140	2,960	2,280	2,960	1,520	505
11	315	360	620	1,080	650	970	3,050	3,140	2,540	2,790	1,320	505
12	315	430	680	1,020	620	970	3,320	3,510	2,790	2,620	1,250	455
13	315	455	920	1,080	590	970	3,510	3,510	2,120	2,450	1,130	405
14	275	455	830	1,080	560	1,250	3,600	2,960	3,890	2,450	1,020	405
15	275	480	750	1,130	560	1,590	3,700	2,450	3,890	2,200	1,020	405
16	275	505	680	1,130	560	1,250	3,700	1,960	4,090	2,200	920	455
17	275	505	680	1,130	560	920	4,290	1,960	3,890	2,120	875	455
18	275	455	620	1,080	505	715	5,660	3,700	2,700	2,120	830	455
19	275	405	715	1,020	455	715	6,540	4,910	3,320	2,120	830	405
20	275	590	830	920	430	715	6,210	4,290	4,090	1,960	830	405
21	295	875	750	830	405	715	5,990	3,890	2,790	1,660	750	405
22	382	1,080	715	750	405	715	5,990	3,700	1,250	1,660	680	405
23	405	1,020	650	750	405	790	5,770	3,700	2,120	1,660	680	360
24	405	920	620	750	405	875	6,210	3,700	2,790	1,520	680	405
25	360	1,380	920	790	405	970	5,770	3,700	4,290	1,380	680	405
26	360	970	1,660	830	405	875	5,120	3,700	3,890	1,660	680	360
27	405	1,020	2,450	830	620	790	4,910	3,700	4,090	2,790	620	405
28	560	970	2,450	830	875	920	4,700	3,510	4,090	2,120	620	360
29	505	970	2,450	830	1,080	1,080	4,290	3,320	3,890	1,810	620	360
30	505	1,190	2,450	830	.....	1,520	3,320	3,510	3,890	1,520	560	405
31	560	.....	2,120	830	.....	2,120	.....	3,320	.....	1,250	560	.....

NOTE.—Stage-discharge relation affected by ice from Dec. 13 to Apr. 11; discharge ascertained by means of gage heights, 3 discharge measurements, observer's notes, and weather records. No gage records, discharge interpolated, Apr. 14, May 14, 28, June 4, 11, July 2, 9, 16, 30, Aug. 27, and Sept. 3, 10, 17.

Monthly discharge of East Branch of Penobscot River at Grindstone, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 1,100 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	620	275	400	0.364	0.42
November	1,380	360	665	.604	.67
December	2,450	620	1,170	1.06	1.22
January	1,810	750	1,070	.973	1.12
February	1,080	405	618	.562	.61
March	2,120	715	1,090	.991	1.14
April	6,540	2,880	4,460	4.06	4.53
May	4,910	1,960	3,480	3.16	3.64
June	4,290	1,250	3,230	2.94	3.28
July	6,660	1,250	2,880	2.62	3.02
August	1,960	560	1,010	.918	1.06
September	560	360	448	.407	.45
The year	6,660	275	1,710	1.55	21.16

NOTE.—The monthly discharge in second-feet per square mile and the run-off in depth in inches do not represent the natural flow from the basin because of artificial storage. The yearly discharge and run-off doubtless represent more nearly the natural flow for probably little stored water is held over from year to year.

MATTAWAMKEAG RIVER AT MATTAWAMKEAG, MAINE.

LOCATION.—At Maine Central Railroad bridge at village of Mattawamkeag, Penobscot County, half a mile above mouth of river.

DRAINAGE AREA.—1,500 square miles.

RECORDS AVAILABLE.—August 26, 1902, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Chain fastened to railroad bridge; read by W. T. Mincher.

DISCHARGE MEASUREMENTS.—Made from the bridge; low-water measurements made by wading at a point about a mile above station.

CHANNEL AND CONTROL.—Practically permanent; channel at bridge broken by two piers.

EXTREMES OF DISCHARGE.—Maximum open-water stage recorded during year, 9.1 feet at 7 a. m. April 6 (discharge, 10,200 second-feet); a stage of 9.6 feet was observed at 7 a. m. April 4, but the stage-discharge relation was affected by ice at the time; minimum stage recorded, 3.6 feet September 5, 6, and 15 (discharge, 450 second-feet).

ICE.—Stage-discharge relation usually affected by ice for several months each winter.

REGULATION.—Dams are maintained at outlets of several large lakes and ponds, but the stored water is used only for log driving.

ACCURACY.—Stage-discharge relation occasionally affected by backwater from log jams and, during winter, by ice. Rating curve well defined below 16,000 second-feet. Gage read to tenths twice daily, except from January 16 to April 3, when it was read twice a week. Daily discharge ascertained by applying rating table to mean daily gage heights. Results good for open-water periods.

Discharge measurements of Mattawamkeag River at Mattawamkeag, Maine, during the year ending Sept. 30, 1916.

Date.	Made by—.	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 26	G. F. Adams	3.92	681	Mar. 3	W. G. Hill	[a] 6.90	1,320
Feb. 5	W. G. Hill	[a] 6.53	786	May 5	T. W. Clark	6.61	4,160
Mar. 1	H. A. Lancaster	[a] 6.78	1,220	June 14	E. W. Conners	6.02	3,130

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Mattawamkeag River at Mattawamkeag, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,470	1,470	2,040	6,140	995	1,240	2,680	5,080	2,240	1,840	1,410	505
2	1,240	1,350	2,170	6,140	950	1,300	3,620	5,080	2,530	1,840	1,240	505
3	1,190	1,350	2,380	6,140	860	1,350	4,680	5,080	2,240	1,900	1,140	505
4	1,140	1,240	2,380	6,360	860	1,300	7,480	5,080	2,100	2,310	1,040	505
5	1,040	1,140	2,530	6,360	780	1,240	9,290	5,080	1,970	5,280	950	450
6	1,140	1,040	2,310	6,720	780	1,300	10,100	5,080	1,840	5,490	950	450
7	1,040	950	2,100	7,220	740	1,300	9,290	5,080	1,840	5,490	860	505
8	950	860	1,970	7,730	740	1,350	7,990	5,810	1,840	5,280	995	505
9	860	860	1,840	7,100	740	1,350	6,980	4,980	1,840	4,700	1,240	565
10	780	860	1,710	6,480	740	1,350	6,480	4,380	1,900	3,800	1,240	565
11	780	860	1,710	5,810	740	1,350	6,360	4,090	2,100	2,920	1,240	565
12	780	860	1,710	5,280	740	1,350	6,360	3,800	2,380	2,460	1,240	505
13	780	860	1,710	4,090	740	1,350	6,360	3,260	3,340	2,170	1,140	505
14	780	860	1,840	3,000	700	1,300	6,600	2,760	3,170	1,900	1,040	505
15	700	905	2,100	2,100	700	1,240	6,850	2,240	3,080	1,710	860	450
16	700	1,090	2,310	1,900	700	1,240	7,100	1,970	2,680	1,470	860	535
17	700	1,410	2,680	1,840	665	1,190	7,100	1,970	2,530	1,190	780	700
18	700	1,470	2,840	1,780	665	1,190	7,730	2,040	2,380	1,590	700	780
19	700	1,530	2,840	1,650	665	1,140	8,380	2,530	2,530	1,590	700	780
20	630	1,710	3,000	1,590	630	1,090	8,640	2,840	2,840	1,590	630	860
21	630	1,710	3,170	1,530	630	1,090	8,900	2,680	2,760	1,350	630	780
22	630	1,900	3,340	1,410	598	1,040	9,160	2,460	2,460	1,240	630	700
23	630	2,310	3,340	1,350	598	950	8,900	2,460	2,040	1,140	565	700
24	700	2,240	3,620	1,350	665	905	8,250	2,920	1,780	1,240	630	630
25	700	1,970	3,900	1,300	740	860	7,860	3,000	1,530	1,240	700	630
26	700	1,840	4,090	1,300	820	780	7,350	2,760	1,410	1,350	630	630
27	995	1,710	4,480	1,240	905	780	6,720	3,170	1,780	1,900	565	565
28	1,140	1,710	4,980	1,240	995	780	6,030	2,760	2,040	2,240	565	565
29	1,240	1,710	5,280	1,190	1,140	780	5,380	2,310	2,170	2,240	565	505
30	1,350	1,840	5,600	1,140	.....	1,240	5,080	2,170	2,100	2,040	505	505
31	1,470	.....	5,920	1,090	.....	1,900	.....	2,530	.....	1,650	505	.....

NOTE.—Stage-discharge relation affected by ice from about Jan. 6 to Apr. 5; discharge ascertained by means of gage heights, 3 discharge measurements, observer's notes, and weather records.

Monthly discharge of Mattawamkeag River at Mattawamkeag, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 1,500 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,470	630	912	0.608	0.70
November	2,310	860	1,390	.927	1.03
December	5,920	1,710	2,960	1.97	2.27
January	7,730	1,090	3,530	2.35	2.71
February	1,140	598	766	.511	.55
March	1,900	780	1,180	.787	.91
April	10,100	2,680	7,130	4.75	5.30
May	5,810	1,970	3,470	2.31	2.66
June	3,340	1,410	2,250	1.50	1.67
July	5,490	1,140	2,390	1.59	1.83
August	1,410	505	863	.575	.66
September	860	450	582	.388	.43
The year	10,100	450	2,290	1.53	20.72

PISCATAQUIS RIVER NEAR FOXCROFT, MAINE.

LOCATION.—At Low's highway bridge, about halfway between Guilford and Foxcroft, Piscataquis County, three-fourths mile above the mouth of Black Stream and 3 miles below Mill Stream.

DRAINAGE AREA.—286 square miles.

RECORDS AVAILABLE.—August 17, 1902, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Staff attached to left abutment of bridge; read by A. F. D. Harlow.

DISCHARGE MEASUREMENTS.—At medium and high stages made from bridge; at low stages made by wading either above or below the bridge.

CHANNEL AND CONTROL.—Practically permanent; banks are high and are overflowed only during extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 8.0 feet at 7 p. m. May 18 (discharge from extension of rating curve, 7,810 second-feet); minimum stage recorded, 2.0 feet on August 6–7 and September 15, 19, 20, 22, and 23 (discharge, 64 second-feet).

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

REGULATION.—The stream is used to develop power at several manufacturing plants above the station; distribution of flow somewhat affected by operation of wheels.

ACCURACY.—Stage-discharge relation occasionally affected by backwater from log jams and by ice during winter. Rating curve well defined between 20 and 4,000 second-feet. Gage read to tenths twice daily. Daily discharge ascertained by applying rating table to mean daily gage heights. Some uncertainty exists in regard to accuracy of gage heights and the effect of diurnal fluctuation. Results considered fair.

COOPERATION.—Several discharge measurements made by students of the University of Maine under the direction of Prof. H. S. Boardman.

Discharge measurements of Piscataquis River near Foxcroft, Maine, during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
Oct. 2	University of Maine students	*Feet.* 2.78	*Sec.-ft.* 345	Oct. 9	University of Maine students	*Feet.* 2.95	*Sec.-ft.* 453
2	....do	2.91	364	Mar. 5	W. G. Hill	[a] 4.15	363
2	....do	2.91	382	8	....do	[a] 4.02	328
2	....do	3.10	524	May 17	E. W. Conners	2.99	362
8	....do	2.84	379	20	....do	4.99	2,100
9	....do	2.74	309				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Piscataquis River near Foxcroft, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	180	437	502	1,450	5,180	1,720	1,620	569	318	148
2	148	502	437	1,210	6,040	1,720	1,020	569	318	148
3	180	406	437	980	5,650	1,070	674	569	244	123
4	220	267	406	600	3,970	1,070	638	938	220	148
5	220	220	406	405	1,960	1,160	709	782	148	148
6	200	220	406	345	2,020	1,110	980	709	81	200
7	244	267	406	320	1,840	858	1,020	709	81	267
8	374	346	406	345	1,840	938	782	1,020	136	267
9	220	318	470	290	782	938	674	374	200	220
10	318	244	569	265	782	709	1,070	437	502	180
11	318	200	709	245	938	536	1,400	502	374	180
12	292	148	1,020	200	1,300	437	1,900	638	318	123
13	200	123	638	200	1,460	406	1,960	782	318	112
14	148	123	180	180	1,720	318	1,400	374	292	112
15	148	136	318	180	1,720	318	1,070	180	267	100
16	123	164	267	220	1,900	318	782	180	148	180
17	123	220	220	180	3,020	2,080	980	437	148	220
18	148	374	292	220	4,890	7,610	1,620	437	148	136
19	148	244	374	245	5,270	4,700	1,620	406	123	81
20	148	1,020	374	245	3,790	2,420	1,510	318	81	81
21	244	1,780	437	245	3,520	1,460	1,210	318	244	81
22	244	1,560	437	265	3,020	1,070	980	406	244	81
23	148	980	374	265	3,610	820	782	437	244	72
24	180	782	292	265	4,060	1,110	782	604	180	81
25	180	437	292	320	3,260	1,210	638	470	148	100
26	136	437	1,620	570	2,560	820	638	569	90	112
27	136	437	3,100	820	2,280	746	709	782	81	136
28	148	437	2,940	1,110	2,420	502	674	638	148	123
29	164	437	1,840	2,020	2,220	709	709	470	148	123
30	346	709	1,560	2,490	1,900	938	674	374	148	180
31	437	.....	980	3,970	.....	1,460	.....	346	164	.....

NOTE.—Stage-discharge relation affected by ice from about Jan. 1 to Mar. 27; discharge Mar. 1–27 ascertained by means of 2 discharge measurements, gage heights, and weather records.

Monthly discharge of Piscataquis River near Foxcroft, Maine, for thr year ending Sept. 30, 1916.

[Drainage area, 286 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	437	123	208	0.727	0.84
November	1,780	123	466	1.63	1.82
December	3,100	180	733	2.56	2.95
January	.....	.....	569	1.99	2.29
February	.....	.....	292	1.02	1.10
March	3,970	180	667	2.33	2.69
April	6,040	782	2,830	9.90	11.04
May	7,610	318	1,330	4.65	5.36
June	1,960	638	1,040	3.64	4.06
July	1,020	180	527	1.84	2.12
August	502	81	203	.710	.82
September	267	72	142	.496	.55
The year	7,610	72	750	2.62	35.64

NOTE.—Monthly discharges for January and February determined from gage heights, weather records, and comparison with records of flow of other streams.

PASSADUMKEAG RIVER AT LOWELL, MAINE.

LOCATION.—About half a mile below the dam and highway bridge at Lowell, Penobscot County, and 10 miles above mouth of river.

DRAINAGE AREA.—301 square miles (authority, Public Utilities Commission of Maine).

RECORDS AVAILABLE.—October 1, 1915, to September 30, 1916.

GAGES.—Chain and staff gages on right bank; read by F. A. Lord. Staff above dam, half a mile upstream, for supplementary use during winter.

DISCHARGE MEASUREMENTS.—Made from cable 20 feet above gage.

CHANNEL AND CONTROL.—Channel rough and somewhat irregular; control about 500 feet below gage; practically permanent. Left bank subject to overflow at gage height 5.5 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.0 feet at 4 p. m. April 25 (stage-discharge relation affected by logs on control); maximum discharge was probably 1,030 second-feet April 19, 20, 21, and 22; minimum stage recorded during year, 1.4 feet October 24, 25, 26, and Aug. 20 (discharge, 146 second-feet).

ICE.—Stage-discharge relation usually affected by ice from December to April.

REGULATION.—Distribution of flow somewhat affected by use of storage reservoirs above station. A small dam one-half mile above gage does not materially affect the flow.

ACCURACY.—Stage-discharge relation practically permanent, except when affected by backwater due to logs on control or to ice. Gage read to tenths once daily. Rating curve well defined between 84 and 2,560 second-feet. Daily discharge ascertained by applying rating table to gage heights. Results good.

COOPERATION.—Discharge measurements made by engineers employed by T. W. Clark, hydraulic engineer, Oldtown, Maine.

Discharge measurements of Passadumkeag River at Lowell, Maine, during 1915–16.

[Made by H. A. Lancaster.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1915.	*Feet.*	*Sec.-ft.*	1915.	*Feet.*	*Sec.-ft.*	1916.	*Feet.*	*Sec.-ft.*
Sept. 30	1.95	278	Nov. 8	1.20	93	Mar. 22	[a] 2.32	167
Oct. 1	2.88	617				22	[a] 2.31	166
1	1.80	242	1916.			Apr. 6	3.02	693
16	1.85	263	Jan. 12	[a] 3.42	196	June 20	[b] 3.74	940
16	1.00	82	26	[a] 2.40	219	23	[b] 3.59	887
Nov. 6	1.30	122	27	[a] 2.22	220	Aug. 1	2.64	518
7	2.42	422	Feb. 11	[a] 2.45	205	Sept. 21	1.80	230

[a] Stage-discharge relation affected by ice. [b] Stage-discharge relation affected by logs on control.

Daily discharge, in second-feet, of Passadumkeag River at Lowell, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	320	234	320	586	200	250	460	780	730	632	542	209
2	320	234	352	580	200	230	632	830	780	586	460	209
3	320	234	352	580	200	220	780	830	830	586	352	186
4	320	234	352	586	200	220	780	830	830	542	290	209
5	320	234	320	500	200	210	730	1,030	780	460	261	209
6	290	234	290	386	200	210	680	1,030	780	632	261	209
7	320	234	290	350	200	210	680	980	680	542	234	186
8	290	221	261	320	200	210	680	586	632	586	234	209
9	290	209	261	260	200	200	632	500	730	586	261	186
10	290	209	260	230	200	200	632	422	830	586	290	186
11	290	186	260	220	200	200	586	352	730	586	290	186
12	290	186	260	200	200	200	586	352	730	586	261	209
13	290	186	260	200	175	185	632	320	632	500	261	209
14	261	175	260	200	175	185	730	352	830	460	261	165
15	261	175	261	200	175	185	730	352	830	422	261	165
16	261	209	230	200	175	185	780	386	830	386	261	209
17	234	234	230	200	165	185	830	386	780	386	234	186
18	234	234	209	200	165	175	830	386	830	386	234	234
19	221	234	234	200	165	165	1,030	460	730	386	352	234
20	234	261	320	200	165	165	1,030	500	930	386	146	234
21	165	320	320	200	165	165	1,030	500	980	422	165	234
22	175	352	320	200	165	165	1,030	422	930	422	209	234
23	165	386	320	200	165	165	830	422	880	422	209	234
24	146	386	290	200	165	165	880	422	830	386	186	234
25	146	386	290	220	165	165	920	386	930	422	234	234
26	146	352	320	220	175	165	930	422	1,030	386	234	234
27	165	352	632	220	200	175	920	460	930	386	290	234
28	209	320	730	220	220	200	930	500	880	386	186	234
29	234	320	632	230	280	220	930	542	780	422	234	209
30	234	320	580	200	.....	275	880	586	680	422	209	234
31	234	.....	580	200	.....	369	.....	680	.....	542	234	.....

NOTE.—Stage-discharge relation affected by ice Dec. 10 to 14, 16, 17, 30, and 31; Jan. 2, 3, and Jan. 7 to Mar. 29. Results corrected for log jams and opening of log sluice Apr. 24, 25, and 27, and for logs in river June 1 to 24. Gage read after opening log sluice gate Oct. 2. Discharge estimated June 25, July 5, Aug. 12, 19, 27. Gate at Lowell dam closed p. m. June 4; closed p. m. June 24, raised a. m. June 25; closed 8 a. m. July 5; closed 8 a. m. Aug. 12; raised a. m. Aug. 19, closed p. m. Aug. 19; raised a. m. Aug. 27, closed p. m. Aug. 27.

Monthly discharge of Passadumkeag River at Lowell, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 301 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	320	146	248	0.824	0.95
November	386	175	262	.870	.97
December	730	209	342	1.14	1.31
January	586	200	281	.934	1.08
February	280	165	188	.625	.67
March	369	165	201	.668	.77
April	1,030	460	791	2.63	2.93
May	1,030	320	549	1.82	2.10
June	1,030	632	810	2.69	3.00
July	632	386	479	1.59	1.83
August	542	146	262	.870	1.00
September	234	165	211	.701	.78
The year	1,030	146	385	1.28	17.39

KENDUSKEAG STREAM NEAR BANGOR, MAINE.

LOCATION.—At highway bridge at Sixmile Falls, about 6 miles northwest of Bangor, Penobscot County, and 7 miles below mouth of Black Stream.

DRAINAGE AREA.—191 square miles. At high stages a part of the water of Souadabscook Stream finds its way through an artificial cut into Black Stream and thus to the Kenduskeag.

RECORDS AVAILABLE.—September 15, 1908, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Chain attached to bridge; read by Fred Cort.

DISCHARGE MEASUREMENTS.—Made from the bridge.

CHANNEL AND CONTROL.—Practically permanent; channel broken by one pier at the bridge.

ICE.—Stage-discharge relation seriously affected by ice for several months.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.9 feet at 4.30 p. m. April 2 (discharge, from extension of rating curve, 3,410 second-feet); minimum stage recorded, 1.9 feet October 24 and 25 (discharge, 57 second-feet).

DIVERSIONS.—An artificial cut was made for log driving through a low divide between Souadabscook Stream and Black Stream, which enters the Kenduskeag about 7 miles above the gaging station. During high stages of the Souadabscook part of its waters finds its way through the artificial cut into the Kenduskeag; at low stages of the Souadabscook all the flow continues down its own channel; Black Stream probably sends its waters only to the Kenduskeag.

ACCURACY.—Stage-discharge relation probably permanent, except during ice periods. Rating curve well defined below 2,600 second-feet. Gage read to tenths twice daily during open water period; read twice a week during the winter. Daily discharge ascertained by applying rating curve to mean daily gage heights. Results good, for ordinary stages.

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Discharge measurements of Kenduskeag Stream near Bangor, Maine, during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 25	G. F. Adams	2.01	52	May 3	G. C. Danforth	3.12	326
Feb. 11	W. G. Hill	[a] 2.70	101	4	....do	3.33	356
Mar. 22	....do	[a] 3.10	83	22	E. W. Conners	3.75	539
Apr. 19	G. C. Danforth	6.30	1,940	June 13	....do	3.81	553
20	....do	5.90	1,730	22	....do	3.69	459

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Kenduskeag Stream near Bangor, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	188	366	520	1,210	290	431	2,430	398	382	431	128	102
2	188	276	483	1,120	305	350	3,180	366	350	335	128	78
3	146	236	483	1,030	290	276	3,100	290	335	483	137	71
4	119	211	398	922	276	236	1,940	262	366	978	128	78
5	94	211	350	845	262	156	1,340	366	398	978	119	110
6	137	211	290	722	249	156	1,210	414	398	678	102	137
7	166	223	290	655	236	146	1,030	398	366	576	110	110
8	199	211	335	795	211	137	820	335	320	655	188	86
9	199	188	262	820	199	137	820	276	305	655	249	119
10	236	156	236	895	146	128	655	223	382	538	350	119
11	188	156	335	770	102	119	870	211	596	414	276	86
12	156	146	335	700	102	119	1,150	211	576	448	249	119
13	166	188	276	615	102	110	1,610	223	448	350	211	102
14	146	199	199	596	102	94	1,370	199	366	290	166	94
15	102	223	166	557	102	86	1,370	177	320	262	128	128
16	102	501	199	335	102	78	1,120	156	305	249	110	137
17	86	501	199	320	102	71	1,240	156	465	236	119	156
18	94	655	382	305	102	71	1,470	922	678	211	94	156
19	110	722	483	290	102	64	2,060	1,720	978	211	102	146
20	119	770	465	276	102	64	1,680	1,440	870	199	128	156
21	102	1,060	483	276	110	64	1,300	950	655	236	102	137
22	86	870	448	276	110	64	1,060	538	483	236	86	146
23	86	655	366	276	119	71	950	414	398	199	119	119
24	64	561	520	262	119	78	870	382	305	305	128	102
25	57	448	655	262	188	94	922	382	335	398	110	78
26	71	382	1,090	249	320	102	820	576	398	290	86	94
27	166	320	2,020	249	465	276	722	700	538	320	119	102
28	382	290	2,390	262	465	501	615	615	722	249	137	86
29	335	305	1,640	262	448	845	557	557	795	223	137	86
30	398	431	1,270	276	.....	1,300	483	483	576	199	128	119
31	431	.....	1,240	276	.....	1,860	.....	445	.....	166	94	.....

NOTE.—Stage-discharge relation affected by ice from Jan. 16 to Apr. 1; discharge ascertained by means of gage heights, 2 discharge measurements, observer's notes, and weather records.

Monthly discharge of Kenduskeag Stream near Bangor, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 191 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	431	57	165	0.864	1.00
November	1,060	146	387	2.05	2.29
December	2,390	166	607	3.18	3.67
January	1,210	249	539	2.82	3.25
February	448	102	201	1.05	1.13
March	1,860	64	267	1.40	1.61
April	3,180	483	1,290	6.75	7.53
May	1,720	156	477	2.50	2.88
June	978	305	480	2.51	2.80
July	978	166	387	2.05	2.36
August	350	86	144	.754	.87
September	156	71	112	.586	.65
The year	3,180	57	421	2.20	30.04

KENNEBEC RIVER BASIN.

MOOSEHEAD LAKE AT EAST OUTLET, MAINE.

LOCATION.—At wharf at east outlet of lake, about 8 miles from Kineo, Piscataquis County.

DRAINAGE AREA.—1,240 square miles.

RECORDS AVAILABLE.—April 1, 1895, to September 30, 1916.

GAGE.—Staff at end of boat landing; two datums have been used at east outlet; the first (or original datum) is 1,011.30 feet above mean sea level and approximately 10 feet below sills of outlet gates; gage is read to this datum; the second, to which all gage readings published to and including 1911 have been referred, is 10 feet higher; that is, the zero is at the sill of the gates; as it is believed that low water may go below the sill of the gates (zero of second datum), gage heights since 1912 are published as read—that is, to original datum.

REGULATION.—The lake is regulated to a capacity of 23,735,000,000 cubic feet. The dam at the east outlet is controlled by 35 gates; the sills of 15 old gates are at gage height 10 feet (original datum) and the sills of 20 gates at gage height 8 feet (original datum). At extreme low stages the flow from the lake is controlled not by the gates but by a bar above the dam at an approximate gage height of 9 feet (original datum). The records show only fluctuations in the level of the lake and are used in the studies of regulation of the lake and in computing the natural flow of the Kennebec at The Forks station.

COOPERATION.—Record furnished by Hollingsworth & Whitney Co.

Daily gage height, in feet, of Moosehead Lake, east outlet, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	13.3	.....	.....	.....	13.25	.....	16.6	.....	.....	.....	16.35
2	.....	.....	13.1	.....	13.5	.....	.....	.....	17.5	.....	16.9	.....
3	.....	13.2	13.1	13.4	.....	.....	13.1	16.65	.....	17.5	.....	.....
4	14.0	.....	.....	.....	13.55	13.2	.....	.....	17.5	.....	16.8	16.1
5	.....	13.2	.....	13.45	.....	.....	13.3	16.9	.....	17.45	.....	.....
6	13.95	.....	13.1	.....	.....	13.2	.....	.....	.....	.....	.....	16.0
7	.....	.....	.....	.....	13.5	.....	.....	.....	17.45	17.4	16.8	.....
8	13.9	13.2	13.1	13.45	.....	.....	13.4	17.1	.....	.....	.....	.....
9	.....	.....	.....	.....	13.5	13.3	.....	.....	.....	.....	16.9	16.0
10	.....	13.2	13.05	13.5	.....	13.3	13.9	17.2	17.4	.....	.....	.....
11	.....	.....	.....	.....	13.5	.....	.....	.....	.....	17.3	17.05	15.85
12	13.85	13.0	13.0	13.6	.....	.....	13.95	17.45	17.4	17.3	.....	.....
13	13.8	.....	.....	.....	.....	13.3	.....	.....	.....	.....	.....	15.75
14	.....	.....	.....	.....	13.5	13.3	.....	.....	17.3	17.25	16.9	.....
15	.....	12.95	12.9	.....	.....	.....	14.2	17.45	.....	.....	.....	15.6
16	13.75	.....	.....	13.55	13.5	.....	.....	.....	17.25	.....	16.8	.....
17	.....	12.9	12.9	13.5	.....	13.3	.....	.....	.....	17.25	.....	.....
18	13.7	.....	.....	.....	.....	.....	14.4	17.55	.....	.....	.....	15.65
19	.....	12.9	.....	13.6	13.45	.....	14.8	17.55	17.3	17.2	16.7	.....
20	13.7	.....	12.9	.....	.....	13.2	.....	.....	.....	.....	.....	15.5
21	.....	.....	.....	13.55	13.55	.....	15.1	.....	17.4	17.2	16.6	.....
22	13.65	12.9	12.85	.....	.....	13.1	.....	17.5	.....	.....	.....	15.4
23	.....	.....	.....	.....	13.4	.....	.....	.....	17.4	.....	16.55	.....
24	.....	12.95	.....	13.5	.....	13.05	15.65	17.5	.....	17.1	.....	.....
25	13.5	.....	12.85	.....	13.3	.....	.....	.....	.....	.....	.....	.....
26	.....	13.0	.....	.....	.....	.....	.....	17.5	17.4	17.1	16.4	15.4
27	13.45	.....	.....	13.5	.....	12.9	16.1	.....	.....	.....	.....	15.4
28	.....	.....	13.1	13.5	13.3	.....	16.2	.....	17.45	17.1	.....	.....
29	13.4	13.1	13.15	.....	.....	12.85	.....	17.4	.....	.....	16.4	15.4
30	.....	.....	.....	.....	.....	.....	.....	.....	17.5	.....	16.4	.....
31	.....	.....	13.2	13.55	.....	13.00	.....	17.5	.....	17.0	.....	.....

KENNEBEC RIVER AT THE FORKS, MAINE.

LOCATION.—At wooden highway bridge about 2,000 feet above the mouth of Dead River at The Forks, Somerset County.

DRAINAGE AREA.—1,570 square miles.

RECORDS AVAILABLE.—September 28, 1901, to September 30, 1916. Data also published in annual reports of Public Utilities Commission of Maine.

GAGES.—Chain on bridge, a vertical staff on timber retaining wall on left bank 75 feet above bridge, and a Gurley 7-day water-stage recorder on left abutment; recorder set to read the same as chain gage at low water, but gives lower readings than chain gage at high water; used during summer months only. Chain gage read by S. C. Durgin.

DISCHARGE MEASUREMENTS.—Made from the bridge.

CHANNEL AND CONTROL.—Practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.2 feet, May 20 (discharge, 10,700 second-feet); minimum stage recorded during year, 0.7 foot on November 26 and 27 (discharge, 395 second-feet).

ICE.—Stage-discharge relation seriously affected by ice for several months.

REGULATION.—Flow regulated by storage in Moosehead Lake. During May, June, July, and August the operation of Indian Pond for log driving causes a large diurnal fluctuation. Records of monthly discharge have been reduced to natural flow by adding or subtracting the amount of water stored in or released from Moosehead Lake.

ACCURACY.—Stage-discharge relation practically permanent except when ice is present. Rating curve well defined, a table of relation being used to convert discharge rating for chain gage to a corresponding rating for water-stage recorder.

Water-stage recorder in operation October 1 to November 26 and May 1 to September 30; chain gage read to half-tenths twice daily November 27 to February 14 and once daily from February 15 to April 30. Daily discharge when water-stage recorder was in operation computed as average of discharge for 12 two-hour periods; when water-stage recorder not in operation, discharge ascertained by applying rating table to mean daily gage heights. Results good.

Discharge measurements of Kennebec River at The Forks, Maine, during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet. [a]	*Sec.-ft.*			*Feet.* [a]	*Sec.-ft.*
Feb. 1	W. G. Hill	[b] 2.96	1,450	Mar. 10	W. G. Hill	[b] 3.45	1,450
23	do	[b] 3.80	2,100	July 18	E. W. Conners	1.84	1,110

[a] From chain gage.
[b] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Kennebec River at The Forks, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,110	1,700	1,280	1,160	1,480	2,200	1,630	3,690	5,850	3,300	3,100	2,480
2	2,080	1,690	1,160	1,160	1,330	2,200	1,530	4,960	4,720	2,890	2,920	2,570
3	1,820	1,650	1,160	1,160	1,240	2,200	2,330	4,820	4,260	4,610	3,100	2,540
4	1,720	1,590	952	1,160	1,200	2,200	1,850	2,690	3,890	6,710	2,820	2,540
5	1,640	1,640	990	1,240	1,200	1,580	1,740	2,140	3,970	4,660	3,680	2,540
6	1,620	1,620	1,030	1,280	1,200	1,430	1,530	2,340	4,900	3,340	3,190	2,540
7	1,600	1,590	1,160	1,200	1,110	1,380	1,330	2,790	4,000	3,310	3,270	2,540
8	1,620	1,540	1,160	1,380	1,070	1,330	1,330	2,780	3,640	3,310	3,530	2,540
9	1,650	1,500	1,330	1,630	1,070	1,330	1,330	3,130	3,980	3,440	3,670	2,540
10	1,640	1,460	1,430	2,200	1,030	1,480	1,160	2,230	4,440	3,390	1,160	2,540
11	1,620	1,440	1,530	2,200	990	1,850	1,160	2,670	4,620	3,110	1,480	2,460
12	1,580	1,460	1,800	2,200	1,110	1,850	1,160	1,930	3,690	2,990	2,160	2,240
13	1,550	1,440	2,200	2,330	1,330	1,850	1,160	2,230	3,130	3,150	3,510	2,200
14	1,540	1,390	2,200	2,400	1,330	1,740	1,240	2,230	3,550	3,400	3,530	2,180
15	1,840	1,390	2,460	2,600	1,430	1,850	1,330	3,470	3,110	3,430	4,020	2,210
16	1,610	1,380	2,800	2,460	1,430	1,850	1,530	3,640	3,960	3,080	3,620	2,480
17	1,540	1,360	2,880	2,530	1,430	1,800	1,960	3,290	3,020	3,650	3,900	2,270
18	1,540	1,360	2,660	2,800	1,530	2,600	2,880	6,000	3,810	3,840	3,610	1,940
19	1,560	1,340	2,460	2,740	1,680	2,600	4,500	7,740	4,130	3,740	3,160	2,090
20	1,590	1,500	2,460	2,530	1,740	2,600	4,150	8,080	2,870	3,290	2,850	2,060
21	1,580	1,340	2,460	2,800	1,740	2,600	2,600	7,340	2,770	3,270	2,650	1,830
22	1,760	763	1,960	2,460	2,020	2,600	3,170	6,790	2,780	3,270	4,220	1,970
23	1,540	535	1,850	2,080	2,080	2,600	3,170	6,560	3,470	3,420	3,060	2,030
24	1,450	475	1,850	2,020	2,200	2,740	3,480	6,310	3,660	3,310	2,760	2,500
25	1,400	450	1,960	1,910	2,200	2,740	2,600	6,060	3,110	3,400	2,690	1,830
26	1,400	472	1,680	1,630	2,600	3,020	2,330	5,440	3,670	3,430	2,790	1,500
27	1,420	805	1,200	1,630	3,560	3,320	2,330	5,230	3,200	3,460	2,640	1,360
28	1,410	1,530	1,160	1,580	3,480	3,170	2,600	4,190	3,010	3,240	2,590	1,370
29	1,440	1,630	1,160	1,430	3,480	3,020	4,150	3,970	3,250	3,260	2,540	1,370
30	1,660	1,530	1,160	1,480	.....	2,740	3,170	4,240	2,960	3,980	2,510	1,600
31	1,660	.....	1,160	1,430	.....	2,880	.....	4,490	.....	3,200	2,490	.....

NOTE.—Stage-discharge relation affected by ice from about Jan. 1 to Mar. 29; discharge ascertained by means of gage heights, 3 discharge measurements, observer's notes, and weather records.

Monthly discharge of Kennebec River at The Forks, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 1,570 square miles.]

Month.	Discharge in second-feet.			Corrected run-off (depth in inches on drainage area).
	Observed mean.	Corrected for storage.		
		Mean.	Per square mile.	
October	1,620	675	0.430	0.50
November	1,320	1,020	.650	.72
December	1,700	1,820	1.16	1.34
January	1,900	2,320	1.48	1.71
February	1,700	1,380	.879	.95
March	2,240	1,890	1.20	1.38
April	2,210	6,440	4.10	4.57
May	4,310	5,580	3.55	4.09
June	3,710	3,710	2.36	2.63
July	3,540	2,930	1.87	2.16
August	3,010	2,290	1.46	1.68
September	2,160	930	.592	.66
The year	2,460	2,590	1.65	22.39

KENNEBEC RIVER AT WATERVILLE, MAINE.

LOCATION.—At dam and mill of Hollingsworth & Whitney Co. at Waterville, in Kennebec County, 2 miles above Sebasticook River, and about 3½ miles above Messalonskee Stream.

DRAINAGE AREA.—4,270 square miles.

RECORDS AVAILABLE.—March 22, 1892, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGES.—Rod gages in pond above dam and in tailrace of mill.

DETERMINATION OF DISCHARGE.—Discharge computed from flow over dam, through the logway, and through the wheels of the mill. When flow is less than about 3,500 second-feet all the water is used through the wheels.

ICE.—Stage-discharge relation not as a rule affected by ice; in most years winter flow passes through wheels of mill.

REGULATION.—Numerous power plants and much storage above station; results not corrected for storage.

COOPERATION.—Records obtained and estimates of daily discharge furnished by Hollingsworth & Whitney Co.

Daily discharge, in second-feet, of Kennebec River at Waterville, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,220	4,380	4,860	5,450	4,890	8,640	23,500	20,600	16,300	9,920	10,300	3,890
2	3,570	3,760	5,020	5,410	4,910	8,180	23,100	17,700	15,700	8,720	5,420	4,200
3	1,360	3,780	4,420	5,520	5,290	7,300	29,000	19,700	13,300	7,180	4,740	2,350
4	4,560	3,760	3,990	5,190	6,500	6,800	25,200	20,200	12,200	7,380	3,800	4,290
5	4,040	3,340	817	4,010	5,480	4,340	20,000	17,200	10,700	11,100	4,120	4,440
6	4,010	3,760	4,130	4,210	1,810	5,860	17,400	15,900	10,700	10,500	2,460	4,220
7	3,750	635	2,790	4,120	4,310	4,970	16,300	13,400	10,700	8,380	7,170	4,210
8	3,700	3,980	3,790	4,360	5,790	4,210	13,500	13,400	11,600	8,030	6,210	3,980
9	4,000	3,640	3,760	921	3,600	4,000	12,600	9,980	12,100	7,550	11,000	4,520
10	2,230	3,450	3,450	3,750	3,450	4,000	11,500	12,900	13,300	8,420	26,000	3,000
11	4,160	2,850	3,490	3,510	3,450	3,860	12,500	8,730	18,400	7,490	16,000	4,500
12	3,890	3,120	530	3,780	3,170	3,070	23,600	11,900	20,000	6,100	10,100	4,370
13	3,200	3,030	3,120	4,350	1,980	4,160	12,500	12,500	20,000	5,680	7,040	5,150
14	2,880	455	3,350	3,870	5,130	4,010	13,500	9,100	15,000	6,330	7,990	3,520
15	3,390	3,970	2,940	4,160	3,420	3,980	14,500	9,380	13,800	5,080	7,720	3,830
16	2,550	3,730	3,090	1,240	3,200	3,780	12,600	8,120	12,700	4,960	6,870	4,570
17	1,000	3,750	2,900	3,810	3,720	3,750	14,000	7,700	10,700	9,790	6,540	6,270
18	3,720	2,830	3,440	3,440	3,740	3,750	20,400	38,600	14,500	6,950	6,060	7,760
19	3,020	3,060	716	3,400	3,820	3,380	32,800	44,500	18,500	7,730	4,810	5,970
20	2,710	3,870	5,130	3,120	1,980	4,190	27,300	30,800	18,400	8,120	3,200	4,950
21	3,030	7,730	4,590	3,060	3,960	3,780	25,000	24,900	14,200	5,970	4,730	4,670
22	2,700	7,280	4,160	3,530	3,770	3,780	22,300	21,600	12,100	5,880	4,150	4,120
23	2,610	5,940	3,790	1,660	3,340	3,850	22,100	18,300	10,500	7,020	3,990	3,630
24	768	5,340	3,820	4,300	3,610	3,850	35,400	15,100	10,900	8,980	5,560	3,010
25	3,070	2,960	2,940	4,050	3,750	3,870	30,400	15,200	9,910	8,820	4,970	7,590
26	2,490	4,380	5,110	4,370	3,740	2,840	25,200	16,900	9,900	7,570	4,580	5,880
27	2,700	3,440	13,700	4,160	5,660	4,910	25,900	14,500	11,300	8,270	3,380	5,250
28	2,760	1,640	12,700	4,360	13,800	5,860	22,400	13,800	9,600	11,600	8,530	4,070
29	2,740	4,600	11,100	3,400	10,000	7,880	23,100	13,300	10,700	8,410	3,860	3,860
30	2,690	4,630	8,750	3,100	.....	12,300	20,300	10,200	12,200	7,380	4,660	4,000
31	626	.....	7,360	4,880	.....	19,400	.....	18,400	.....	6,820	4,640	.....

Monthly discharge of Kennebec River at Waterville, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 4,270 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	4,560	626	2,940	0.688	0.79
November	7,730	455	3,770	.883	.98
December	13,700	530	4,640	1.09	1.26
January	5,520	921	3,820	.895	1.03
February	13,800	1,810	4,530	1.06	1.14
March	19,400	2,840	5,440	1.27	1.46
April	35,400	11,500	20,900	4.90	5.47
May	44,500	7,700	16,900	3.96	4.56
June	20,000	9,600	13,300	3.12	3.48
July	11,600	4,960	7,810	1.83	2.11
August	26,000	2,460	6,800	1.59	1.83
September	7,760	2,350	4,540	1.06	1.18
The year	44,500	455	7,960	1.86	25.29

NOTE.—The monthly discharge in second-feet per square mile and the run-off in depth in inches do not represent the natural flow from the basin because of artificial storage. The yearly discharge and run-off doubtless represent more nearly the natural flow, for probably little stored water is held over from year to year.

DEAD RIVER AT THE FORKS, MAINE.

LOCATION.—One-eighth mile above farmhouse of Jeremiah Durgin, 1½ miles west of The Forks, Somerset County.

DRAINAGE AREA.—878 square miles.

RECORDS AVAILABLE.—September 29, 1901, to August 15, 1907; March 16, 1910, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Staff bolted to large boulder on left bank; read by H. J. Farley.

DISCHARGE MEASUREMENTS.—Made from cable 700 feet above gage.

CHANNEL AND CONTROL.—Stream bed rough; control practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.1 feet at 6.30 p. m. May 18 (discharge, 10,100 second-feet); minimum open water stage recorded during year, 0.6 foot at 6 p. m. September 4 (discharge from extension of rating curve, 100 second-feet); (an estimated discharge of 25 second-feet February 15, stage-discharge relation affected by ice at the time).

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

REGULATION.—A number of dams on lakes above; used for log driving during May and June.

ACCURACY.—Stage-discharge relation practically permanent except when ice is present. Rating curve well defined. Gage read to half-tenths twice daily except during the winter, when it was read twice daily on three days a week. Daily discharge ascertained by applying rating curve to mean daily gage heights. Results good for open-water period; estimates for winter months considered fair.

Discharge measurements of Dead River at The Forks, Maine, during the year ending Sept. 30, 1916.

[Made by W. G. Hill.]

Date.	Gage height.[a]	Discharge.	Date.	Gage height.[a]	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Feb. 1	3.65	1,640	Mar. 10	3.40	831
23	1.60	395			

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Dead River at The Forks, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	325	510	610	902	1,620	1,390	4,220	4,460	2,660	1,240	665	240
2	415	610	840	840	200	1,390	4,710	4,710	2,750	1,240	510	160
3	415	610	1,100	780	100	1,390	5,240	4,100	3,340	1,390	415	160
4	462	510	840	720	60	1,390	4,840	4,100	2,750	1,240	415	100
5	560	510	610	665	25	1,390	4,340	4,580	2,560	1,100	462	282
6	610	510	610	610	42	1,240	3,550	3,440	2,560	1,100	720	840
7	560	370	510	560	60	1,170	1,700	3,440	2,750	1,100	1,240	1,240
8	415	370	462	510	100	1,032	1,460	3,140	2,380	1,100	1,700	120
9	510	370	510	415	160	965	1,170	3,880	2,660	1,100	3,240	325
10	510	415	610	370	240	840	1,170	3,660	3,040	1,030	4,970	415
11	510	415	510	370	370	780	1,320	2,940	3,140	965	4,220	415
12	510	510	510	325	510	720	1,540	3,440	3,140	840	3,040	780
13	462	462	415	240	415	610	1,940	2,840	2,940	720	2,200	780
14	415	462	415	200	415	560	2,030	1,540	2,940	560	1,620	780
15	370	510	325	160	415	462	2,290	2,380	2,660	370	1,390	780
16	370	462	240	100	370	415	2,290	1,700	2,290	282	1,170	1,170
17	325	510	240	160	370	370	2,560	2,030	2,120	780	902	1,780
18	370	510	1,100	160	325	325	2,660	6,790	2,200	1,780	665	1,240
19	415	462	1,700	100	282	325	4,460	7,660	2,200	1,390	610	720
20	415	610	1,460	160	370	325	3,240	6,460	2,470	1,240	610	462
21	370	780	1,240	200	370	325	2,940	5,240	2,380	1,030	610	415
22	325	1,030	1,100	325	370	325	3,140	4,840	2,290	902	510	282
23	325	1,240	902	240	415	325	4,460	5,240	1,940	965	462	282
24	240	1,030	780	370	415	1,240	4,340	5,830	1,620	902	510	610
25	200	780	610	370	462	1,240	4,580	5,830	1,390	840	840	560
26	160	610	1,540	325	510	1,240	6,790	5,530	1,170	965	840	510
27	160	510	2,840	370	840	1,240	3,880	4,580	965	1,100	665	415
28	160	510	2,200	415	965	2,380	4,580	4,100	1,390	1,100	665	325
29	160	510	1,620	325	1,170	3,990	6,460	3,340	1,390	1,100	510	240
30	240	610	1,240	240	.....	4,220	4,340	3,140	1,390	1,100	665	370
31	370	.....	965	902	.....	3,990	.....	3,550	.....	902	510	.....

NOTE.—Stage-discharge relation affected by ice from about Jan. 1 to Mar. 31; discharge ascertained by means of gage heights, 3 discharge measurements, observer's notes, and weather records.

Monthly discharge of Dead River at The Forks, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 878 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	610	160	376	0.428	0.49
November	1,240	370	577	.657	.73
December	2,840	240	922	1.05	1.21
January	902	100	401	.457	.53
February	1,620	25	413	.470	.51
March	4,220	325	1,210	1.38	1.59
April	6,790	1,170	3,410	3.87	4.32
May	7,660	1,540	4,150	4.73	5.45
June	3,140	965	2,320	2.64	2.94
July	1,780	370	1,010	1.15	1.33
August	4,970	415	1,210	1.38	1.59
September	1,780	100	560	.638	.71
The year	7,660	25	1,380	1.57	21.40

SEBASTICOOK RIVER AT PITTSFIELD, MAINE.

LOCATION.—At steel highway bridge, just above the Maine Central Railroad bridge, in Pittsfield, Somerset County.

DRAINAGE AREA.—320 square miles.

RECORDS AVAILABLE.—July 27, 1908, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Chain attached to highway bridge; read by C. D. Morrill.

DISCHARGE MEASUREMENTS.—Made from the highway bridge.

CHANNEL AND CONTROL.—Practically permanent; banks high and rocky and not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.8 feet at 8 a. m. and 4.15 p. m. April 6 (discharge, 2,860 second-feet); minimum stage recorded during year, 2.4 feet at 9 a. m. and 4 p. m. October 10 (discharge from extension of rating curve, 50 second-feet).

ICE.—Stage-discharge relation not seriously affected by ice, as the rapid fall and the proximity of the power plant immediately above station tend to keep river open.

REGULATION.—About 800 feet upstream from the station is the dam of the Robert Dobson Co. and the Smith Woolen Co.; and about half a mile farther upstream is the dam of the Waverly Woolen Mill; the storage of water at these dams causes diurnal fluctuation at the gage.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined between 70 and 4,000 second-feet. Gage read to tenths twice daily. A correction has been applied to the observed gage heights for days when mills shut down at night, on account of the lower stage at night. Discharge ascertained by applying rating table to the corrected mean daily gage heights. Owing to lack of exact information in regard to the stage at night when the mills are shut down, figures for daily discharge are not published; but as the errors in values for individual days may be largely compensating, it is thought that the monthly record is fairly good.

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

May 2, 1916: Gage height, 4.15 feet; discharge, 949 second-feet.

Monthly discharge of Sebasticook River at Pittsfield, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 320 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	352	50	235	0.734	0.85
November	668	193	379	1.18	1.32
December	1,470	230	492	1.54	1.78
January	1,250	193	526	1.64	1.89
February	395	193	322	1.01	1.09
March	338	158	337	1.05	1.21
April	2,860	1,200	2,070	6.47	7.22
May	2,080	97	656	2.05	2.36
June	938	438	677	2.12	2.36
July	1,040	270	513	1.60	1.84
August	438	193	312	.975	1.12
September	352	158	268	.838	.94
The year	2,860	50	564	1.76	23.97

ANDROSCOGGIN RIVER BASIN.

ANDROSCOGGIN RIVER AT ERROL DAM, N. H.

LOCATION.—At Errol dam, 1 mile above Errol, Coos County.

DRAINAGE AREA.—1,095 square miles.

RECORDS AVAILABLE.—January 1, 1905, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Movable rod gage; readings taken daily from sill of deep gate No. 6; elevation of zero of gage or sill of gate, 1,231.3 feet above mean sea level.

DISCHARGE.—Computed from discharge through 14 gates in the dam by means of coefficients determined from a few discharge measurements.[1]

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

REGULATION.—Errol dam regulates the storage of Umbagog Lake, the lower of the Rangeley series of lakes, comprising the principal storage of Androscoggin River and amounting to nearly 20 billion cubic feet, and also a recently developed storage site on Magalloway River created by the Aziscohos Dam, which amounts to about 9.6 billion cubic feet, thus making the total storage about 29.6 billion cubic feet. Errol dam is about 5 miles below outlet of Umbagog Lake and about 3.5 miles below mouth of Magalloway River, thus making this stream one of the feeders of Umbagog Lake. Results not corrected for storage.

COOPERATION.—Records obtained and computations of daily discharge made under direction of Walter H. Sawyer, agent for Union Water Power Co., Lewiston, Me.

Daily discharge, in second-feet, of Androscoggin River at Errol dam, N. H., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,510	1,610	1,640	1,680	1,050	1,740	956	2,030	3,460	2,760	1,790	1,740
2	1,480	1,580	1,660	1,580	1,050	1,680	1,020	2,060	4,870	2,450	1,880	1,710
3	1,450	1,520	1,670	1,580	1,130	1,640	1,080	2,080	3,900	2,440	1,870	1,670
4	1,470	1,470	1,670	1,570	1,310	1,640	1,100	2,090	3,420	2,920	1,880	1,820
5	1,480	1,480	1,740	1,500	1,290	1,660	1,140	2,110	3,500	3,050	1,920	1,860
6	1,440	1,620	1,800	1,260	1,300	1,660	1,160	2,110	4,240	3,050	2,000	1,830
7	1,420	1,680	1,800	1,500	1,410	1,650	1,160	2,110	5,630	2,990	1,970	1,760
8	1,400	1,670	1,790	1,630	1,540	1,700	1,160	2,050	5,820	2,500	1,700	1,670
9	1,380	1,640	1,790	1,630	1,620	1,710	1,160	1,730	5,880	1,900	1,370	1,530
10	1,410	1,600	1,790	1,550	1,670	1,680	1,260	1,590	5,930	1,810	1,420	1,590
11	1,790	1,560	1,870	1,460	1,670	1,680	1,280	1,580	5,870	1,690	1,580	1,780
12	1,600	1,620	1,850	1,460	1,800	1,690	1,280	1,580	5,970	1,500	1,940	1,880
13	1,550	1,620	1,810	1,460	1,700	1,680	1,170	1,610	6,340	1,250	1,940	1,900
14	1,570	1,640	1,780	1,470	1,650	1,680	1,290	1,580	6,230	1,440	1,870	1,940
15	1,570	1,600	1,810	1,500	1,630	1,660	1,530	1,570	5,350	1,550	1,870	1,660
16	1.600	1,570	1,760	1,590	1,630	1,680	1,410	1,560	4,060	1,630	1,860	1,020
17	1,570	1,490	1,730	1,520	1,630	1,700	1,320	1,540	3,070	1,640	1,830	1,170
18	1,530	1,530	1,700	1,560	1,630	1,740	1,370	2,470	2,840	1,680	1,810	1,610
19	1,610	1,610	1,680	1,640	1,630	1,770	1,420	3,130	2,880	1,680	1,790	2,020
20	1,700	1,650	1,630	1,670	1,630	1,820	1,480	3,170	3,920	1,690	1,770	2,100
21	1,640	1,650	1,620	1,650	1,630	1,790	1,510	3,130	5,390	1,710	1,760	2,060
22	1,590	1,660	1,640	1,690	1,630	1,810	1,550	3,110	5,880	1,710	1,720	1,970
23	1,570	1,680	1,710	1,460	1,630	1,810	1,570	2,820	5,090	1,710	1,700	1,930
24	1,630	1,660	1,730	1,490	1,630	1,790	1,680	2,150	4,160	1,710	1,690	1,900
25	1,660	1,590	1,760	1,520	1,630	1,790	1,810	2,050	3,550	1,720	1,670	1,900
26	1,680	1,650	1,380	1,510	1,310	1,790	1,870	2,040	3,260	1,730	1,650	1,880
27	1,630	1,680	1,080	1,450	1,210	1,770	1,940	2,070	3,260	1,720	1,620	1,930
28	1,630	1,690	1,200	1,110	1,430	1,220	1,980	2,090	3,140	1,710	1,600	1,960
29	1,640	1,690	1,280	1,040	1,590	855	2,000	2,130	2,530	1,680	1,580	1,960
30	1,670	1,620	1,420	1,190	.....	823	2,010	2,420	2,740	1,640	1,660	1,660
31	1,660	.....	1,590	1,080	.....	894	.....	2,600	.....	1,640	1,770	.....

[1] See U. S. Geol. Survey Water-Supply Paper 321, p. 61.

Monthly discharge of Androscoggin River at Errol dam, N. H., for the year ending Sept. 30, 1916.

[Drainage area, 1,095 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,790	1,380	1,570	1.43	1.65
November	1,690	1,470	1,610	1.47	1.64
December	1,870	1,080	1,660	1.52	1.75
January	1,690	1,040	1,480	1.35	1.56
February	1,800	1,050	1,500	1.37	1.48
March	1,820	823	1,620	1.48	1.71
April	2,010	956	1,420	1.30	1.45
May	3,170	1,540	2,140	1.95	2.25
June	6,340	2,530	4,410	4.03	4.50
July	3,050	1,250	1,940	1.77	2.04
August	2,000	1,370	1,760	1.61	1.86
September	2,100	1,020	1,780	1.63	1.82
The year	6,340	823	1,910	1.74	23.71

NOTE.—The monthly discharge in second-feet per square mile and the run-off in depth in inches do not represent the natural flow from the basin because of artificial storage.

ANDROSCOGGIN RIVER AT BERLIN, N. H.

LOCATION.—At the upper or sawmill dam of the Berlin Mills Co., at Berlin, Coos County.

DRAINAGE AREA.—1,350 square miles.

RECORDS AVAILABLE.—October 1, 1913, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGES.—Fixed gages are maintained in the river above the forebay racks and in the tailrace immediately below the outlet of the wheels; these gages are referred to the same datum, and the differences in the readings give the head acting on the wheels; a gage is also attached to each wheel gate, from which the wheel-gate opening can be ascertained.

DETERMINATION OF DISCHARGE.—Discharge computed from curves prepared from Holyoke tests of the wheel runners, using the head and gate openings as ascertained from the gages. Quantity of water wasted over the dam is computed by the Francis formula for discharge over weirs.

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

REGULATION.—Under an agreement between the power users on Androscoggin River, the flow at Berlin, N. H., is maintained at a minimum of 1,550 second-feet and at such a point above 1,550 second-feet as is consistent with the constant maintenance of that quantity. Final regulation of the river is made at Pontocook dam, N. H., above which is a pond containing about a day's supply; the primary regulation is made at Errol, N. H., about 30 miles above Berlin.

COOPERATION.—Gages are under the direction of John H. Wilson, of the Berlin Mills Co., and discharge record is furnished for publication by Walter H. Sawyer, agent for Union Water Power Co., Lewiston, Maine.

Daily discharge, in second-feet, of Androscoggin River at Berlin, N. H., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,750	1,760	1,780	1,870	1,940	1,980	2,600	3,800	4,550	4,400	1,970	2,030
2	1,750	1,760	1,750	1,910	1,930	1,970	2,750	3,950	5,000	3,800	1,940	2,090
3	1,740	1,780	1,780	1,920	1,850	1,930	2,900	4,200	5,000	4,400	1,970	2,030
4	1,750	1,760	1,780	1,890	1,800	1,850	2,750	4,000	4,900	5,500	2,000	2,030
5	1,750	1,740	1,780	1,920	1,800	1,840	2,450	3,950	5,400	5,500	2,000	2,030
6	1,760	1,730	1,780	1,900	1,800	1,820	2,200	3,650	6,850	4,700	2,000	2,030
7	1,740	1,740	1,780	1,780	1,730	1,780	2,050	3,500	7,400	4,100	2,030	2,010
8	1,780	1,750	1,780	1,850	1,720	1,750	1,950	3,400	7,300	5,200	2,030	2,030
9	1,760	1,750	1,780	1,850	1,720	1,780	1,850	3,150	7,650	4,900	3,000	2,230
10	1,740	1,740	1,770	1,930	1,730	1,780	1,750	2,950	8,200	3,300	4,200	2,200
11	1,740	1,710	1,740	1,930	1,730	1,760	1,850	2,750	9,500	2,650	3,500	2,100
12	1,750	1,710	1,780	1,840	1,740	1,760	1,970	2,850	9,500	2,450	3,000	2,040
13	1,750	1,720	1,850	1,790	1,720	1,750	2,050	2,600	9,200	2,250	3,000	2,030
14	1,750	1,730	1,910	1,780	1,710	1,760	2,350	2,500	8,550	2,000	3,000	2,000
15	1,750	1,750	1,930	1,750	1,720	1,760	2,350	2,500	8,000	1,940	2,800	2,130
16	1,740	1,750	1,930	1,760	1,740	1,760	2,700	2,500	7,000	2,000	2,500	2,400
17	1,740	1,720	1,910	1,760	1,770	1,760	3,100	3,750	6,000	2,150	2,500	2,000
18	1,740	1,730	1,960	1,770	1,740	1,770	3,900	7,300	6,200	2,160	2,450	1,870
19	1,680	1,720	1,940	1,760	1,790	1,760	4,500	7,000	7,900	2,150	2,450	1,900
20	1,700	1,880	1,890	1,770	1,790	1,770	3,700	6,200	7,000	2,150	2,450	1,930
21	1,740	1,890	1,790	1,780	1,780	1,770	3,500	4,800	7,500	2,150	2,300	1,880
22	1,750	1,770	1,760	1,780	1,760	1,760	4,000	4,300	7,850	2,150	2,100	1,970
23	1,740	1,810	1,780	1,780	1,830	1,760	4,500	4,000	7,500	2,300	2,100	1,950
24	1,750	1,800	1,780	1,770	1,810	1,760	6,500	3,600	6,400	2,400	2,130	1,950
25	1,740	1,810	1,800	1,770	1,840	1,760	5,400	3,250	5,700	2,400	2,080	1,950
26	1,750	1,780	1,980	1,780	1,920	1,760	5,000	3,250	5,200	2,330	2,000	1,920
27	1,760	1,760	2,300	1,780	1,950	1,770	4,300	3,200	4,600	2,300	2,000	1,890
28	1,760	1,750	2,250	2,000	1,930	1,850	3,950	3,200	5,150	2,250	1,930	1,870
29	1,760	1,760	2,020	1,880	1,950	2,100	3,850	3,100	4,600	2,130	1,870	2,080
30	1,770	1,900	1,820	1,950	.....	2,430	3,700	3,150	4,600	2,050	1,970	2,650
31	1,760	.....	1,780	1,960	.....	2,500	.....	3,950	.....	2,020	2,000	.....

Monthly discharge of Androscoggin River at Berlin, N. H., for the year ending Sept. 30, 1916.

[Drainage area, 1,350 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,780	1,680	1,750	1.29	1.49
November	1,900	1,710	1,760	1.30	1.45
December	2,300	1,740	1,860	1.38	1.59
January	2,000	1,750	1,840	1.36	1.57
February	1,950	1,710	1,800	1.33	1.43
March	2,500	1,750	1,850	1.37	1.58
April	6,500	1,750	3,210	2.38	2.66
May	7,300	2,500	3,750	2.78	3.20
June	9,500	4,550	6,670	4.94	5.51
July	5,500	1,940	2,970	2.20	2.54
August	4,200	1,870	2,360	1.75	2.02
September	2,650	1,870	2,040	1.51	1.68
The year	9,500	1,680	2,660	1.97	26.72

NOTE.—The monthly discharge in second-feet per square mile and the run-off in depth in inches do not represent the natural flow from the basin because of artificial storage. The yearly discharge and run-off doubtless represent more nearly the natural flow, for probably little stored water is held over from year to year.

ANDROSCOGGIN RIVER AT RUMFORD FALLS, MAINE.

LOCATION.—At dam of Rumford Falls Power Co., at Rumford, Oxford County.

DRAINAGE AREA.—2,090 square miles.

RECORDS AVAILABLE.—May 18, 1892, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGES.—One in pond above dam; another in tailrace of power house.

DISCHARGE.—Computed from discharge over the dam by use of the Francis weir formula with modified coefficient, and the quantities passing through the various wheels of the power house, which have been carefully rated.

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

REGULATION.—Storage in Rangeley system of lakes at headwaters of Androscoggin River aggregates about 29.6 billion cubic feet. The stored water is regulated in the interests of the water-power users below. Results not corrected for storage.

COOPERATION.—Records obtained and computations made by Charles A. Mixer, engineer, Rumford Falls Power Co.

Daily discharge, in second-feet, of Androscoggin River at Rumford Falls, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,000	2,060	2,950	2,550	3,430	3,110	8,050	6,990	5,380	4,630	2,630	2,350
2	1,970	2,060	2,720	2,230	3,730	2,990	8,900	7,230	5,860	3,880	2,490	2,430
3	1,520	2,100	2,430	2,510	3,060	2,870	7,380	7,090	5,980	5,750	2,430	1,940
4	2,010	2,020	2,350	2,500	2,830	2,830	6,160	6,530	5,900	6,880	2,470	1,880
5	2,100	2,050	1,860	2,620	2,580	2,420	4,840	6,590	6,980	7,850	2,450	2,420
6	2,270	2,060	2,390	2,560	2,110	2,440	4,610	5,730	7,170	6,380	2,490	2,440
7	2,280	1,380	2,160	2,660	2,500	2,480	4,220	5,770	8,430	5,000	2,570	2,380
8	2,270	1,930	2,160	2,310	2,470	2,390	3,970	5,630	8,910	5,250	2,660	2,370
9	2,390	2,050	2,110	2,150	2,220	2,400	3,230	5,600	13,200	5,410	6,260	2,400
10	1,570	2,020	1,580	2,310	2,280	2,390	3,480	4,630	15,900	4,390	8,130	1,970
11	2,030	1,990	1,500	2,490	2,330	2,380	3,560	4,280	15,800	3,690	5,610	2,210
12	2,130	1,990	1,420	2,410	2,390	2,280	4,010	4,540	13,500	3,240	3,980	2,280
13	2,060	2,030	1,930	2,410	2,000	2,310	4,210	3,800	12,800	3,130	2,950	2,260
14	2,010	1,420	1,830	2,210	2,100	2,350	4,800	3,330	10,900	3,020	3,440	2,200
15	2,040	2,100	1,910	2,100	2,230	2,370	4,210	3,090	9,370	2,980	3,210	2,890
16	2,040	2,120	1,840	2,100	2,180	2,320	4,200	3,460	8,100	2,040	2,980	6,020
17	1,630	2,110	2,050	2,190	2,340	2,220	6,000	8,930	7,940	2,770	2,870	3,610
18	1,900	1,920	2,330	2,110	2,240	2,200	7,910	19,500	10,500	2,820	2,780	2,760
19	1,960	2,030	2,060	2,060	2,270	1,870	9,150	11,300	12,500	2,820	2,710	2,610
20	1,870	3,260	2,640	2,030	2,160	2,180	6,980	8,290	9,910	2,750	1,970	2,530
21	1,880	2,670	2,490	2,100	2,070	2,240	6,630	6,470	8,300	2,790	2,560	2,500
22	1,960	2,810	2,260	2,310	2,030	2,200	7,110	6,440	7,830	2,930	2,560	2,450
23	1,910	2,570	2,130	2,140	2,060	2,200	11,100	5,820	7,610	2,450	2,510	2,520
24	1,310	2,460	2,150	2,570	2,040	2,200	14,900	5,320	6,920	3,500	2,950	2,310
25	1,880	2,310	1,500	2,460	2,260	2,200	10,300	4,730	5,570	3,330	2,750	2,530
26	1,930	2,190	3,650	2,430	4,600	1,980	9,310	4,440	5,880	3,020	2,570	2,430
27	1,930	2,140	5,670	2,650	7,480	2,660	8,210	4,010	5,380	2,830	1,710	2,380
28	1,980	1,730	4,440	3,220	4,480	3,340	7,210	4,100	7,220	2,860	2,550	2,400
29	2,000	2,410	3,550	4,240	3,400	4,070	6,940	3,750	6,270	2,680	2,620	2,360
30	2,060	3,050	2,790	2,840	.....	5,730	6,410	4,290	5,230	2,090	2,420	2,970
31	1,450	.....	2,600	3,030	.....	7,720	.....	6,230	.....	2,690	2,330	.....

Monthly discharge of Androscoggin River at Rumford Falls, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 2,090 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,390	1,310	1,950	0.93	1.07
November	3,260	1,380	2,170	1.04	1.16
December	5,670	1,420	2,430	1.16	1.34
January	4,240	2,030	2,470	1.18	1.36
February	7,480	2,000	2,750	1.32	1.42
March	7,720	1,870	2,750	1.32	1.52
April	14,900	3,230	6,600	3.16	3.53
May	19,500	3,090	6,060	2.90	3.34
June	15,900	5,230	8,710	4.17	4.65
July	7,850	2,040	3,740	1.79	2.06
August	8,130	1,710	3,050	1.46	1.68
September	6,020	1,940	2,560	1.22	1.36
The year	19,500	1,310	3,770	1.80	24.49

NOTE.—The monthly discharge in second-feet per square mile and the run-off in depth in inches do not represent the natural flow from the basin because of artificial storage.

MAGALLOWAY RIVER AT AZISCOHOS DAM, MAINE.

LOCATION.—At the Aziscohos dam, Oxford County, about 15 miles above the mouth.

DRAINAGE AREA.—215 square miles.

RECORDS AVAILABLE.—January 1, 1912, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Vertical staff in two sections, the lower attached to one of the concrete buttresses of the dam and the upper on the concrete gate tower.

DETERMINATION OF DISCHARGE.—Discharge determined from readings of gate openings. Gates have been rated by current-meter measurements at a station about a mile below the dam.

REGULATION.—The storage of about 9,593,000,000 cubic feet is completely regulated, and the discharge corresponds to requirements of water users below. The operation of the gates is planned to maintain as nearly as possible a constant flow at Berlin, N. H. Results not corrected for storage.

COOPERATION.—Discharge computed and furnished for publication by Walter H. Sawyer, agent Union Water Power Co., Lewiston, Maine.

Monthly discharge of Magalloway River at Aziscohos dam, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 215 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	898	76	147	0.684	0.78
November	148	84	97	.452	.50
December	88	86	86	.400	.46
January	935	88	213	.991	1.14
February	1,480	77	798	3.71	4.00
March	79	78	79	.367	.42
April	89	79	83	.386	.44
May	1,340	89	672	3.13	3.61
June	1,960	110	1,120	5.21	5.81
July	1,370	130	610	2.84	3.27
August	1,820	99	414	1.92	2.21
September	1,430	98	248	1.15	1.28
The year	1,960	76	378	1.76	23.92

NOTE.—The monthly discharge in second-feet per square mile and the run-off depth in inches do not represent the natural flow from the basin because of artificial storage. The yearly discharge and run-off doubtless represent more nearly the natural flow, for probably little stored water is held over from year to year.

LITTLE ANDROSCOGGIN RIVER NEAR SOUTH PARIS, MAINE.

LOCATION.—At left end of an old dam at Bisco Falls, 200 feet below highway bridge and 5 miles above South Paris, Oxford County.

DRAINAGE AREA.—75 square miles.

RECORDS AVAILABLE.—September 14, 1913, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGE.—Chain on left bank installed April 16, 1914; original gage, a vertical staff, was destroyed by ice March 2, 1914; from March 18 to April 9, 1914, a chain gage on a footbridge was used; all gages referred to same datum and at practically same place. Gage read by G. A. Jackson.

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

CHANNEL AND CONTROL.—At low and medium stages water flows through opening at left of old stone dam; opening was enlarged by high water of April 9, 1914; water flows over dam at gage height 5.30 feet.

EXTREMES OF STAGE.—Maximum stage recorded during year, 8.75 feet at 6 a. m. May 18 (discharge, 2,420 second-feet); minimum stage recorded during year, 1.4 feet at 7 p. m. August 20 (discharge, 16 second-feet); (a somewhat lower stage probably occurred on August 21–22, but no record was obtained).

ICE.—Control remains open throughout the winter; stage-discharge relation not affected by ice.

REGULATION.—Storage at Snow's Falls, 1½ miles above the station, and at West Paris, 4 miles above, has some effect on regimen of stream.

ACCURACY.—Stage-discharge relation changed at the time of high water April 9, 1914; otherwise practically permanent. Rating curve well defined below 700 second-feet and fairly well defined between 700 and 1,800 second-feet. Gage read to tenths once daily. Daily discharge ascertained by applying rating table to daily gage heights. Results good except for times of sudden changes in stage, when the number of gage readings is insufficient to determine accurately the mean daily flow.

Discharge measurements of Little Androscoggin River near South Paris, Maine, during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 14	G. C. Danforth	1.84	37.1	May 18	G. C. Danforth	7.65	1,320
Apr. 25	do	6.58	586	June 16	E. W. Conners	4.28	270
27	do	5.78	421	20	do	5.48	345
May 1	do	5.36	365	Aug. 23	G. C. Danforth	1.50	23.1
8	do	3.12	140	28	do	3.18	147
18	E. W. Conners	8.03	1,700	Sept. 6	do	1.82	33.9

Daily discharge, in second-feet, of Little Androscoggin River near South Paris, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	40	68	108	124	159	189	990	366	219	124	40	54
2	40	47	100	108	169	159	990	292	199	84	34	54
3	68	40	68	124	132	140	865	219	159	502	29	47
4	47	47	54	108	124	124	615	219	169	325	24	61
5	54	61	40	92	116	108	426	209	199	502	20	32
6	61	54	54	108	108	92	442	169	169	325	24	47
7	54	47	47	100	108	108	458	140	149	199	24	47
8	92	61	47	92	92	108	458	132	194	199	20	29
9	84	54	40	68	92	100	384	124	475	159	239	308
10	76	47	47	61	108	92	360	132	1,040	124	314	159
11	68	29	34	54	108	100	325	124	865	159	124	92
12	68	47	47	54	76	76	397	116	558	149	108	76
13	47	61	34	68	47	84	458	100	475	149	84	47
14	40	47	34	68	68	84	493	76	397	124	108	47
15	47	68	40	68	68	76	458	92	303	92	76	47
16	40	84	29	61	61	68	411	108	244	61	47	484
17	29	76	29	54	54	68	512	615	426	76	47	249
18	34	61	40	47	47	61	558	1,870	675	68	34	159
19	40	54	40	54	61	61	990	585	434	61	24	179
20	34	169	47	54	54	61	493	442	348	61	16	124
21	29	149	47	54	47	68	458	360	303	100	.....	108
22	34	108	40	68	47	54	372	292	239	108	.....	92
23	29	100	47	92	54	61	632	259	179	108	.....	140
24	29	76	47	92	47	61	1,320	239	140	84	360	320
25	24	54	40	84	47	68	558	219	124	68	132	149
26	34	47	219	92	219	100	458	199	124	76	108	140
27	68	47	493	108	524	199	384	149	159	54	124	128
28	54	40	270	179	325	325	360	132	209	61	132	116
29	61	47	199	159	219	493	512	124	159	54	132	108
30	124	124	140	132	.....	760	512	348	159	47	108	116
31	108	.....	132	132	.....	945	.....	397	.....	47	54	.....

NOTE.—No record for Aug. 21–23; discharge probably decreasing Aug. 21–22, and rising suddenly on Aug. 23, averaging about 80 second-feet for the 3-day period.

99282°—18—WSP 431——4

Monthly discharge of Little Androscoggin River near South Paris, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 75 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	124	29	53	0.706	0.81
November	169	29	67	.893	1.00
December	493	29	86	1.15	1.33
January	179	47	89	1.19	1.37
February	524	47	117	1.56	1.68
March	945	54	164	2.19	2.52
April	1,320	325	555	7.40	8.26
May	1,870	76	285	3.80	4.38
June	1,040	124	316	4.21	4.70
July	502	47	140	1.87	2.16
August	360	.....	91	1.21	1.40
September	484	29	125	1.67	1.86
The year	1,870	.....	174	2.32	31.47

PRESUMPSCOT RIVER BASIN.

PRESUMPSCOT RIVER AT OUTLET OF SEBAGO LAKE, MAINE.

LOCATION.—At outlet dam at Sebago Lake and the hydroelectric plant at Eel Weir Falls, Cumberland County, 1 mile below lake outlet.

DRAINAGE AREA.—436 square miles.

RECORDS AVAILABLE.—January 1, 1887, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine. Results of a recomputation of all data from 1887 to 1911 are published in the second annual report of Maine State Water Storage Commission.

GAGES.—On bulkhead of gatehouse at outlet dam and in forebay and tailrace of power plant.

DISCHARGE.—Prior to March, 1904, discharge was determined from records of opening of gates in dam; since March, 1904, flow from lake has been recorded by three Allen meters, one on each of three pairs of 30-inch Hercules wheels; wheels and recording meters checked by current-meter measurements, brake tests of wheels, and electrical readings of the generator output. Water wasted at regulating gates is measured from records of gate openings and coefficients determined from current-meter measurements.

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

REGULATION.—Sebago Lake (area, 46 square miles) is under complete regulation. Results not corrected for storage.

COOPERATION.—Entire record furnished by S. D. Warren Co.

Daily discharge in second-feet, of Presumpscot River at outlet of Sebago Lake, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	643	562	687	577	590	615	445	555	674	872	798	782
2	520	663	628	178	624	672	93	597	795	757	770	620
3	178	680	648	644	630	653	537	598	802	740	783	162
4	653	550	585	660	640	592	525	588	827	720	708	383
5	622	637	222	645	570	232	638	600	937	1,250	695	755
6	553	535	647	670	218	628	577	632	925	1,520	257	785
7	650	208	702	652	648	638	637	138	965	1,480	802	837
8	583	637	697	619	589	657	543	645	1,270	944	860	824
9	581	681	682	210	664	622	153	632	1,620	914	876	700
10	228	587	627	602	612	630	654	684	1,920	938	874	293
11	632	585	667	622	650	670	552	632	1,980	952	882	767
12	558	648	218	660	635	200	577	664	2,000	948	874	774
13	482	628	612	658	248	607	472	638	2,040	950	252	810
14	637	232	642	672	597	632	550	230	2,080	928	872	782
15	640	727	635	657	637	683	530	658	2,070	910	872	803
16	563	691	623	183	654	603	152	635	2,110	283	815	645
17	232	612	642	660	627	674	638	382	2,180	705	867	323
18	635	632	563	594	635	590	518	97	2,200	722	870	876
19	625	605	147	664	619	232	432	434	2,200	782	867	874
20	532	367	612	690	225	610	529	427	2,180	770	322	764
21	637	230	670	619	640	625	577	577	2,280	774	835	824
22	683	662	625	610	614	638	542	510	2,440	572	847	890
23	513	605	638	227	692	630	18	642	2,440	442	840	862
24	225	607	485	637	662	650	307	630	2,360	640	815	275
25	680	472	597	640	602	578	453	627	1,790	752	847	890
26	587	715	417	587	212	187	515	580	1,450	800	820	888
27	670	272	413	572	118	544	529	635	1,320	724	260	862
28	598	280	517	577	504	507	502	212	1,000	772	850	892
29	645	808	613	612	580	447	432	612	828	733	840	885
30	597	602	643	213	.....	467	168	585	878	305	824	892
31	162	.....	678	680	.....	368	.....	564	.....	767	825	.....

Monthly discharge of Presumpscot River at outlet of Sebago Lake, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 436 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	683	162	540	1.24	1.43
November	727	208	557	1.28	1.43
December	702	147	574	1.32	1.52
January	690	178	564	1.29	1.49
February	692	118	550	1.26	1.36
March	683	187	551	1.26	1.45
April	654	18	460	1.06	1.18
May	684	97	537	1.23	1.42
June	2,440	674	1,620	3.72	4.15
July	1,520	283	818	1.88	2.17
August	882	252	758	1.74	2.01
September	892	162	724	1.66	1.85
The year	2,440	18	687	1.58	21.46

NOTE.—The monthly discharge in second-feet per square mile and the run-off in depth in inches do not represent the natural flow from the basin because of artificial storage. The yearly discharge and run-off doubtless represent more nearly the natural flow, for probably little stored water is held over from year to year.

SACO RIVER BASIN.

SACO RIVER AT CORNISH, MAINE.

LOCATION.—At highway bridge at Cornish, York County, half a mile below mouth of Ossipee River.

DRAINAGE AREA.—1,300 square miles (authority, Public Utilities Commission of Maine).

RECORDS AVAILABLE.—June 4, 1916, to September 30, 1916.

GAGE.—Chain attached to bridge; read by S. J. Elliott.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Channel covered with sand and boulders; broken by one pier at bridge.

ICE.—Ice forms to considerable thickness; stage-discharge relation probably affected.

REGULATION.—Power developments at Swan Falls and Kezar Falls probably have little effect on the flow.

ACCURACY.—Rating curve not well defined; determinations of discharge withheld from publication. Gage read to half-tenths twice daily.

Discharge measurements of Saco River at Cornish, Maine, during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 25	Walter Flynt	1.77	1,630	July 15	E. W. Conners	3.56	4,160
May 11	do	4.30	5,290	Aug. 15	do	2.52	2,200
19	do	5.70	9,140				

Daily gage height, in feet, of Saco River at Cornish, Maine, for the year ending Sept. 30, 1916.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	.....	4.0	2.3	1.6	16	6.35	3.3	2.35	2.25
2	.....	3.8	2.2	1.6	17	6.3	3.2	2.25	2.48
3	.....	4.0	2.1	1.5	18	6.5	3.0	2.15	2.55
4	3.9	4.2	2.0	1.5	19	6.4	2.75	2.02	2.4
5	4.05	4.7	1.95	1.45	20	6.4	2.65	1.92	2.32
6	4.2	4.8	1.9	1.4	21	6.4	2.6	1.85	2.22
7	4.1	4.8	1.9	1.48	22	6.2	2.6	1.85	2.12
8	4.1	4.8	1.85	1.5	23	5.9	2.65	1.62	2.05
9	4.2	4.65	2.1	1.48	24	5.5	2.6	1.55	2.25
10	5.1	4.4	2.4	1.45	25	5.3	2.6	1.6	2.2
11	5.65	4.2	2.7	1.38	26	5.2	2.55	1.65	2.2
12	6.0	3.95	2.8	1.4	27	4.95	2.5	1.65	2.12
13	6.5	3.9	2.7	1.38	28	4.7	2.5	1.65	2.1
14	6.75	3.75	2.6	1.3	29	4.5	2.5	1.7	1.92
15	6.6	3.6	2.5	1.38	30	4.2	2.5	1.65	1.9
					31	.....	2.4	1.65	.....

SACO RIVER AT WEST BUXTON, MAINE.

LOCATION.—At hydroelectric plant of Portland Electric Co. at West Buxton, York County.

DRAINAGE AREA.—1,550 square miles.

RECORDS AVAILABLE.—October 19, 1907, to September 30, 1916. Data also in annual reports of Public Utilities Commission of Maine.

GAGES.—One in pond above dam; another in tailrace of power house.

CHANNEL AND CONTROL.—Crest of concrete dam about 300 feet long.

DISCHARGE.—Flow over dam and through rated wheels of power plant determined by means of hourly gage readings.

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

REGULATION.—Dams on numerous but comparatively small lakes in basin above station; storage regulation probably affects regimen of stream but not to extent that obtains in other basins in Maine where natural storage facilities are better and more fully developed.

COOPERATION.—Records furnished by Cumberland County Power & Light Co., Portland, Maine.

Daily discharge, in second-feet, of Saco River at West Buxton, Maine, for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,630	1,690	2,080	2,990	3,110	4,430	9,030	11,400	5,540	5,530	2,680	1,640
2	1,600	1,840	2,060	2,720	3,190	4,100	9,940	10,100	5,460	5,070	2,450	1,420
3	1,210	1,650	1,920	3,090	3,180	3,930	10,300	9,450	5,230	5,480	2,100	1,400
4	1,670	1,760	1,800	2,760	3,200	3,760	9,960	9,120	5,090	6,820	2,120	1,220
5	1,760	1,840	1,440	2,720	3,170	3,370	9,820	8,730	5,700	7,960	1,800	1,750
6	1,610	1,600	1,960	2,680	2,830	3,550	9,930	8,420	5,610	7,980	1,430	1,390
7	1,660	1,180	1,900	2,590	3,040	3,740	9,670	7,830	5,510	7,700	2,080	1,230
8	1,620	1,660	1,840	2,550	2,820	4,040	9,250	7,610	5,260	7,420	1,610	1,150
9	1,620	1,700	1,800	2,250	2,820	3,700	8,640	7,390	5,820	7,060	1,850	1,070
10	1,420	1,820	1,660	3,040	2,800	3,740	8,600	7,000	7,930	6,760	1,930	1,060
11	1,960	1,700	1,440	2,240	2,770	3,460	8,440	6,610	9,120	6,240	2,550	1,420
12	1,800	1,630	767	2,280	2,730	3,080	8,310	6,150	10,400	5,880	2,750	1,510
13	1,750	1,600	1,160	2,410	2,350	3,380	7,880	5,720	11,500	5,380	2,540	1,170
14	1,690	1,070	1,150	2,240	2,460	3,100	7,410	5,030	12,000	5,130	2,730	1,140
15	1,690	1,500	1,230	2,170	2,060	3,110	7,470	5,170	11,600	4,670	2,530	1,300
16	1,590	1,490	1,200	1,790	2,140	2,990	7,450	4,840	10,900	4,160	2,300	1,420
17	1,210	1,480	1,230	2,390	2,020	2,860	7,680	6,980	10,800	4,190	2,220	2,280
18	1,580	1,470	1,440	2,180	1,980	2,730	7,840	12,400	11,400	3,600	2,070	2,850
19	1,660	1,780	1,500	2,000	1,780	2,410	8,440	11,500	11,600	3,200	1,860	2,590
20	1,720	2,140	2,240	1,920	1,480	2,870	8,330	11,300	11,600	2,960	1,480	2,400
21	1,450	1,740	2,200	1,770	2,100	2,720	8,140	11,100	11,100	3,010	1,990	2,110
22	1,270	2,580	2,040	1,800	1,710	2,740	7,760	11,000	10,500	3,300	1,840	2,030
23	1,460	2,300	1,960	1,610	2,120	2,440	8,840	10,200	9,970	3,130	1,590	2,060
24	1,110	2,200	1,980	2,200	1,730	2,540	12,300	9,390	9,080	3,690	1,740	1,770
25	1,340	1,860	1,670	2,140	1,900	2,350	13,900	8,820	8,110	3,360	1,460	2,410
26	1,390	2,280	2,160	2,140	3,520	2,240	13,500	8,070	8,530	3,210	1,530	2,090
27	1,300	2,240	3,180	2,440	5,590	2,920	14,100	7,400	7,800	3,020	1,410	2,100
28	1,570	1,560	3,150	2,630	5,310	3,230	13,600	6,500	7,170	2,950	1,950	1,990
29	1,720	2,100	3,200	2,790	4,870	4,130	13,100	6,610	6,660	2,980	1,550	1,970
30	1,640	2,110	3,000	2,440	.....	5,720	12,100	5,940	6,020	2,510	1,630	1,880
31	1,410	.....	3,020	3,010	.....	7,700	.....	5,900	.....	3,010	1,690	.....

Monthly discharge of Saco River at West Buxton, Maine, for the year ending Sept. 30, 1916.

[Drainage area, 1,550 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,960	1,110	1,550	1.00	1.15
November	2,580	1,070	1,780	1.15	1.28
December	3,200	767	1,910	1.23	1.42
January	3,090	1,610	2,380	1.54	1.78
February	5,590	1,710	2,780	1.79	1.93
March	7,700	2,240	3,460	2.23	2.57
April	14,100	7,410	9,690	6.25	6.97
May	12,400	4,840	8,180	5.28	6.09
June	12,000	5,090	8,440	5.45	6.08
July	7,980	2,510	4,750	3.06	3.53
August	2,750	1,410	1,980	1.28	1.48
September	2,850	1,060	1,730	1.12	1.25
The year	14,100	767	4,060	2.62	35.53

OSSIPEE RIVER AT CORNISH, MAINE.

LOCATION.—At highway bridge in Cornish, York County, 1¼ miles above confluence with Saco River.

DRAINAGE AREA.—448 square miles (Authority: Public Utilities Commission of Maine).

RECORDS AVAILABLE.—July 5, 1916, to September 30, 1916.

GAGE.—Chain attached to bridge; read by O. W. Adams.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Channel covered with sand and gravel, possibly somewhat shifting; broken by one pier at bridge.

ICE.—Ice forms to considerable thickness; stage-discharge relation probably affected.

REGULATION.—Flow affected by dams at Kezar Falls and at outlet of Great Ossipee Lake.

ACCURACY.—Rating curve not well defined; determinations of discharge withheld from publication. Gage read to half-tenths once daily, occasionally twice daily.

Discharge measurements of Ossipee River at Cornish, Maine, during the year ending Sept. 30, 1916.

[Made by E. W. Conners.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
July 6	4.30	2,240
Aug. 15	2.08	847

Daily gage height, in feet, of Ossipee River at Cornish, Maine, for the year ending Sept. 30, 1916.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1	.....	2.0	1.22	11	3.2	2.38	1.0	21	1.95	1.6	1.75
2	.....	1.95	1.2	12	2.85	2.35	1.0	22	2.05	1.55	1.6
3	.....	1.85	1.15	13	2.85	2.3	1.05	23	2.2	1.2	1.6
4	.....	1.8	1.15	14	3.0	2.2	1.0	24	2.2	1.1	1.85
5	4.25	1.72	1.05	15	2.9	2.0	1.1	25	2.15	1.1	2.0
6	4.35	1.65	1.1	16	2.75	1.95	2.32	26	2.1	1.1	1.85
7	4.0	1.62	1.15	17	2.4	1.8	2.05	27	2.05	1.15	1.85
8	3.8	1.65	1.1	18	2.25	1.8	2.1	28	.....	1.3	1.85
9	3.6	1.9	1.1	19	2.05	1.7	2.1	29	2.3	1.3	1.75
10	3.4	2.4	1.05	20	1.9	1.68	1.8	30	2.25	1.25	1.55
								31	2.25	1.25	.....

MERRIMACK RIVER BASIN.

MERRIMACK RIVER AT FRANKLIN JUNCTION, N. H.

LOCATION.—At covered wooden bridge of the Boston & Maine Railroad near Franklin Junction, Merrimack County, about 1 mile below the confluence of Pemigewasset and Winnepesaukee rivers.

DRAINAGE AREA.—1,460 square miles.

RECORDS AVAILABLE.—July 8, 1903, to September 30, 1916.

GAGE.—Chain gage fastened to floor of bridge on upstream side over the west channel; read by F. R. Roers. A gage painted on the downstream right-hand side of the center pier is used by the United States Weather Bureau for high-water readings but is considerably in error for low stages.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge.

CHANNEL AND CONTROL.—Composed of coarse gravel and boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 14.4 feet at 7 a. m. May 18 (discharge, 20,800 second-feet); minimum stage recorded, 4.25 feet at 6 p. m. September 6 and 7 a. m. September 13 (discharge, 1,280 second-feet).

ICE.—Stage-discharge relation affected by ice for short periods during the winter months.

REGULATION.—Flow affected by storage in Winnepesaukee, Squam, and New Found lakes, and by the operation of mills above the station.

ACCURACY.—Stage-discharge relation practically permanent except when ice is present. Rating curve fairly well defined below 10,000 second-feet. Stage-discharge relation affected by ice for short periods in January and February. Gage read to half-tenths twice daily, except Sundays and holidays, when no readings are made; accuracy of readings somewhat uncertain. Daily discharge ascertained by applying rating table to mean of twice-a-day readings. Results fair.

COOPERATION.—Gage-height record furnished by the Proprietors of Locks and Canals on Merrimack River, Lowell, Mass.

Discharge measurements of Merrimack River at Franklin Junction, N. H., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Aug. 27	Pierce and Thweatt	5.72	2,960	Apr. 19	Hardin Thweatt	8.32	8,060
Sept. 7	Thweatt and Adams	4.44	1,520	22	do	7.47	6,140
Nov. 23	do	4.98	2,140				

Daily discharge, in second-feet, of Merrimack River at Franklin Junction, N. H., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,440	1,670	2,180	2,600	3,460	3,620	10,100	6,140	4,280	3,940	2,050	1,440
2	1,440	1,670	2,180	2,300	3,460	3,310	10,800	6,140	4,110	4,110	1,920	1,330
3	1,440	1,670	1,920	2,050	3,460	3,010	11,400	6,140	3,620	4,280	1,790	1,330
4	1,440	1,550	1,790	2,050	3,160	2,860	9,920	5,740	4,880	7,820	1,730	1,330
5	1,500	1,550	1,730	1,920	3,160	2,580	6,140	5,540	6,140	6,770	1,670	1,330
6	1,440	1,670	1,670	2,180	3,080	2,310	6,140	4,800	6,140	6,140	1,670	1,330
7	1,790	1,610	1,670	1,920	3,010	2,050	5,740	4,460	5,350	5,160	1,670	1,550
8	2,050	1,550	1,550	1,920	2,580	2,180	5,540	4,110	4,980	4,450	1,550	1,550
9	1,920	1,550	1,550	1,920	2,440	2,180	4,660	3,940	4,980	4,200	1,550	1,330
10	1,800	1,440	1,550	1,920	2,180	2,310	3,780	3,780	8,240	3,940	4,450	1,360
11	1,670	1,550	1,550	1,920	2,050	2,100	4,110	3,780	8,870	3,940	3,310	1,380
12	1,670	1,520	1,500	1,920	2,050	1,880	4,110	3,780	9,500	3,780	2,860	1,330
13	1,670	1,480	1,440	1,920	2,120	1,670	5,740	3,620	9,710	3,620	2,320	1,330
14	1,670	1,450	1,380	2,000	2,180	1,790	5,350	3,240	9,290	3,310	1,790	1,330
15	1,550	1,670	1,330	2,100	2,180	1,670	5,160	2,860	8,660	2,720	1,550	1,330
16	2,180	1,920	1,380	2,000	2,180	1,790	5,350	2,720	6,560	2,580	1,670	1,670
17	2,180	1,670	1,330	1,900	2,050	1,790	5,540	4,980	7,450	2,440	1,670	2,060
18	2,180	1,550	1,670	1,900	1,920	1,670	5,350	20,100	8,340	2,310	1,550	2,440
19	1,920	1,440	2,060	1,800	1,790	1,730	8,030	9,500	9,240	2,180	1,550	2,050
20	1,790	2,580	2,440	1,750	1,800	1,790	7,080	7,400	10,100	2,050	1,550	1,920
21	1,670	3,100	2,180	1,750	1,750	1,790	6,140	6,570	8,870	2,050	1,550	1,670
22	1,550	2,580	2,050	1,850	1,750	1,790	6,140	5,740	8,450	1,920	1,550	1,670
23	1,550	2,180	1,670	1,950	1,750	1,920	9,710	5,540	8,030	2,120	1,550	1,550
24	1,500	1,920	1,550	2,050	1,920	1,920	13,300	4,980	7,820	2,310	1,920	2,000
25	1,440	1,850	1,440	2,050	1,920	1,790	6,560	4,280	7,080	2,180	1,920	2,440
26	1,440	1,920	1,500	2,050	2,720	1,980	7,610	4,280	6,350	2,180	1,920	2,440
27	1,550	1,790	10,100	2,180	10,000	2,180	6,980	3,940	6,140	2,580	1,800	2,180
28	1,920	1,670	6,140	3,460	5,740	3,160	6,140	3,780	6,140	2,860	1,670	2,180
29	1,790	1,550	4,450	4,450	4,280	4,280	6,140	3,620	4,800	2,720	1,550	1,670
30	1,920	2,180	3,460	3,880	.....	6,140	6,140	3,460	4,280	2,450	1,440	1,790
31	1,800	.....	2,860	3,310	.....	9,080	.....	4,280	.....	2,180	1,440	.....

NOTE.—Stage-discharge relation affected by ice Jan. 14-23 and Feb. 20-23; discharge ascertained by comparison with records of Merrimack River at Garvins Falls. Discharge estimated for Sundays and other days when gage was not read.

Monthly discharge of Merrimack River at Franklin Junction, N. H., for the year ending Sept. 30, 1916.

[Drainage area, 1,460 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,180	1,440	1,710	1.17	1.35
November	3,100	1,440	1,780	1.22	1.36
December	10,100	1,330	2,300	1.58	1.82
January	4,450	1,750	2,220	1.52	1.75
February	10,000	1,750	2,830	1.94	2.09
March	9,080	1,670	2,590	1.77	2.04
April	13,300	3,780	6,830	4.68	5.22
May	20,100	2,720	5,270	3.61	4.16
June	10,100	3,620	6,950	4.76	5.31
July	7,820	1,920	3,400	2.33	2.69
August	4,450	1,440	1,880	1.29	1.49
September	2,440	1,330	1,680	1.15	1.28
The year	20,100	1,330	3,280	2.25	30.56

NOTE.—The monthly discharge in second-feet per square mile and the run-off in depth in inches do not represent the natural flow from the basin because of artificial storage. The yearly discharge and run-off doubtless represent more nearly the natural flow, for probably little stored water is held over from year to year.

MERRIMACK RIVER AT LOWELL, MASS.

LOCATION.—At the Boott Mills in Lowell, Middlesex County.

DRAINAGE AREA.—3,979 square miles above Pawtucket Dam. Prior to March 7, 1898, when the Metropolitan Water Board [1] of Boston diverted the flow of South Branch of Nashua River, the area was 4,097 [2] square miles.

RECORDS AVAILABLE.—January 1, 1848, to May 31, 1861; March 1, 1866, to September 30, 1916.

GAGE.—Vertical staff in three sections on right bank. Low-water section attached to rollway wall, upper section to foundation wall of Boott Mills. Gage read once a day at approximately 10.45 a. m.

DETERMINATION OF DISCHARGE.—Rating curves determined from quantity of water flowing through the canals and water wheels, and leaking and wasting over Pawtucket Dam at various stages. Tables show only the flow for the 10 hours during which mills were operating.

CHANNEL AND CONTROL.—Bed of stream smooth and regular; right bank a vertical mill wall over half a mile long; left bank high and rarely overflows even during spring floods. Control probably at Hunts Falls, a short distance below station. Control has been altered at various times by removal of ledge rock, boulders, and other material. During recent years zero flow occurred at gage height of about 38.5 feet, referred to datum of gage owned by the Proprietors of Locks and Canals on Merrimack River.

DIVERSIONS.—Almost the entire flow of South Branch of Nashua River is diverted for water supply of metropolitan district of Boston.

REGULATION.—Practically the entire low-water flow is regulated by dams and mills above station. Tables of discharge show only the 10-hour flow during periods when mills are in operation. In very dry seasons entire flow is stored during nights, Sundays, and holidays.

COOPERATION.—Entire record furnished by the Proprietors of Locks and Canals on Merrimack River, Lowell, Mass., through Arthur T. Safford, engineer. Record changed to climatic year form by engineers of the Geological Survey.

[1] Metropolitan Water Board Fourth Ann. Rept., Jan. 1; 1899., p. 15.

[2] Examination of water supplies: Massachusetts State Board of Health Rept., 1890, pt. 1, p. 442.

Ten-hour discharge, in second-feet, of Merrimack River at Lowell, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5,493	7,452	7,525	8,750	10,925	17,330	29,230	17,400	10,075	9,475	7,925	7,140
2	6,156	5,470	8,050	6,900	10,800	17,645	31,430	15,690	9,900	6,900	7,500	3,160
3	1,268	5,585	7,875	8,450	9,775	12,120	33,950	14,640	8,500	6,852	7,500	3,214
4	6,300	5,539	7,260	8,375	9,450	10,550	29,630	14,040	7,020	10,100	7,260	2,448
5	6,372	5,940	3,610	8,425	8,375	8,950	24,575	12,570	11,225	13,770	6,900	6,540
6	6,492	7,188	7,625	8,575	7,260	9,575	20,830	12,120	12,330	12,780	3,250	6,420
7	6,612	2,170	6,372	8,625	8,675	8,875	19,150	10,200	11,730	11,175	7,260	6,300
8	6,588	6,780	6,228	8,125	8,000	8,700	17,610	11,175	11,225	9,900	6,780	6,372
9	7,140	5,964	6,156	6,132	8,050	8,500	15,630	11,175	10,625	7,212	7,188	6,420
10	3,466	6,036	6,780	8,125	8,050	8,625	15,540	10,800	12,570	9,400	7,020	2,080
11	6,924	5,940	6,660	8,175	8,125	8,050	15,240	10,625	19,430	9,000	8,125	6,252
12	2,414	6,540	165	8,050	7,700	6,180	15,780	9,725	23,735	9,125	7,380	6,060
13	6,924	7,020	5,964	8,000	4,540	8,375	16,630	8,925	21,600	8,675	4,300	5,988
14	6,660	98	5,940	7,900	8,250	8,175	16,700	6,660	19,430	7,875	7,308	5,988
15	6,612	6,708	6,108	7,452	8,075	8,175	16,805	8,950	16,525	7,500	6,972	6,036
16	7,020	6,972	5,844	4,842	7,775	8,125	17,015	8,875	14,430	4,740	7,020	6,660
17	2,185	7,044	5,940	8,000	7,825	8,075	18,100	9,725	13,680	7,380	6,996	11,275
18	6,324	7,140	6,708	7,750	8,125	7,700	18,030	26,510	18,555	7,500	6,900	10,425
19	6,324	6,900	4,200	7,750	7,750	5,355	17,575	34,110	22,000	7,500	6,660	8,325
20	6,444	7,140	9,000	7,428	4,863	8,000	17,155	25,555	25,380	7,380	770	7,380
21	6,588	7,308	9,300	7,380	7,950	8,050	15,540	18,485	23,910	7,260	6,612	7,140
22	6,612	9,075	8,825	7,188	3,304	8,000	14,280	15,870	20,480	6,780	6,420	7,116
23	7,140	8,275	8,400	6,420	7,380	7,925	14,880	13,830	16,700	4,340	6,420	6,708
24	146	8,150	8,150	9,325	7,875	7,825	23,735	13,470	14,280	8,125	5,748	3,800
25	6,420	4,120	5,125	9,125	7,875	7,500	27,550	13,530	11,325	7,925	7,500	7,575
26	5,470	7,625	6,468	9,250	9,825	5,424	24,330	12,180	12,420	7,825	7,140	7,500
27	5,539	7,092	12,270	9,700	21,880	8,250	21,705	10,975	13,110	8,575	3,960	7,140
28	5,585	3,629	19,430	11,100	25,100	9,650	18,975	8,575	12,270	10,425	7,188	7,020
29	5,470	7,700	15,630	11,350	21,950	12,930	19,500	10,100	11,150	10,425	7,260	6,972
30	6,900	7,500	11,430	11,050	.....	17,505	18,555	7,116	10,675	8,250	7,750	6,564
31	2,652	.....	9,775	12,030	.....	24,400	.....	9,950	.....	8,625	7,332	.....

NOTE.—No record June 19; discharge interpolated. Figures represent 10-hour flow; those given for Sundays and holidays have not been used in computation of monthly discharge.

Monthly discharge of Merrimack River at Lowell, Mass., for the year ending Sept. 30, 1916.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
October	7,140	5,470	6,404
November	9,075	5,470	6,911
December	19,430	5,844	8,432
January	12,030	7,188	8,631
February	25,100	7,380	9,737
March	24,400	7,500	10,319
April	33,950	14,280	20,440
May	34,110	8,875	13,943
June	25,380	8,500	14,718
July	13,770	6,780	8,933
August	8,125	5,748	7,113
September	10,425	5,988	6,918
The year	34,110	5,470	9,742

NOTE.—Determinations based on records of the 10 hours daily during which the mills are operated.

MERRIMACK RIVER AT LAWRENCE, MASS.

LOCATION.—At the dam of the Essex Co. in Lawrence, Essex County.

DRAINAGE AREA.[1]—Total of Merrimack River basin above Lawrence, 4,663 square miles; net drainage area, exclusive of diverted parts of Nashua and Sudbury River and Lake Cochituate basins, 4,552 square miles.

RECORDS AVAILABLE.—January 1, 1880, to September 30, 1916.

COMPUTATIONS OF DISCHARGE.—Accurate record is kept of the flow over the dam and through the various wheels and gates. This flow includes the water wasted into the Merrimack from the Nashua, Sudbury, and Cochituate drainage basins. Estimates of the quantity wasted from these basins is furnished by the Metropolitan Water and Sewerage Board of Boston and subtracted from the quantity measured at Lawrence to obtain the net flow from the net drainage area of 4,452 square miles.

DIVERSIONS.—Practically the entire flow of the South Branch of Nashua River, Sudbury River, and Lake Cochituate is diverted for use by the Metropolitan water district of Boston.

REGULATION.—Flow regulated to some extent by storage in Lake Winnepesaukee. The low water flow of the stream is affected by operation of various power plants above Lawrence.

STORAGE.—There are several reservoirs in the basin. It is estimated that the water surface is about 3.5 per cent of the entire drainage area.

COOPERATION.—The entire record has been furnished by R. A. Hale, principal assistant engineer of the Essex Co. Record changed to climatic year form by engineers of the Geological Survey.

Daily discharge, in second-feet, of Merrimack River at Lawrence, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,573	4,752	4,325	7,333	10,281	15,509	28,273	16,815	8,459	7,593	6,395	4,136
2	1,615	2,957	4,987	6,086	9,891	12,606	30,031	15,383	8,395	6,460	5,558	2,362
3	774	2,641	4,961	7,275	9,069	10,346	32,778	14,187	6,770	6,804	5,010	2,971
4	3,955	3,129	3,080	6,762	8,623	8,503	29,016	13,606	6,733	9,545	4,563	2,400
5	3,512	3,526	3,092	6,872	7,625	7,279	24,033	12,159	10,206	13,027	3,162	4,479
6	3,249	2,429	5,304	7,299	6,792	7,822	20,408	11,140	11,396	11,856	2,643	3,745
7	3,251	1,255	3,524	7,571	7,718	6,748	18,783	9,917	10,761	10,266	4,611	3,545
8	3,460	4,450	3,648	6,525	6,517	6,372	17,000	10,245	10,278	8,352	3,694	3,402
9	2,848	3,413	3,633	5,951	6,351	5,981	15,369	9,876	9,572	6,854	3,670	2,331
10	2,607	3,255	3,769	6,806	6,007	6,030	15,124	9,634	11,620	7,746	3,888	1,466
11	4,760	3,083	2,533	5,807	6,056	5,276	14,851	9,221	17,940	7,038	5,384	4,223
12	2,044	3,420	726	5,503	4,714	4,782	15,506	8,277	21,969	6,592	5,165	3,658
13	4,653	2,487	3,455	5,511	4,264	6,075	16,074	6,652	20,771	5,763	3,890	3,147
14	3,557	554	3,665	5,938	6,275	5,553	16,438	6,229	18,519	5,755	5,321	3,125
15	3,534	4,156	3,395	4,476	5,477	5,625	16,328	7,144	15,951	4,853	4,335	2,878
16	2,584	3,777	3,367	4,985	4,804	5,501	16,382	6,453	13,829	4,372	4,035	3,680
17	1,506	3,674	3,123	6,350	5,193	5,370	17,583	8,616	13,238	5,593	3,744	10,557
18	4,461	3,955	2,711	5,377	5,261	4,513	17,498	24,744	17,675	4,791	3,676	9,776
19	3,462	4,031	3,305	4,672	4,380	4,150	16,945	32,883	23,051	4,621	2,420	7,199
20	3,516	3,555	8,402	4,225	4,342	5,433	16,514	24,671	24,005	3,934	1,032	5,973
21	3,540	6,815	8,440	4,349	5,987	5,104	15,215	17,763	22,624	4,378	4,265	5,371
22	3,540	8,350	7,806	3,617	3,151	5,026	13,683	15,388	19,721	2,963	3,368	4,926
23	2,492	6,811	6,879	6,108	5,791	4,959	14,654	13,286	16,230	4,050	3,282	3,391
24	802	5,913	6,027	8,742	4,658	4,799	22,284	12,704	13,403	6,664	3,182	3,308
25	3,662	3,745	4,945	8,386	4,844	3,886	26,532	12,562	11,145	6,428	4,038	5,897
26	3,163	5,692	6,570	8,598	10,006	3,828	23,575	11,382	11,728	6,360	4,388	5,758
27	2,579	3,532	15,074	9,263	19,405	8,417	20,496	9,570	12,218	7,371	3,820	5,068
28	2,759	3,203	17,081	10,522	21,609	13,012	18,841	8,213	11,424	9,185	5,023	4,458
29	2,613	5,450	15,018	10,698	19,243	15,362	18,666	8,553	10,071	8,148	4,549	4,122
30	2,474	4,313	11,130	10,960	.....	18,777	17,793	6,740	9,257	7,959	5,131	2,768
31	2,182	.....	8,976	11,628	.....	23,807	.....	8,503	.....	7,616	4,754	.....

NOTE.—The above table shows the actual flow at Lawrence; not corrected for water wasted by the Metropolitan Water and Sewerage Board.

[1] See footnote to tables of weekly discharge.

Weekly discharge, in second-feet, of Merrimack River at Lawrence, Mass., for the year ending Sept. 30, 1916.

[Weeks arranged in order of dryness.]

Week ending Sunday—	Measured at Lawrence (total drainage area, 4,663 square miles).	Wasting into Merrimack from diverted drainage basins (211 square miles).	From net drainage area of 4,452 square miles.	Per square mile of net drainage area.	Week ending Sunday—	Measured at Lawrence (total drainage area, 4,663 square miles).	Wasting into Merrimack from diverted drainage basins (211 square miles).	From net drainage area of 4,452 square miles.	Per square mile of net drainage area.
Oct. 3, 1915...	2,590	32	2,558	0.575	July 16.....	6,017	49	5,968	1.341
Oct. 31, 1915...	2,776	25	2,751	.618	Mar. 12.....	6,144	230	5,914	1.328
Nov. 14, 1915..	2,952	28	2,924	.657	Jan. 9.....	6,894	128	6,766	1.520
Nov. 7, 1915...	2,956	39	2,917	.655	Dec. 26, 1915..	7,010	158	6,852	1.539
Sept. 10.....	3,053	8	3,045	.684	July 30.....	7,445	79	7,366	1.655
Oct. 24, 1915...	3,116	34	3,082	.692	Feb. 27.....	7,692	300	7,392	1.660
Oct. 17, 1915...	3,234	32	3,202	.719	June 4.....	7,736	86	7,650	1.718
Oct. 10, 1915...	3,269	41	3,228	.725	May 14.....	8,591	111	8,480	1.905
Dec. 19, 1915...	3,289	117	3,172	.712	Feb. 6.....	9,130	126	9,004	2.022
Dec. 12, 1915..	3,305	33	3,272	.735	July 9.....	9,529	47	9,482	2.130
Aug. 20.....	3,509	15	3,494	.785	Jan. 30.....	9,596	134	9,462	2.125
Aug. 27.....	3,763	11	3,752	.843	July 2.....	9,822	66	9,756	2.191
Sept. 3.....	4,132	13	4,119	.925	Jan. 2.....	11,528	160	11,368	2.553
Nov. 21, 1915..	4,280	72	4,208	.945	June 11.....	11,682	138	11,544	2.593
Dec. 5, 1915....	4,315	42	4,273	.960	May 28.....	11,872	124	11,748	2.639
Aug. 13.....	4,329	13	4,316	.969	May 7.....	13,315	240	13,075	2.937
July 23.....	4,333	53	4,280	.961	Mar. 5.....	13,585	284	13,301	2.988
Oct. 1.....	4,431	8	4,423	.993	Apr. 16.....	15,815	289	15,526	3.487
Sept. 17.....	4,467	12	4,455	1.001	Apr. 23.....	16,013	258	15,755	3.539
Mar. 26.....	4,719	107	4,612	1.036	June 18.....	17,422	251	17,171	3.857
Jan. 23.....	4,957	79	4,878	1.096	May 21.....	17,468	243	17,225	3.869
Aug. 6.....	4,992	23	4,969	1.116	June 25.....	18,597	203	18,394	4.132
Feb. 20.....	5,105	276	4,829	1.085	Apr. 2.....	19,668	298	19,370	4.351
Mar. 19.....	5,255	310	4,945	1.111	Apr. 30.....	21,170	330	20,840	4.681
Nov. 28, 1915..	5,321	60	5,261	1.182	Apr. 9.....	22,484	333	22,151	4.976
Jan. 16.....	5,575	106	5,469	1.228					
Sept. 24.....	5,706	12	5,694	1.279	Year....	7,960	125	7,835	1.760
Feb. 13.....	5,947	395	5,552	1.247					

NOTE.—Record of discharge wasted from diverted drainage area based on data furnished by the Metropolitan Water and Sewerage Board of Boston.

Monthly discharge of Merrimack River at Lawrence, Mass., for the year ending Sept. 30, 1916.

Month.	Mean discharge in second-feet.				Run-off.		Rainfall in inches.
	Measured at Lawrence (total drainage area, 4,663 square miles).	Wasting into Merrimack from diverted drainage basins (211 square miles).	From net drainage area of 4,452 square miles.	Per square miles of net drainage area.	Depth in inches on drainage area.	Per cent of rainfall.	
October.....	2,959	33	2,926	0.657	0.757	27.4	2.76
November.....	3,944	51	3,893	.874	.975	34.8	2.80
December.....	5,902	103	5,799	1.303	1.502	33.5	4.48
January.....	6,910	113	6,797	1.527	1.760	115.8	1.52
February.....	7,736	284	7,452	1.674	1.805	36.8	4.91
March.....	7,950	225	7,725	1.735	2.000	63.1	3.17
April.....	19,556	311	19,245	4.323	4.823	120.9	3.99
May.....	12,339	172	12,167	2.733	3.151	81.2	3.88
June.....	13,965	161	13,804	3.101	3.459	54.9	6.30
July.....	6,869	55	6,814	1.531	1.765	36.9	4.78
August.....	4,129	15	4,114	.924	1.065	41.0	2.60
September.....	4,337	11	4,326	.972	1.084	29.1	3.72
The year.....	8,025	127	7,898	1.774	24.146	53.77	44.91

NOTE.—The monthly discharge in second-feet per square mile and the run-off in depth in inches, shown by the table, do not represent the natural flow from the basin because of artificial storage.

SOUHEGAN RIVER AT MERRIMACK, N. H.

LOCATION.—At the head of Atherton Falls, 7 miles below the mouth of Beaver Brook, and about 1½ miles above confluence of the Souhegan with the Merrimack River at Merrimack, Hillsboro County.

DRAINAGE AREA.—168 square miles.

RECORDS AVAILABLE.—July 13, 1909, to September 30, 1916.

GAGES.—Vertical staff on the left bank 40 feet above the falls, used until April 11, 1911, when it was washed out. Beginning April 12, 1911, a chain gage, attached to a tree on the left bank about 350 feet above the falls, was used. October 15, 1913, a Gurley water-stage recorder was installed near the chain gage; gage heights referenced to gage datum by a hook gage inside the well, the chain gage being used for auxiliary readings. All gages referred to same datum.

DISCHARGE MEASUREMENTS.—Made by wading below the falls at low stages and from cable at high stages.

CHANNEL AND CONTROL.—The channel opposite the gage is a pool in which velocity is very low. The control of this pool is a rock ledge at the head of Atherton Falls and is permanent.

EXTREMES OF DISCHARGE.—1909–1916: Maximum stage recorded, 9.6 feet August 5, 1915 (discharge, 4,930 second-feet); minimum stage recorded, 1.90 feet at 8 a. m. September 8, 1909 (discharge, 15 second-feet).

ICE.—Ice forms on control for short periods in the winter, slightly affecting stage-discharge relation.

REGULATION.—Flow affected by the operation of mills at Milford, about 8 miles above.

ACCURACY.—Stage-discharge relation permanent except as affected by ice for short periods. Rating curve well defined below 2,000 second-feet. July 13, 1909, to October 14, 1913, gage read to hundredths twice daily; October 15, 1913, to September 30, 1916, operation of water-stage recorder satisfactory except for periods noted. Daily discharge ascertained by applying rating table to mean daily gage heights determined by averaging twice-daily readings (July 13, 1909, to Oct. 14, 1913) or mean hourly gage heights (Oct. 15, 1913, to Sept. 30, 1916). Results good. Computations have been revised, and the records given in the following tables supersede those previously published.

Discharge measurements of Souhegan River at Merrimack, N. H., during 1909–1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1909.		*Feet.*	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
July 13	D. M. Wood	2.22	37.7	1914.			
Aug. 16	do	2.05	27.1	Feb. 21	C. C. Covert	2.94	202
Sept. 20	do	1.99	20.5	July 27	R. S. Barnes	2.09	27.7
20	do	1.99	20.4	Sept. 21	do	2.08	27.5
Dec. 15[a]	Wood and Garratt	3.02	215	Nov. 15	do	2.05	25.9
31	D. M. Wood	[b] 2.37	43.8	27	C. S. De Golyer	2.16	30.1
1910.				1915.			
Mar. 3	do	5.65	1,910	Mar. 15[d]	R. S. Barnes	2.98	223
29[c]	do	4.22	730	May 5[d]	do	3.25	338
Apr. 11[a]	do	3.06	255	1916.			
21[c]	do	3.64	518	Mar. 2	Hardin Thweatt	[b] 4.31	634
June 3	do	2.65	115	8	do	[e] 3.60	397
1912.				8	do	3.56	395
Aug. 8	G. H. Canfield	2.10	25.6	Apr. 25	do	5.38	1,470
8	do	2.07	25.3	25	do	5.33	1,420
				May 10	do	3.48	400
1913.				10	C. H. Pierce	3.49	372
Oct. 14	do	2.53	84	Aug. 18	H. W. Fear	2.46	72
				18	C. H. Pierce	2.45	74

[a] Made at covered highway bridge 1½ miles above gage.
[b] Stage-discharge relation affected by ice.
[c] Made at Boston & Maine R. R. bridge near mouth of river.
[d] Measurement unreliable.
[e] Some anchor ice floating. Stage-discharge relation not affected by ice.

Daily discharge, in second-feet, of Souhegan River at Merrimack, N. H., for the years ending Sept. 30, 1909–1916.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1909.				1909.				1909.			
1	.....	30	22	11	.....	28	22	21	28	79	24
2	.....	27	22	12	.....	27	22	22	28	79	24
3	.....	24	22	13	39	28	21	23	43	49	24
4	.....	27	24	14	43	27	25	24	43	47	24
5	.....	30	30	15	37	27	21	25	36	44	28
6	.....	34	28	16	37	26	23	26	28	42	32
7	.....	32	21	17	43	29	22	27	45	37	39
8	.....	28	18	18	39	44	23	28	37	30	68
9	.....	25	22	19	30	115	21	29	37	29	187
10	.....	31	22	20	28	87	21	30	32	28	155
								31	32	24	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1909–10.												
1	105	37	83	45	333	4,350	770	471	121	85	39	21
2	103	37	83	45	290	3,350	710	447	118	81	48	21
3	61	33	75	45	290	1,880	653	378	121	72	42	21
4	39	34	72	40	269	1,320	447	400	115	55	29	24
5	37	37	50	40	230	960	355	400	108	55	42	28
6	30	35	59	40	212	960	333	400	128	50	35	28
7	30	35	52	40	200	1,550	333	378	269	47	34	52
8	30	36	92	40	180	1,550	355	269	249	45	39	64
9	28	33	61	40	180	1,960	355	215	215	50	36	68
10	27	30	52	40	170	1,710	333	290	215	58	64	59
11	24	29	59	40	160	1,550	290	290	311	53	55	66
12	24	28	47	40	150	1,550	269	290	378	52	45	47
13	22	28	43	40	140	1,400	311	249	496	45	53	34
14	23	30	94	40	130	1,030	269	249	400	44	48	29
15	22	29	215	40	120	1,100	249	230	311	42	33	29
16	22	30	170	40	120	1,170	269	215	230	42	37	27
17	28	28	130	40	110	1,100	249	204	230	35	36	27
18	30	30	95	40	100	1,100	230	218	290	31	61	29
19	32	26	60	40	90	1,030	1,030	269	290	31	64	32
20	33	25	50	40	80	1,100	710	249	290	28	64	41
21	32	24	50	45	100	1,170	521	230	290	26	83	39
22	33	24	45	378	300	1,170	471	400	269	27	41	24
23	37	24	45	1,710	200	1,100	471	290	249	24	36	24
24	45	24	45	1,470	150	960	496	208	230	22	32	25
25	49	24	45	1,030	120	1,320	496	174	208	25	31	30
26	48	32	45	653	100	1,790	496	167	188	27	28	32
27	43	134	45	447	200	1,400	1,470	137	155	28	28	32
28	37	87	45	447	1,030	960	960	115	115	27	24	33
29	39	68	45	447	.....	830	546	105	101	28	24	31
30	39	83	45	400	.....	770	423	101	92	30	23	30
31	37	.....	45	447	.....	770	.....	113	.....	34	22	.....

Daily discharge, in second-feet, of Souhegan River at Merrimack, N. H., for the years ending Sept. 30, 1909–1916—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1910–11.												
1	32	61	68	80	85	290	770	239	64	54	72	116
2	47	59	68	105	85	160	333	239	76	68	57	118
3	53	66	52	360	60	70	269	253	90	70	48	86
4	29	79	50	625	50	55	290	239	60	49	57	66
5	32	98	23	300	60	50	250	222	54	35	49	41
6	30	110	25	190	50	45	311	195	57	35	45	72
7	30	96	24	175	40	40	2,045	145	201	37	35	66
8	32	87	30	160	45	40	1,320	142	388	34	34	54
9	32	87	29	120	35	35	710	140	190	34	33	60
10	37	77	30	80	40	50	521	145	130	34	32	72
11	35	66	30	80	40	50	572	145	96	33	31	41
12	49	55	30	85	40	55	510	138	96	31	30	86
13	32	52	29	65	40	60	535	116	239	28	27	54
14	37	53	27	65	35	90	550	132	327	26	27	43
15	33	52	26	60	30	425	830	135	307	24	25	76
16	41	59	25	50	25	1,320	720	116	201	21	25	60
17	42	47	27	40	35	472	515	108	96	27	25	54
18	32	41	27	35	35	378	465	104	120	26	25	43
19	34	46	27	35	35	378	375	96	120	26	24	57
20	37	52	25	35	30	222	367	132	116	26	23	54
21	37	50	24	45	30	378	355	88	88	26	24	58
22	37	50	24	35	25	355	343	92	80	26	26	52
23	41	50	33	30	25	472	256	72	72	27	24	55
24	49	50	149	30	25	472	281	92	74	24	37	45
25	47	50	250	35	25	184	267	106	72	28	35	40
26	49	50	181	35	25	90	264	170	76	25	41	31
27	47	50	77	85	75	424	253	165	57	25	35	30
28	42	50	110	370	300	2,670	219	108	44	30	45	34
29	39	50	101	330	.....	1,550	201	108	57	39	58	42
30	55	50	115	180	.....	1,710	213	84	55	80	86	46
31	64	.....	103	100	.....	1,550	.....	78	.....	72	106	.....
1911–12.												
1	48	195	267	400	135	207	1,200	375	447	36	43	33
2	52	204	260	400	135	198	1,300	299	375	34	51	32
3	96	190	274	350	135	142	1,260	292	281	34	48	34
4	104	185	264	350	135	140	1,230	295	274	34	43	52
5	118	178	264	300	135	142	1,230	303	260	34	39	58
6	130	175	207	300	135	142	1,260	295	172	35	34	64
7	120	232	216	300	135	148	1,300	295	160	35	32	51
8	128	260	185	275	135	182	1,300	343	160	34	28	51
9	135	281	274	275	132	239	1,330	416	114	32	28	48
10	128	253	172	250	135	239	1,330	580	106	31	28	39
11	120	225	165	250	132	242	1,260	456	100	32	32	39
12	120	192	188	250	135	347	1,140	331	94	31	36	35
13	88	185	195	250	140	1,070	802	315	86	32	40	34
14	88	225	188	250	140	1,440	540	311	84	43	41	32
15	48	232	190	225	162	1,820	307	295	80	52	48	35
16	45	363	225	225	148	2,250	188	331	80	64	49	57
17	70	327	406	225	246	2,170	281	665	76	57	48	72
18	92	327	692	200	245	1,960	402	638	76	60	180	72
19	610	748	420	200	250	1,610	748	398	70	54	55	54
20	980	530	388	200	255	1,400	748	371	64	49	64	45
21	496	411	281	200	260	1,070	560	456	58	60	60	43
22	600	359	274	200	260	920	474	665	60	64	57	41
23	802	284	720	175	265	720	492	638	64	68	60	40
24	692	295	1,330	175	265	488	510	540	60	64	64	39
25	411	311	775	175	267	474	540	456	60	60	54	37
26	319	335	665	150	284	420	560	267	57	54	44	35
27	284	331	600	150	270	388	545	246	54	46	39	35
28	246	327	535	150	250	375	267	232	52	35	28	35
29	236	335	363	150	222	980	253	219	44	43	34	35
30	219	303	452	150	.....	2,330	347	339	37	41	34	34
31	201	.....	450	135	.....	1,540	.....	411	.....	39	32	.....

Daily discharge, in second-feet, of Souhegan River at Merrimack, N. H., for the years ending Sept. 30, 1909–1916—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1912–13.												
1	34	72	145	890	253	638	950	359	331	42	64	39
2	35	80	140	555	246	520	802	335	228	45	74	41
3	36	84	359	492	222	470	570	288	222	42	46	51
4	33	82	175	1,040	190	351	525	207	195	40	82	41
5	31	90	319	720	172	319	501	185	180	41	82	45
6	33	80	311	456	195	281	510	180	160	37	128	46
7	35	76	424	420	180	281	530	190	120	43	49	41
8	37	434	307	406	82	170	510	180	104	32	30	35
9	35	416	264	323	68	225	438	158	106	30	80	41
10	34	274	331	281	48	380	398	135	100	30	31	35
11	35	185	270	295	130	438	388	98	100	68	32	34
12	34	192	213	375	125	375	775	155	68	76	30	37
13	32	178	145	520	128	510	950	125	43	43	70	37
14	32	198	140	384	125	580	950	116	78	21	116	37
15	35	665	135	367	125	1,440	748	116	68	43	96	140
16	35	665	132	311	125	1,010	610	132	57	66	49	76
17	34	600	140	343	128	720	560	145	54	25	49	78
18	34	228	145	402	125	456	465	145	51	76	37	33
19	34	232	192	438	116	492	411	130	48	60	43	32
20	35	207	474	456	116	720	393	116	64	45	76	33
21	32	190	384	406	160	830	359	110	60	66	106	34
22	24	175	228	420	216	720	315	116	62	34	45	36
23	30	150	180	315	303	506	311	150	52	31	60	292
24	92	155	132	492	393	555	253	510	64	40	72	155
25	232	242	150	474	250	540	232	580	58	57	66	148
26	180	351	138	411	225	802	260	434	54	86	49	90
27	120	303	213	351	204	1,470	225	311	54	43	128	55
28	106	207	260	303	250	2,890	213	264	45	48	66	60
29	100	145	201	288	.....	1,400	406	860	48	70	106	35
30	84	145	239	288	.....	1,040	393	830	37	45	39	48
31	84	.....	1,070	260	.....	775	.....	438	.....	82	38	.....
1913–14.												
1	51	228	155	170	665	242	1,070	950	114	60	43	40
2	49	182	190	122	510	1,960	2,030	748	132	82	43	42
3	483	180	232	170	367	2,810	1,610	610	120	94	43	45
4	281	185	319	24	343	2,030	980	530	118	92	43	46
5	253	180	270	210	474	1,680	860	550	192	80	43	48
6	140	172	239	225	375	1,300	775	1,070	185	57	43	41
7	108	155	207	195	367	890	665	890	120	82	38	35
8	88	140	638	175	281	775	775	665	112	108	38	28
9	86	138	545	170	260	860	1,470	605	120	116	38	30
10	88	692	424	182	250	802	1,400	501	118	94	38	28
11	98	525	363	140	232	802	1,010	465	96	95	38	27
12	82	343	411	140	295	610	860	420	94	95	38	28
13	84	281	246	30	138	575	860	830	84	96	38	26
14	112	250	213	80	225	474	748	950	72	104	38	25
15	90	250	239	60	110	343	692	665	57	80	35	27
16	98	204	219	100	145	395	665	1,070	76	54	36	29
17	104	188	207	100	150	445	720	950	76	64	31	30
18	104	210	213	100	150	495	1,010	393	68	41	30	29
19	68	201	178	100	242	550	950	367	72	45	32	27
20	92	198	135	100	219	384	950	343	82	40	33	27
21	347	213	145	100	192	343	1,010	299	57	48	37	27
22	274	201	162	100	170	295	802	278	51	52	44	29
23	195	170	168	100	188	288	610	264	62	48	60	26
24	165	145	192	76	182	299	515	213	58	52	64	27
25	180	162	284	132	188	315	460	198	55	47	64	28
26	830	145	253	288	188	492	470	213	55	47	43	27
27	720	132	256	303	188	1,440	1,890	198	48	47	39	27
28	478	120	160	315	182	2,730	2,170	172	52	47	39	24
29	367	145	160	315	.....	2,170	1,330	155	45	47	43	22
30	303	145	190	335	.....	1,200	1,140	130	55	47	51	25
31	260	.....	180	802	.....	1,010	.....	114	.....	47	37	.....

Daily discharge, in second-feet, of Souhegan River at Merrimack, N. H., for the years ending Sept. 30, 1909–1916—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1914–15.												
1	23	21	64	42	104	890	148	550	55	44	288	207
2	21	21	57	38	104	830	150	483	66	158	510	175
3	22	22	57	37	106	748	132	380	60	605	530	150
4	22	22	64	33	110	692	116	355	62	638	493	138
5	21	22	54	36	114	610	175	292	52	351	3,850	120
6	22	23	40	33	120	398	243	246	49	295	2,490	112
7	21	23	33	135	180	243	295	225	38	225	1,580	108
8	22	23	52	560	260	225	355	190	64	204	1,200	118
9	22	24	54	264	295	195	339	216	64	2,410	1,750	118
10	21	24	43	168	195	216	288	222	58	1,680	1,750	110
11	22	24	45	135	158	216	402	201	48	775	1,100	102
12	23	25	39	190	158	225	980	182	48	506	748	86
13	20	25	34	245	138	162	748	165	38	359	665	68
14	21	25	46	295	138	168	483	216	31	284	665	88
15	21	26	48	232	140	175	384	175	38	242	488	86
16	21	26	64	165	225	182	323	138	37	222	555	96
17	22	27	62	128	665	188	288	140	46	198	550	84
18	22	27	58	190	420	175	256	155	52	160	380	88
19	22	27	49	1,200	442	162	253	150	68	142	295	58
20	22	27	48	1,580	375	140	242	138	49	180	253	49
21	22	27	33	665	335	130	219	128	43	201	207	62
22	22	27	43	367	295	158	192	106	60	178	180	90
23	22	25	44	210	260	165	172	84	55	190	692	112
24	22	24	44	195	355	175	185	98	52	162	506	98
25	22	25	40	182	1,890	192	140	104	46	114	402	84
26	22	26	34	170	2,970	225	152	96	46	110	488	58
27	22	26	34	158	1,890	178	182	102	39	188	364	54
28	23	45	34	145	950	155	162	112	34	351	239	68
29	23	58	37	132	.....	165	170	86	37	355	195	70
30	23	52	34	120	.....	168	178	64	36	347	198	68
31	21	.....	41	110	.....	153	.....	54	.....	256	228	.....
1915–16.												
1	62	70	225	355	595	890	2,030	775	264	201	165	120
2	74	72	188	319	501	638	2,330	638	219	160	132	102
3	92	70	162	335	347	470	1,780	545	192	236	122	82
4	148	96	155	284	367	510	1,230	535	331	323	114	62
5	132	78	142	315	319	398	1,010	488	388	292	104	55
6	135	96	116	488	278	343	1,010	434	442	267	80	70
7	130	98	135	474	284	307	920	384	465	210	68	90
8	132	92	130	347	207	315	775	398	339	180	96	90
9	190	88	125	246	195	363	692	434	398	145	116	88
10	145	86	125	232	198	380	665	393	950	165	142	58
11	128	88	180	278	178	380	830	343	1,540	172	162	54
12	125	84	94	278	168	299	1,040	284	1,040	160	132	60
13	100	86	86	267	108	292	1,040	260	1,100	145	100	60
14	92	70	90	295	132	307	860	219	748	130	112	55
15	108	68	96	236	172	288	830	236	550	125	116	76
16	135	204	90	195	165	260	1,140	260	492	102	106	239
17	138	192	96	188	170	256	1,040	1,010	802	90	84	236
18	125	138	116	168	170	239	860	2,730	1,580	112	70	152
19	122	138	830	168	158	239	720	1,260	980	106	68	145
20	110	720	775	182	112	216	605	802	980	102	52	145
21	104	496	460	207	122	239	540	610	748	104	45	125
22	108	331	335	638	148	225	506	520	570	150	60	112
23	100	253	284	1,040	175	219	1,300	470	456	192	62	100
24	78	213	292	665	201	222	2,030	506	367	222	108	92
25	70	188	284	496	236	228	1,470	447	323	168	185	142
26	80	162	665	638	1,860	264	950	367	555	152	130	116
27	86	170	1,540	1,100	2,970	470	860	311	411	207	92	100
28	88	145	950	1,170	1,820	775	860	270	323	580	140	86
29	92	148	638	860	1,200	1,040	1,400	288	270	359	253	72
30	90	232	434	530	.....	1,330	980	256	232	210	201	78
31	74	.....	406	515	.....	2,030	.....	274	.....	178	148	.....

NOTE.—Stage-discharge relation affected by ice Dec. 15, 1909, to Jan. 21, 1910; Feb. 7–27, 1910; Jan. 1 to Mar. 15, 1911; Jan. 16–20, Feb. 5–22, and Feb. 29 to Mar. 7, 1916. Discharge ascertained by means of gage heights, discharge measurements, and climatic records. No records as follows: July 25, 1909; July 31, Nov. 19, 21–30, Dec. 25, 1910; Nov. 27, 1911; Jan. 1–31, Feb. 1–7, 18–24, 1912; Jan. 16–21, 23, Mar. 16–18, July 11–12, 15, 25–31, Aug. 1–13, Sept. 4, 7, Oct. 17–29, Nov. 1–14, 25–26, 1914; Jan. 12–13, Aug. 27, 1915: Discharge ascertained by comparison with records at stations in adjacent drainage basins and by interpolation. Jan. 24 to Mar. 15, 1915, discharge ascertained from readings of chain gage and comparison with records at stations in adjacent drainage basins.

Monthly discharge of Souhegan River at Merrimack, N. H., for the years ending Sept. 30, 1909–1916.

[Drainage area, 168 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1909.					
July 13–31	45	28	36.1	0.215	0.15
August	115	24	39.2	.233	.27
September	187	18	35.2	.209	.23
1909–10.					
October	105	22	38.4	.229	.26
November	134	24	38.5	.229	.26
December	215	43	69.1	.411	.47
January	1,710	40	267	1.59	1.83
February	1,030	80	206	1.23	1.28
March	4,350	770	1,420	8.45	9.74
April	1,470	230	496	2.95	3.29
May	471	101	263	1.57	1.81
June	496	92	226	1.35	1.51
July	85	22	41.9	.249	.29
August	83	22	41.2	.245	.28
September	68	21	34.9	.208	.23
The year	4,350	21	263	1.57	21.25
1910–11.					
October	64	29	39.8	0.237	0.27
November	110	41	61.4	.365	.41
December	250	23	59.3	.353	.41
January	625	30	130	.774	.89
February	300	25	50.9	.303	.32
March	2,670	35	456	2.71	3.12
April	2,045	201	497	2.96	3.30
May	253	72	140	.833	.96
June	388	44	123	.732	.82
July	80	21	37.3	.222	.26
August	106	23	40.0	.238	.27
September	118	30	58.4	.348	.39
The year	2,670	21	141	.839	11.42
1911–12.					
October	980	45	252	1.50	1.73
November	748	175	293	1.74	1.94
December	1,330	165	383	2.28	2.63
January	400	135	235	1.40	1.61
February	284	132	191	1.14	1.23
March	2,330	140	832	4.95	5.71
April	1,330	188	790	4.70	5.24
May	665	219	389	2.32	2.68
June	447	37	124	.738	.82
July	68	31	44.7	.266	.31
August	180	28	47.5	.283	.33
September	72	32	43.7	.260	.29
The year	2,330	28	303	1.80	24.52
1912–13.					
October	232	24	57.0	0.339	0.39
November	665	72	237	1.41	1.57
December	1,070	132	257	1.53	1.76
January	1,040	260	435	2.59	2.99
February	393	48	175	1.04	1.08
March	2,890	170	707	4.21	4.85
April	950	213	498	2.96	3.30
May	860	98	261	1.55	1.79
June	331	37	97.0	.577	.64
July	86	21	48.6	.289	.33
August	128	30	65.8	.392	.45
September	292	32	63.5	.378	.42
The year	2,890	21	243	1.45	19.57

Monthly discharge of Souhegan River at Merrimack, N. H., for the year ending Sept. 30, 1909–1916—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1913–14.					
October	830	49	215	1.28	1.48
November	692	120	216	1.29	1.44
December	638	135	251	1.49	1.72
January	802	24	176	1.05	1.21
February	665	110	260	1.55	1.61
March	2,810	242	936	5.57	6.42
April	2,170	460	1,020	6.07	6.77
May	1,070	114	510	3.04	3.50
June	192	45	88.2	.525	.59
July	116	40	68.0	.405	.47
August	64	30	41.3	.246	.28
September	48	22	30.7	.183	.20
The year	2,810	22	318	1.89	25.69
1914–15.					
October	23	20	21.8	0.130	0.15
November	58	21	27.3	.162	.18
December	64	33	46.1	.274	.32
January	1,580	33	263	1.57	1.81
February	2,970	104	478	2.85	2.97
March	890	130	280	1.67	1.92
April	980	116	278	1.65	1.84
May	550	54	189	1.12	1.29
June	68	31	49.0	.292	.33
July	2,410	44	391	2.33	2.69
August	3,850	180	769	4.58	5.28
September	207	49	97.5	.580	.65
The year	3,850	20		1.43	19.43
1915–16.					
October	190	62	109	0.649	.75
November	720	68	166	.988	1.10
December	1,540	86	330	1.96	2.26
January	1,170	168	436	2.60	3.00
February	2,970	108	467	2.78	3.00
March	2,030	216	466	2.77	3.19
April	2,330	506	1,080	6.43	7.17
May	2,730	219	540	3.21	3.70
June	1,580	192	602	3.58	3.99
July	580	90	192	1.14	1.31
August	253	45	115	.685	.79
September	239	54	102	.607	.68
The year	2,970	45	382	2.27	30.94

Days of deficiency in discharge of Souhegan River at Merrimack, N. H., during the years ending Sept. 30, 1910–1916.

Discharge in second-feet.	Theoretical horsepower per foot of fall.	Days of deficient discharge.						
		1909–10	1910–11	1911–12	1912–13	1913–14	1914–15	1915–16
25	2.8	23	11	.....	2	3	43	.....
30	3.4	52	47	4	3	22	58	.....
35	4.0	84	81	26	30	29	69	.....
40	4.5	106	108	45	52	44	81	.....
45	5.1	132	129	57	67	58	91	.....
50	5.7	157	147	68	84	74	105	1
60	6.8	175	193	87	94	88	123	6
70	8.0	186	212	104	110	97	139	15
80	9.1	189	230	110	122	102	140	29
90	10.2	197	247	116	134	114	148	43
100	11.4	202	258	119	139	126	153	62
125	14.2	222	279	127	157	152	176	94
150	17.0	228	290	152	187	169	195	130
175	19.8	236	294	163	198	187	222	152
200	22.7	239	301	182	217	214	253	169
250	28.4	266	312	212	240	238	281	201
300	34.1	285	323	256	259	260	299	230
350	39.8	293	331	278	276	273	303	249
400	45.5	300	341	290	293	282	317	264
500	56.8	320	347	311	319	295	326	283
600	68.2	322	353	321	336	304	334	298
800	90.9	329	357	337	348	323	347	316
1,000	114	335	358	342	357	341	351	334
1,500	170	354	360	359	364	355	354	354
2,000	227	363	363	363	364	359	361	360
2,500	284	363	364	366	364	363	363	364
3,000	341	363	365	.....	365	365	364	366
3,500	398	364	.....	.....	.....	.....	364	.....
4,000	455	364	.....	.....	.....	.....	365	.....
4,500	511	365	.....	.....	.....	.....	.....	.....

NOTE.—The above table gives the theoretical horsepower per foot of fall that may be developed at different rates of discharge, and shows the number of days on which the discharge and corresponding horsepower were respectively less than the amounts given in the columns for discharge and horsepower. In using this table, allowance should be made for the various losses, the principal ones being the wheel loss, which may be as large as 20 per cent, and the head loss, which may be as large as 5 per cent.

SOUTH BRANCH OF NASHUA RIVER BASIN (WACHUSETT DRAINAGE BASIN) NEAR CLINTON, WORCESTER COUNTY, MASS.

LOCATION.—At Wachusett dam near Clinton.

DRAINAGE AREA.—119 square miles 1896 to 1907; 118.19 square miles 1908–1913; 108.84 square miles 1914–16.

RECORDS AVAILABLE.—July, 1896, to September, 1916.

REGULATION.—Flow affected by storage in Wachusett reservoir and other ponds. Beginning with 1897 the determinations of discharge have been corrected for gain or loss in the reservoir and ponds so that the record shows approximately the natural flow of the stream.

The yield per square mile is the yield of the drainage area including the water surfaces. For the years 1897 to 1902, inclusive, the water surface amounted to 2.2 per cent of the total area; 1903, 2.4 per cent; 1904, 3.6 per cent; 1905, 4.1 per cent; 1906, 5.1 per cent; 1907, 6.0 per cent; 1908–1915, 7.0 per cent.

COOPERATION.—Record furnished by the Metropolitan Water and Sewerage Board of Boston; rearranged to climatic year form by engineers of the Geological Survey.

Yield and rainfall in South Branch of Nashua River basin (Wachusett drainage area) near Clinton, Mass., for the year ending Sept. 30, 1916.

[Drainage area 108.84 square miles.]

Month.	Total yield (million gallons).	Yield per square mile.		Run-off.		Rainfall (inches).
		Million gallons per day.	Second-feet.	Depth on drainage area (inches).	Per cent of rainfall.	
October	1,305.3	0.387	0.599	0.690	22.6	3.05
November	1,624.6	.498	.770	.859	27.5	3.12
December	4,586.1	1.359	2.103	2.424	47.5	5.11
January	4,438.2	1.315	2.035	2.346	146.7	1.60
February	5,732.4	1.816	2.810	3.030	50.7	5.98
March	6,380.6	1.891	2.926	3.374	101.5	3.32
April	10,774.4	3.300	5.106	5.696	156.0	3.65
May	5,726.2	1.697	2.626	3.028	90.7	3.34
June	6,706.5	2.054	3.178	3.546	53.9	6.57
July	3,663.9	1.086	1.680	1.937	34.2	5.66
August	957.3	.284	.439	.506	29.5	1.72
September	958.3	.294	.454	.506	12.0	4.21
Year	52,853.8	1.327	2.053	27.942	59.0	47.33

Summary of yield and rainfall in South Branch of Nashua River basin (Wachusett drainage area) near Clinton, Mass., for the years ending Sept. 30, 1897–1916.

[Drainage area, 108.84 square miles.][a]

Month.	Total yield (million gallons).	Yield per square mile.		Run-off.		Rainfall (inches).
		Million gallons per day.	Second-feet.	Depth on drainage area (inches).	Per cent of rainfall.	
October	34,973.8	0.518	0.801	0.925	53.6	3.82
November	49,681.1	.761	1.177	1.313	34.9	3.76
December	78,651.0	1.165	1.803	2.079	53.6	3.88
January	83,452.4	1.237	1.913	2.206	60.1	3.67
February	86,564.1	1.410	2.181	2.288	60.0	3.82
March	172,221.3	2.552	3.948	4.553	110.7	4.11
April	141,858.9	2.173	3.361	3.751	98.4	3.81
May	80,806.2	1.197	1.852	2.136	63.6	3.36
June	50,132.9	.768	1.188	1.325	36.0	3.68
July	29,987.4	.444	.687	.793	18.7	4.24
August	29,310.0	.434	.672	.775	18.5	4.19
September	21,374.2	.327	.506	.565	16.0	3.53
Year	859,013.3	1.081	1.673	22.709	49.5	45.87

[a] Although the drainage area has been changed at different times, quantities in the table correspond to the present drainage area.

CONCORD RIVER AT LOWELL, MASS.

LOCATION.—At Lawrence Street Bridge in the city of Lowell, Middlesex County.

DRAINAGE AREA.—Concord River above Lowell, 376.5 square miles; net drainage area, excluding diversions, 301.3 square miles; occasional waste water reaches the river from diverted drainage above dam No. 1.

RECORDS AVAILABLE.—January 1, 1901, to September 30, 1916.

GAGES.—Staff gages on east bank above dam and on west bank above head gates.

DISCHARGE MEASUREMENTS.—Mill use determined from water-wheel ratings checked by current-meter measurements. Water wasting over dam computed from weir formula with some corrections for depth.

CHANNEL AND CONTROL. Control formed by crest of dam and head gates to canal. Channel of river about 100 feet wide from Lawrence Street Bridge to North Billerica, 4 miles. Pondage drawn on but little.

DIVERSIONS.—Run-off from 75.2 square miles above dam No. 1 of Boston Water Works, and including Farm Pond, diverted from the upper part of Sudbury River for municipal supply for city of Boston. Only waste water from this area reaches Concord River.

REGULATION.—Distribution of flow somewhat affected by operation of mills between North Billerica and Lowell.

COOPERATION.—Records furnished by Arthur T. Safford, hydraulic engineer for the owners of the water power taken from Wamesit canal. Record changed to climatic year form by engineers of the Geological Survey.

Daily discharge, in second-feet, of Concord River at Lowell, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	190	242	327	657	618	1,370	1,629	1,373	478	614	399	59
2	190	212	316	.....	559	1,152	.....	1,351	443	.....	389	63
3	.....	213	316	624	529	904	1,829	1,306	433	395	362	.....
4	239	212	317	599	529	784	1,737	1,270	.....	.....	336	.....
5	257	212	.....	578	554	.....	1,708	1,185	452	465	234	.....
6	257	213	311	540	.....	668	1,635	1,119	460	465	.....	157
7	257	.....	281	620	587	580	1,625	.....	505	455	199	219
8	257	213	277	592	447	613	1,563	1,062	489	408	206	239
9	310	239	257	.....	509	553	.....	937	521	.....	263	239
10	.....	257	257	585	507	568	1,544	882	554	388	256	.....
11	309	257	275	523	535	557	1,481	825	.....	378	254	248
12	.....	257	.....	483	519	.....	1,463	818	651	363	237	188
13	302	257	257	475	.....	589	1,463	835	678	362	.....	174
14	279	.....	257	468	228	614	1,379	.....	720	303	256	158
15	279	257	259	376	222	581	1,329	555	800	295	235	224
16	301	258	259	.....	339	559	.....	525	775	.....	237	255
17	.....	258	304	396	481	563	1,345	534	806	248	237	.....
18	257	257	318	354	530	581	1,310	716	.....	233	237	254
19	257	258	.....	338	491	.....	.....	886	1,065	253	223	251
20	257	344	674	334	.....	581	1,213	872	1,080	220	.....	253
21	258	.....	725	321	450	612	1,143	.....	1,094	218	240	256
22	258	355	691	365	.....	619	1,076	1,109	1,133	239	161	256
23	258	357	660	.....	486	551	.....	1,035	1,052	.....	197	256
24	.....	378	701	510	432	545	1,146	922	997	313	225	.....
25	257	.....	.....	559	490	561	1,194	839	.....	364	217	188
26	257	345	.....	466	602	.....	1,275	749	1,129	418	222	186
27	257	347	693	639	.....	679	1,192	662	1,017	42[1]	.....	191
28	257	.....	761	656	1,338	780	1,209	.....	789	491	216	191
29	243	333	818	605	1,451	988	1,249	.....	734	495	186	191
30	242	331	496	.....	.....	1,203	.....	.....	664	.....	243	191
31	.....	.....	613	658	.....	1,471	.....	507	.....	464	185	.....

NOTE.—No records on Sundays and holidays.

Monthly discharge of Concord River at Lowell, Mass., for the year ending Sept. 30, 1916.

Month.	Mean discharge in second-feet.	Month.	Mean discharge in second-feet.
October	259	May	915
November	274	June	751
December	439	July	371
January	512	August	246
February	560	September	204
March	734		
April	1,406	The year	554

NOTE.—Means obtained by averaging only daily determinations recorded in preceding table.

SUDBURY RIVER AND LAKE COCHITUATE BASINS NEAR FRAMINGHAM AND COCHITUATE, MIDDLESEX COUNTY, MASS.

DRAINAGE AREA.—Area of Sudbury basin from 1875 to 1878, inclusive, was 77.8 square miles; 1879–80, 78.2 square miles; 1881–1916, 75.2 square miles. Area of Cochituate basin from 1863 to 1909, inclusive, was 18.87 square miles; 1910, 17.8 square miles; 1911 to 1916, 17.58 square miles.

RECORDS AVAILABLE.—Of Sudbury River, January, 1875, to September, 1916; of Lake Cochituate, January, 1863, to September, 1916. Sudbury River and Lake Cochituate have been studied by the engineers of the city of Boston, the State Board of Health of Massachusetts, and the Metropolitan Water and Sewerage Board; records of rainfall have been kept in the Sudbury basin since 1875 and in the Cochituate basin since 1852, but the latter are considered of doubtful accuracy previous to 1872.

REGULATION.—The greater part of the flow from these basins is controlled by storage reservoirs constructed by the city of Boston and the Metropolitan Water and Sewerage Board. Lake Cochituate, which drains into Sudbury River a short distance below Framingham, is controlled as a storage reservoir by the Metropolitan Waterworks. In the Sudbury River basin the water surfaces exposed to evaporation have been increased from time to time by the construction of additional storage reservoirs. From 1875 to 1878, inclusive, the water surface amounted to 1.9 per cent of the total area; from 1879 to 1884, to 3 per cent; 1885 to 1893, to 3.4 per cent; 1894 to 1897, to 3.9 per cent; 1898 and subsequent years, 6.5 per cent.

DETERMINATION OF DISCHARGE.—In determining the run-off of the Sudbury and Cochituate drainage areas the water diverted for the municipal supply of Framingham, Natick, and Westboro, which discharge their sewerage outside the basins, is taken into consideration; the results, however, are probably less accurate since the sewerage diversion works were constructed. The public water and sewerage works were installed in these towns as follows:

Dates of installation of water and sewerage works in Framingham, Natick, and Westboro.

Town.	Water supply.	Sewerage works.
Framingham	1875	1889
Natick	1874	1896
Westboro	1879	1892

Water from the Wachusetts drainage area also passes into the reservoirs in the Sudbury basin and must be measured to determine the yield of the Sudbury basin; the small errors unavoidable in the measurement of large quantities of water decrease the accuracy of the determination of the Sudbury water supply during months of low yield for years subsequent to 1897.

COOPERATION.—Record furnished by the Metropolitan Water and Sewerage Board of Boston; form changed to climatic year by engineers of the Geological Survey.

Yield and rainfall in Sudbury River basin near Framingham, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 75.2 square miles.]

Month.	Total yield (million gallons).	Yield per square mile.		Run-off.		Rainfall (inches).
		Million gallons per day.	Second-feet.	Depth on drainage area (inches).	Per cent of rainfall.	
October	538.2	0.231	0.357	0.412	14.0	2.95
November	589.2	.261	.404	.451	16.2	2.79
December	2,094.2	.898	1.390	1.602	31.5	5.09
January	2,196.4	.942	1.458	1.681	109.8	1.53
February	2,956.9	1.356	2.098	2.262	38.2	5.91
March	4,241.7	1.820	2.815	3.245	78.1	4.16
April	6,851.0	3.037	4.699	5.243	125.1	4.19
May	3,354.0	1.439	2.226	2.567	74.9	3.43
June	2,701.9	1.198	1.853	2.068	43.4	4.77
July	1,364.7	.585	.906	1.044	20.2	5.17
August	181.6	.078	.121	.139	6.9	2.01
September	58.2	.026	.040	.044	2.5	1.80
Year	27,128.0	.986	1.526	20.758	47.4	43.80

Summary of yield and rainfall in Sudbury River basin near Framingham, Mass., for the years ending Sept. 30, 1876–1916.

[Drainage area, 75.2 square miles.[a]]

Month.	Total yield (million gallons).	Yield per square mile.		Run-off.		Rainfall (inches).
		Million gallons per day.	Second-feet.	Depth on drainage area (inches).	Per cent of rainfall.	
October	40,250.1	0.421	0.651	0.751	19.6	3.84
November	69,349.8	.750	1.160	1.294	34.4	3.76
December	93,134.2	.974	1.507	1.738	45.2	3.84
January	116,245.2	1.216	1.882	2.169	52.9	4.10
February	146,312.1	1.680	2.599	2.803	67.2	4.17
March	261,710.3	2.738	4.236	4.884	113.1	4.32
April	182,733.2	1.976	3.057	3.411	96.3	3.54
May	101,406.9	1.061	1.642	1.893	57.9	3.27
June	43,963.6	.475	.735	.820	27.9	2.94
July	17,264.8	.181	.279	.322	8.7	3.69
August	22,945.3	.240	.371	.428	11.1	3.86
September	20,031.3	.217	.335	.374	11.4	3.29
Year	1,115,346.8	.991	1.533	20.887	46.8	44.62

[a] Although the drainage area has been changed at different times, quantities in this table correspond to the present drainage area.

Yield and rainfall in Lake Cochituate basin near Cochituate, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 17.58 square miles.]

Month.	Total yield (million gallons).	Yield per square mile.		Run-off.		Rainfall (inches).
		Million gallons per day.	Second-feet.	Depth on drainage area (inches).	Per cent of rainfall.	
October	166.1	0.305	0.472	0.54	18.6	2.93
November	203.3	.385	.596	.67	25.8	2.58
December	603.5	1.107	1.713	1.98	28.6	5.48
January	585.2	1.074	1.661	1.91	126.0	1.52
February	880.1	1.726	2.671	2.88	50.9	5.66
March	1,214.8	2.229	3.449	3.98	86.1	4.62
April	1,399.6	2.654	4.106	4.58	111.2	4.12
May	892.0	1.637	2.532	2.92	91.2	3.20
June	779.4	1.478	2.287	2.55	46.8	5.45
July	442.1	.811	1.255	1.45	37.2	3.89
August	116.8	.214	.332	.38	21.8	1.75
September	32.1	.061	.094	.10	8.1	1.30
Year	7,315.0	1.137	1.759	23.94	56.3	42.50

Summary of yield and rainfall in Lake Cochituate basin near Cochituate, Mass., for the years ending Sept. 30, 1864–1916.

[Drainage area, 17.58 square miles.[a]]

Month.	Total yield (million gallons).	Yield per square mile.		Run-off.		Rainfall (inches).
		Million gallons per day.	Second-feet.	Depth on drainage area (inches).	Per cent of rainfall.	
October	15,175.4	0.525	0.813	0.94	23.0	4.07
November	20,911.2	.748	1.157	1.29	32.8	3.94
December	26,311.2	.911	1.409	1.62	45.0	3.61
January	32,007.5	1.108	1.714	1.98	51.0	3.88
February	39,883.2	1.515	2.345	2.53	64.2	3.94
March	62,002.3	2.147	3.321	3.83	89.1	4.30
April	46,581.3	1.666	2.578	2.88	82.8	3.48
May	27,781.0	.962	1.488	1.72	48.2	3.57
June	12,822.3	.459	.710	.79	26.2	3.01
July	7,641.3	.265	.409	.47	12.5	3.77
August	11,037.0	.382	.591	.68	16.6	4.09
September	10,831.8	.388	.600	.67	19.1	3.51
Year	312,985.5	.920	1.423	19.40	42.9	45.17

[a] The drainage area has been changed at different times, but quantities in this table correspond to the present drainage area.

BLACKSTONE RIVER BASIN.

BLACKSTONE RIVER AT ALBION, R. I.

LOCATION.—At the dam of the Valley Falls Co. in Albion, Providence County, about 5 miles below the Massachusetts-Rhode Island State line, and 5½ miles below the mouth of Branch River.

DRAINAGE AREA.—433 square miles (321 square miles in Massachusetts and 112 square miles in Rhode Island).

RECORDS AVAILABLE.—October 1, 1914, to September 30, 1916.

GAGES.—Water-stage recorder on right bank of pond, 40 feet above the dam installed August 3, 1915; vertical staff at edge of pond 25 feet above dam used prior to installation of water-stage recorder and for auxiliary readings; staff gage in canal near wheel intake, and staff gage in lower tailrace.

COMPUTATIONS OF DISCHARGE.—Flow over dam ascertained from rating curve based on current-meter measurements; discharge through wheels ascertained from measurements of flow in canal at various gate openings; records kept of wheel operations, usually at fullgate during working hours, variations in load being carried by an auxiliary steam plant.

ICE.—Little if any effect from ice.

REGULATION.—At ordinary stages the flow is regulated by power plants and held in storage by dams above the station, causing low flow during hours when mills are not in operation and on Sundays.

ACCURACY.—Stage-discharge relation for dam remained practically permanent until about September 25, 1916, when operation of flashboards and sluice gates destroyed the value of the record; rating curve fairly well defined below 3,000 second-feet. Discharge rating for wheels was not very accurate, as current-meter measurements made at different times did not agree closely. Open-water ratings used throughout the year. Staff gages on pond, canal, and tailrace, read 5 times daily at 6.15 a. m., 9 a. m., 11.30 a. m., 3 p. m., and 5.30 p. m., to half-tenths. Operation of water-stage recorder was satisfactory except from February 13 to March 24, when there was ice in the float well; gage heights from staff gage used during this period. Owing to lack of full information regarding wheel operation, and uncertainties in connection with rating of flow through the wheels, the values of daily discharge do not have a high degree of accuracy but the values of mean monthly flow are fairly good.

COOPERATION.—Gage-height records for staff gages on pond, canal, and tailrace, furnished by Arnold B. Chace, of the Valley Falls Co.

Discharge measurements of Blackstone River at Albion, R. I., during the year ending Sept. 30, 1916.

[Made by Hardin Thweatt.]

Date.	Discharge.	Date.	Discharge.
	Sec.-ft.		*Sec.-ft.*
Aug. 15	[a] 234	Aug. 16	[a] 245
Aug. 15	[b] 332	Aug. 16	[c] 318

[a] In tailrace No. 1; head on wheels 13.0.
[b] In tailrace No. 2; head on wheels 12.9.
[c] In tailrace No. 2; head on wheels 13.0.

Monthly discharge of Blackstone River at Albion, R. I., for the year ending Sept. 30, 1916.

[Drainage area, 433 square miles.]

Month.	Discharge in second-feet.		Run-off (depth in inches on drainage area).	Month.	Discharge in second-feet.		Run-off (depth in inches on drainage area).
	Mean.	Per square mile.			Mean.	Per square mile.	
October	148	0.342	0.39	May	1,010	2.33	2.69
November	149	.344	.38	June	1,120	2.59	2.89
December	533	1.23	1.42	July	612	1.41	1.63
January	679	1.57	1.81	August	327	.755	.87
February	1,090	2.52	2.72	September	233	.538	.60
March	1,230	2.84	3.27				
April	1,800	4.16	4.64	The year	743	1.72	23.31

CONNECTICUT RIVER BASIN.

CONNECTICUT RIVER AT ORFORD, N. H.

LOCATION.—At covered highway bridge between Orford, N. H., and Fairlee, Vt., approximately 10 miles downstream (by river) from the mouth of Waits River.

DRAINAGE AREA.—3,100 square miles.

RECORDS AVAILABLE.—August 6, 1900, to September 30, 1916.

GAGES.—Inclined staff on left bank 25 feet below bridge; chain attached to upstream side of bridge is also used at certain stages.

DISCHARGE MEASUREMENTS.—Open-water measurements made from cable.

CHANNEL AND CONTROL.—Channel wide and deep, with gravelly bottom; control for high stages is probably at the dam at Wilder, 20 miles below station.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 23.5 feet at 7 a. m. April 3 (discharge, 32,300 second-feet, stage-discharge relation affected by ice); minimum stage recorded, 3.9 feet at 7 a. m. September 3 (discharge, 1,230 second-feet).

1900–1916: Maximum stage recorded, 33.4 feet at 12 noon March 28, 1913 (discharge, computed from extension of rating curve, 57,300 second-feet); minimum 24-hour discharge, 288 second-feet, September 28, 1908.

ICE.—Stage-discharge relation seriously affected by ice, usually from December to March; ice cover usually remains in place throughout the winter.

REGULATION.—About 2,370 million cubic feet of storage has been developed in First Connecticut Lake; natural flow not seriously affected by use of stored water prior to September 30, 1916.

ACCURACY.—Stage-discharge relation affected at times by use of flashboards at Wilder dam and, during the winter, by ice. Two rating curves were used during the year, one curve being well defined for ordinary conditions, the other curve fairly well defined above 3,000 second-feet and used when flashboards were on the dam at Wilder. Gage read to tenths twice daily. Daily discharge ascertained by applying rating table to mean daily gage heights. Results good.

Discharge measurements of Connecticut River at Orford, N. H., during the year ending Sept. 30, 1916.

[Made by R. S. Barnes.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Dec. 22	[a] 8.44	3,450	Feb. 16	[a] 7.05	2,890
Jan. 10	[a] 7.20	2,910	Mar. 25	[a] 6.53	1,982
Feb. 8	[a] 9.85	5,420			

[a] Stage-discharge relation affected by ice.

NOTE.—Several discharge measurements obtained subsequent to Sept. 30 were used in determining the discharge rating curve used from Aug. 29 to Sept. 30.

Daily discharge, in second-feet, of Connecticut River at Orford, N. H., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,490	4,260	4,380	4,610	11,500	5,460	23,600	12,600	8,300	5,580	2,470	1,530
2	2,850	4,840	4,840	3,930	12,000	4,500	29,300	13,000	8,600	4,610	2,650	1,310
3	2,650	5,330	4,500	3,820	11,200	3,930	31,700	13,200	6,900	5,200	2,950	1,280
4	2,850	5,330	4,380	3,930	9,620	3,710	29,900	12,600	6,360	7,180	2,290	1,490
5	2,850	4,840	3,930	3,820	7,740	3,270	25,900	13,000	10,100	10,700	2,110	2,020
6	2,850	4,610	4,150	4,040	6,630	3,050	19,300	11,600	13,500	10,700	1,950	2,150
7	3,380	4,610	3,710	4,040	5,960	2,950	13,200	10,100	13,700	8,020	1,950	2,020
8	3,710	4,500	3,270	3,820	5,330	2,750	11,200	9,320	13,000	6,100	1,790	1,780
9	3,710	4,150	3,160	3,380	4,500	2,750	10,400	8,600	9,920	5,840	2,850	1,540
10	3,490	3,930	2,850	2,950	4,150	2,560	9,470	8,020	8,880	6,760	10,500	1,440
11	3,490	3,820	2,850	3,050	3,710	2,470	9,470	7,460	11,000	5,960	13,000	1,540
12	2,850	3,930	2,750	3,050	3,600	2,380	9,770	6,900	12,100	4,960	11,000	2,290
13	2,290	4,040	2,650	2,750	3,710	2,290	10,700	7,320	12,300	4,380	7,460	2,020
14	2,110	4,040	2,850	3,050	3,380	2,200	11,000	6,630	10,500	4,150	4,960	1,840
15	2,110	4,500	2,750	2,850	2,950	2,110	11,300	5,460	8,880	4,150	4,150	1,540
16	2,200	4,720	2,650	2,560	3,050	2,030	11,600	5,080	7,460	3,820	3,380	1,600
17	2,290	4,840	2,560	2,470	3,050	2,030	12,000	6,630	6,630	3,270	2,850	2,780
18	2,290	4,720	2,850	2,380	2,950	2,030	15,200	17,000	7,040	3,270	2,470	3,450
19	2,200	4,380	3,600	1,950	2,850	2,030	19,100	19,300	7,180	5,960	2,030	3,360
20	1,870	4,380	4,150	1,950	2,750	2,030	20,100	17,200	8,450	6,360	1,790	2,780
21	1,950	5,460	4,040	1,950	2,650	2,200	18,200	13,500	9,770	4,150	1,500	2,570
22	2,470	5,580	3,380	2,110	2,560	2,110	16,300	10,700	9,030	3,490	1,640	2,360
23	2,850	5,580	3,160	2,850	2,470	2,110	18,700	8,880	7,600	4,260	1,570	2,290
24	3,490	5,080	3,050	3,930	2,560	2,110	21,700	8,160	6,360	5,580	1,640	2,360
25	4,260	4,500	3,270	4,380	2,650	2,030	22,100	7,460	5,330	5,700	1,790	2,500
26	3,930	4,150	5,460	4,720	4,150	2,290	20,900	6,630	4,840	4,960	1,640	2,430
27	3,710	3,710	10,500	5,460	8,450	2,560	19,700	6,360	4,960	3,820	1,640	2,150
28	3,710	3,490	11,600	9,180	8,020	3,600	17,000	6,100	6,500	3,490	1,790	1,840
29	3,710	4,040	10,400	13,200	6,500	5,580	14,400	5,330	7,460	3,270	1,890	1,780
30	3,710	3,930	8,020	13,000	.....	10,100	12,800	5,330	6,630	2,850	1,910	3,020
31	3,710	.....	6,100	11,800	.....	18,500	.....	6,630	.....	2,380	1,640	.....

NOTE.—Stage-discharge relation affected by ice from Dec. 9 to Apr. 4; discharge ascertained by means of gage heights, five discharge measurements, observer's notes, and weather records.

Monthly discharge of Connecticut River at Orford, N. H., for the year ending Sept. 30, 1916.

[Drainage area, 3,100 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	4,260	1,870	3,000	0.968	1.12
November	5,580	3,490	4,510	1.45	1.62
December	11,600	2,560	4,450	1.44	1.66
January	13,200	1,950	4,420	1.43	1.65
February	12,000	2,470	5,190	1.67	1.80
March	18,500	2,030	3,540	1.14	1.31
April	31,700	9,470	17,200	5.55	6.19
May	19,300	5,080	9,550	3.08	3.55
June	13,700	4,840	8,640	2.79	3.11
July	10,700	2,380	5,190	1.67	1.92
August	13,000	1,500	3,330	1.07	1.23
September	3,450	1,280	2,100	.677	.76
The year	31,700	1,280	5,910	1.91	25.92

CONNECTICUT RIVER AT SUNDERLAND, MASS.

LOCATION.—At the five-span steel highway bridge at Sunderland, Franklin County, on the road leading to South Deerfield, about 18 miles in a direct line and 24 miles by river above dam at Holyoke. Deerfield River enters the Connecticut from the west about 8 miles above the station.

DRAINAGE AREA.—8,000 square miles.

RECORDS AVAILABLE.—March 31, 1904, to September 30, 1916. From 1880 to 1899 records were obtained at Holyoke, Mass.

GAGES.—Chain on downstream side of bridge read by V. Lawer. Sanborn water-stage recorder on left bank, installed September 3, 1916.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Channel deep, with bottom of coarse gravel and alluvial deposits. Control at low stages not well defined but practically permanent; at high stages the control is evidently the crest of the dam at Holyoke.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 22.75 feet at 7 a. m. April 3 (discharge, computed from extension of rating curve, 71,900 second-feet); minimum stage recorded during year, 1.25 feet at 11.30 p. m. September 10 (discharge, 1,350 second-feet).

1904–1916: Maximum stage, 30.7 feet during the night of March 28, 1913, determined by leveling from flood marks (discharge, computed from extension of rating curve, 101,000 second-feet); minimum stage recorded, 0.6 foot September 28, 1914 (discharge, computed from extension of rating curve, 700 second-feet).

ICE.—The river usually freezes over early in the winter but the ice is likely to break up at times of sudden rises in stage and at those times it occasionally forms ice jams at Northampton, 10 miles below the station, causing several feet of backwater at the gage.

REGULATION.—Distribution of flow affected by operation of power plants at Vernon, Vt., Turners Falls, Mass., and on Deerfield River and Millers River. The effect of the regulation is shown by low water at the gage on Sundays and Mondays.

ACCURACY.—Stage-discharge relation practically permanent except when ice is present. Rating curve well defined between 1,500 and 70,000 second-feet. Chain gage read to half-tenths twice daily. Daily discharge ascertained by applying mean of daily gage heights to rating table. Results good except for periods of extremely high and low stages and for times of ice effect, for which they are fair.

Discharge measurements of Connecticut River at Sunderland, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 22	Pierce and Barnes	[a] 9.03	8,500	Mar. 24	Hardin Thweatt	[a] 8.27	8,490
Feb. 1	R. S. Barnes	[a] 16.9	46,800	31	do	[a] 19.0	50,900
4	do	[a] 15.9	33,500				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Connecticut River at Sunderland, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	6,720	4,790	9,520	15,300	47,000	22,500	58,200	37,300	13,300	12,600	9,520	4,590
2	5,620	6,050	9,240	14,000	42,200	20,300	62,800	34,400	14,000	10,100	8,160	4,790
3	4,210	6,720	10,700	10,700	38,500	18,400	70,100	32,800	14,700	10,100	5,200	3,170
4	3,670	6,720	10,700	11,700	34,000	16,700	61,500	30,400	17,000	16,700	4,990	2,450
5	6,490	7,420	6,490	12,600	31,600	16,400	53,900	29,600	15,700	16,000	5,200	3,850
6	6,270	7,420	4,400	11,300	24,400	7,910	51,000	27,200	17,400	20,600	2,720	5,200
7	6,950	6,950	7,660	13,000	25,600	12,300	45,900	27,200	21,700	21,400	3,850	4,210
8	7,420	3,500	6,490	11,700	25,200	12,600	41,400	18,800	21,700	16,400	4,790	4,030
9	6,270	5,620	5,830	8,960	17,000	12,300	34,400	23,300	22,900	11,300	4,990	2,870
10	6,050	4,790	5,410	8,420	18,400	11,000	32,800	21,400	21,400	11,000	9,240	2,080
11	7,660	4,590	8,960	10,100	17,400	11,000	31,200	19,900	22,900	13,300	9,810	3,020
12	6,950	5,830	7,660	9,520	17,000	8,690	33,600	17,000	24,800	11,000	16,000	4,590
13	5,410	5,620	5,200	9,810	11,700	6,950	39,000	19,500	26,400	10,100	17,400	4,590
14	5,410	4,210	5,830	7,910	11,300	11,000	38,100	10,100	26,000	12,600	10,700	4,030
15	6,050	4,400	4,990	9,520	13,600	10,300	37,700	8,420	24,000	11,300	8,160	4,790
16	6,490	7,420	4,590	7,180	11,700	9,520	37,700	14,700	18,100	6,050	7,910	14,000
17	5,620	7,910	4,400	6,490	14,300	9,810	41,000	20,600	21,000	7,420	5,830	11,700
18	4,590	10,100	4,400	10,700	17,000	11,000	41,800	43,900	29,600	10,100	5,200	8,420
19	6,050	9,240	18,100	11,000	13,300	5,830	43,000	45,900	26,800	7,910	6,050	6,270
20	5,620	11,300	11,000	7,180	8,760	5,200	45,100	40,600	28,400	5,830	3,170	7,180
21	5,620	11,700	12,000	7,180	4,210	8,420	44,700	34,800	29,200	9,810	3,330	6,270
22	5,830	8,690	11,700	8,960	10,400	8,420	42,600	31,200	24,800	7,910	4,590	6,720
23	7,180	11,300	11,700	16,700	12,600	8,960	45,900	25,200	24,000	6,950	4,400	6,270
24	4,030	9,240	9,810	18,100	14,700	8,960	56,500	22,900	17,400	6,490	5,200	3,330
25	3,020	8,420	8,420	17,400	17,000	10,400	58,800	21,700	16,000	12,000	5,620	6,490
26	4,400	8,160	23,600	17,000	34,800	5,620	53,900	21,000	15,300	12,000	3,850	6,950
27	4,790	8,960	35,300	23,600	41,000	6,950	50,300	18,400	16,000	19,500	2,320	6,050
28	5,620	7,420	32,000	40,000	33,600	16,000	45,900	12,600	16,000	17,400	3,330	5,620
29	5,410	4,400	25,600	61,200	26,800	24,000	43,500	9,810	14,300	15,700	4,790	5,620
30	6,490	7,180	19,900	57,200	.....	33,600	39,000	12,600	12,600	10,700	5,830	8,420
31	4,400	.....	17,400	51,000	.....	5,460	.....	13,000	.....	9,520	5,200	.....

NOTE.—Discharge relation affected by ice Dec. 14 to Apr. 2; discharge ascertained by means of gage heights, five discharge measurements, weather records, and comparison with records of flow at Orford and Turners Falls.

Monthly discharge of Connecticut River at Sunderland, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 8,000 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	7,660	3,020	5,690	0.711	0.82
November	11,700	3,500	7,200	0.900	1.00
December	35,300	4,400	11,600	1.45	1.67
January	61,200	7,180	16,900	2.11	2.43
February	47,000	4,210	21,900	2.74	2.96
March	54,600	5,620	13,700	1.71	1.97
April	70,100	31,200	46,000	5.75	6.42
May	45,900	8,420	24,100	3.01	3.47
June	29,600	12,600	20,400	2.55	2.84
July	21,400	5,830	11,900	1.49	1.72
August	17,400	2,320	6,370	.796	.92
September	14,000	2,080	5,650	.706	.79
The year	70,100	2,080	15,900	1.99	27.01

PASSUMPSIC RIVER AT PIERCE'S MILLS, NEAR ST. JOHNSBURY, VT.

LOCATION.—At suspension footbridge just below Pierce's mills, about 2 miles below mouth of Sheldon Branch, 4 miles above mouth of Moose River, and 5 miles north of St. Johnsbury, Caledonia County.

DRAINAGE AREA.—237 square miles.

RECORDS AVAILABLE.—May 26, 1909, to September 30, 1916.

GAGE.—Staff, in two sections; low-water section a vertical staff bolted to ledge just above bridge; high-water section an inclined staff bolted to ledge below bridge; read by Joseph Cox.

DISCHARGE MEASUREMENTS.—Made from footbridge or by wading below the bridge.

CHANNEL AND CONTROL.—Bed composed of ledge rock partly covered with gravel and alluvial deposits. At high stages the control is probably at the dam near Centervale.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.9 feet at 7 a. m. March 31 (discharge, computed from extension of rating curve, 3,210 second-feet); minimum stage recorded during year, 1.4 feet at 5.30 p. m. August 19 (discharge, 109 second-feet).

1909–1916: Maximum stage recorded, 14.8 feet during the night of March 27, 1913, determined by leveling from flood marks (discharge not computed); minimum stage recorded, zero flow at various times due to water being held back by mills.

ICE.—River freezes over at the control, causing the stage-discharge relation to be seriously affected; ice jams occasionally form below the gage.

REGULATION.—There is a small diurnal fluctuation caused by the operation of Pierce's mills, just above station, and by other mills farther upstream. The effect of the diurnal fluctuation was studied by means of a portable automatic gage from August 16 to September 11, 1914. Although the results obtained from twice-a-day gage heights were found to be occasionally in error for individual days, yet the values of mean discharge for the period as determined from twice-a-day gage heights and from hourly values were found to be identical.

ACCURACY.—The stage-discharge relation has remained practically permanent, but individual discharge measurements frequently show a large percentage of error, probably due to fluctuation in stage during the measurement. Rating curve fairly well defined below 2,000 second-feet. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying rating table to mean daily gage heights. Results good.

Discharge measurements of Passumpsic River at Pierce's mills, near St. Johnsbury, Vt., during the year ending Sept. 30, 1916.

[Made by R. S. Barnes.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Dec. 16	[a] 1.79	213	Mar. 26	[b] 2.70	191
Feb. 9	[b] 2.90	326			

[a] Partly frozen over at control. Stage-discharge relation not affected.
[b] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Passumpsic River at Pierce's mills, near St. Johnsbury, Vt., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	189	216	305	460	1,410	670	2,360	830	530	320	245	152
2	202	216	202	530	1,120	600	2,360	750	390	275	176	245
3	260	202	260	530	910	560	1,220	670	320	830	164	230
4	202	216	202	460	750	460	950	1,000	1,310	750	164	176
5	260	216	202	460	670	460	750	670	910	640	164	216
6	500	202	189	500	600	390	710	600	750	405	189	202
7	290	202	176	600	530	360	790	530	560	320	152	176
8	230	202	176	500	360	290	750	500	460	710	164	176
9	230	189	189	390	360	290	710	500	420	500	1,560	460
10	202	202	164	360	290	290	600	460	600	340	1,660	230
11	189	189	176	290	290	290	710	500	910	420	670	176
12	176	176	176	290	260	320	910	420	670	360	500	152
13	176	189	216	230	260	290	830	375	530	500	360	152
14	176	189	176	275	260	290	1,000	340	670	320	290	141
15	245	230	202	202	260	230	790	320	460	245	230	152
16	216	320	176	202	202	202	910	420	390	230	202	530
17	176	230	176	152	176	176	1,170	1,220	460	290	189	245
18	176	189	260	202	176	152	2,060	2,480	460	260	176	189
19	202	164	560	176	176	176	1,760	1,170	460	230	141	202
20	460	530	360	176	176	152	1,080	790	1,000	202	152	152
21	305	405	290	164	176	130	670	600	600	176	141	164
22	290	320	230	202	152	130	1,220	530	460	202	152	141
23	230	275	202	750	130	130	2,240	500	375	830	152	164
24	202	230	230	640	152	130	1,510	460	320	360	176	176
25	202	189	230	530	152	130	1,310	420	305	260	164	176
26	189	176	1,660	600	560	152	1,170	390	360	216	164	152
27	230	189	1,410	790	950	260	950	360	275	390	152	152
28	216	230	870	2,060	910	600	910	320	640	230	202	130
29	202	230	530	1,760	750	1,760	830	340	420	202	230	152
30	216	460	530	1,220	.....	2,660	830	500	500	189	189	2,060
31	260	.....	405	1,170	.....	3,140	.....	870	.....	275	202	.....

NOTE.—Stage-discharge relation affected by ice Jan. 9–25, Feb. 4–27, and Mar. 3–28; discharge ascertained by means of gage heights, discharge measurements, observer's notes, and weather records.

Monthly discharge of Passumpsic River at Pierce's mills, near St. Johnsbury, Vt., for the year ending Sept. 30, 1916.

[Drainage area, 237 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	500	176	235	0.992	1.14
November	530	164	239	1.01	1.13
December	1,660	164	365	1.54	1.78
January	2,060	152	544	2.30	2.65
February	1,410	130	454	1.92	2.07
March	3,140	130	512	2.16	2.49
April	2,360	600	1,140	4.81	5.37
May	2,480	320	640	2.70	3.11
June	1,310	275	550	2.32	2.59
July	830	176	370	1.56	1.80
August	1,660	141	306	1.29	1.49
September	2,060	130	261	1.10	1.23
The year	3,140	130	466	1.97	26.85

WHITE RIVER AT WEST HARTFORD, VT.

LOCATION.—About 500 feet above the highway bridge in the village of West Hartford, Windsor County, and 7 miles above the mouth of the river.

DRAINAGE AREA.—687 square miles.

RECORDS AVAILABLE.—June 9, 1915, to September 30, 1916.

GAGE.—Inclined staff on left bank; read by F. P. Morse.

DISCHARGE MEASUREMENTS.—Made from cable 1,500 feet below the gage or by wading.

CHANNEL AND CONTROL.—Channel wide and of fairly uniform cross section at measuring section; covered with gravel and small boulders. Control formed by rock ledge 100 feet below the gage, and well defined.

EXTREMES OF DISCHARGE.—Maximum stage recorded from June 9, 1915, to September 30, 1916, 10.7 feet at 7 a. m. April 2, 1916 (discharge, determined from extension of rating curve, 10,200 second-feet); minimum stage recorded, 2.33 feet at 6 a. m. August 29, 1916 (discharge, determined from extension of rating curve, 40 second-feet). The high water of March 27, 1913, reached a stage of 18.9 feet, as determined from reference mark on scale platform opposite gage (discharge not determined).

ICE.—River freezes over at the gage; control remains partly open, although ice on the rocks and along the shore affects the stage-discharge relation for short periods.

REGULATION.—There are several power plants on main stream and tributaries above the station, the nearest being that of the Vermont Copper Co. at Sharon; the operation of this plant causes a small diurnal fluctuation at the gage.

ACCURACY.—Stage-discharge relation practically permanent except when ice is present. Rating curve fairly well defined between 150 and 5,000 second-feet. Staff gage read to quarter-tenths twice daily. Daily discharge ascertained by applying rating table to mean daily gage heights. Results good.

Discharge measurements of White River at West Hartford, Vt., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 22	G. F. Adams	4.17	715	Apr. 7	R. S. Barnes	6.59	3,170
Dec. 5	C. H. Pierce	3.52	376	8[b]	do	6.12	2,220
21	R. S. Barnes	4.10	718	9[b]	do	6.22	2,310
Jan. 11	do	[a] 4.35	748	20	Hardin Thweatt	6.56	3,280
Feb. 7	do	[a] 5.04	936	21	do	6.45	3,090
15	do	4.08	668	25	R. S. Barnes	7.30	4,230
Mar. 20	do	3.98	617	June 21	Hardin Thweatt	5.70	2,120
21	do	3.96	627				

[a] Stage discharge relation affected by ice.
[b] Measurement of doubtful accuracy.

Daily discharge, in second-feet, of White River at West Hartford, Vt., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	210	337	625	715	4,130	1,360	6,080	2,960	1,180	845	315	165
2	225	315	460	950	2,960	1,270	8,900	2,560	950	745	275	142
3	275	295	515	950	2,070	1,180	4,760	1,960	915	1,640	257	177
4	337	295	487	915	1,450	1,180	3,830	2,070	1,640	1,360	275	174
5	295	295	360	810	985	1,100	2,960	1,850	1,450	1,540	257	156
6	410	295	385	1,180	985	1,020	3,240	1,640	1,360	1,270	240	142
7	410	295	360	1,540	985	915	3,380	1,540	1,180	950	195	156
8	315	275	295	1,100	810	1,100	2,690	1,540	1,020	845	295	165
9	275	275	257	950	810	950	2,690	1,540	1,270	715	225	174
10	240	275	295	777	810	810	2,430	1,360	1,740	655	257	128
11	240	295	315	745	810	715	2,690	1,180	1,960	635	275	159
12	225	257	410	745	625	810	3,240	1,020	1,960	597	240	120
13	210	257	360	745	685	810	3,240	950	1,740	745	225	94
14	195	275	275	715	625	745	3,240	915	1,740	625	225	108
15	257	315	275	745	715	625	2,960	880	1,360	570	225	108
16	410	597	275	515	745	597	3,240	845	1,270	435	210	295
17	315	487	295	542	777	625	3,830	2,820	1,960	515	159	240
18	295	337	360	542	745	570	4,440	5,910	2,310	410	210	240
19	275	460	597	515	715	597	3,680	3,100	1,960	435	195	225
20	275	880	950	487	625	625	3,380	2,310	2,690	360	168	148
21	315	880	715	542	542	625	2,960	1,960	1,960	315	180	195
22	315	745	542	715	597	570	3,100	1,640	1,640	487	195	130
23	275	597	460	2,310	655	542	5,570	1,740	1,360	1,100	295	122
24	225	515	487	2,310	625	542	6,080	1,740	1,180	810	295	171
25	225	435	542	1,640	845	570	4,440	1,450	1,180	597	156	177
26	257	385	2,960	1,540	1,180	685	3,980	1,270	1,270	542	148	168
27	257	410	2,310	3,680	3,380	845	3,380	1,180	1,020	515	142	174
28	295	385	1,740	7,820	1,740	1,360	2,960	1,020	1,540	655	142	171
29	275	487	1,270	4,130	1,450	2,190	2,690	1,100	1,180	460	90	145
30	275	685	1,100	2,430	.....	3,680	2,960	1,020	1,020	385	195	1,020
31	275	.....	915	2,690	.....	5,080	.....	1,850	.....	360	180	.....

NOTE.—Stage-discharge relation affected by ice Jan. 10–21 and Feb. 4–14; discharge ascertained by means of gage heights, discharge measurements, observer's notes, and weather records.

Monthly discharge of White River at West Hartford, Vt., for the year ending Sept. 30, 1916.

[Drainage area, 687 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	410	195	280	0.408	0.47
November	880	257	421	.613	.68
December	2,960	257	684	.996	1.15
January	7,820	487	1,480	2.15	2.48
February	4,130	542	1,180	1.72	1.86
March	5,080	542	1,110	1.62	1.87
April	8,900	2,430	3,770	5.49	6.12
May	5,910	845	1,770	2.58	2.97
June	2,690	915	1,500	2.18	2.43
July	1,640	315	714	1.04	1.20
August	315	90	217	.316	.36
September	1,020	94	193	.281	.31
The year	8,900	90	1,110	1.62	21.90

ASHUELOT RIVER AT HINSDALE, N. H.

LOCATION.—At the lower steel highway bridge about a quarter of a mile below dam of Fisk Paper Co. and 1¼ miles above mouth of river at Hinsdale, Cheshire County.

DRAINAGE AREA.—440 square miles.

RECORDS AVAILABLE.—February 22, 1907, to December 31, 1909, and July 11, 1914, to September 30, 1916.

GAGE.—Chain gage on downstream side of bridge; read by T. W. Golden.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Channel covered with coarse gravel and boulders. Control is a short distance below gage and is practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period July 11, 1914, to September 30, 1916, 7.5 feet at 5 p. m. February 26, 1915 (discharge from extension of rating curve, 5,190 second-feet); minimum stage recorded, 2.0 feet at 4 p. m. October 4, 1914 (discharge from extension of rating curve, 10 second-feet).

ICE.—Ice forms below bridge on control, affecting stage-discharge relation for short periods.

REGULATION.—The mills immediately above the station are operated continuously, except on Sundays and holidays, and cause some fluctuation in stage. Storage in mill ponds above has some effect on the distribution of flow.

ACCURACY.—Stage-discharge relation practically permanent, except when ice is present. Rating curve fairly well defined below 4,000 second-feet. Gage read to hundredths twice daily. Discharge ascertained by applying mean of twice-daily gage heights to rating table.

Discharge measurements of Ashuelot River at Hinsdale, N. H., during the years ending Sept. 30, 1915–1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1914.		*Feet.*	*Sec.-ft.*	1916.		*Feet.*	*Sec.-ft.*
Nov. 7	R. S. Barnes	2.72	88	Sept. 26	Hardin Thweatt	3.90	553

Daily discharge, in second-feet, of Ashuelot River at Hinsdale, N. H., for the years ending Sept. 30, 1914–1916.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1914.				1914.				1914.			
1		115	231	11	145	118	88	21	115	139	68
2		68	179	12	90	155	65	22	142	185	129
3		86	155	13	209	137	49	23	120	129	82
4		102	150	14	179	139	102	24	96	209	98
5		72	124	15	139	158	129	25	106	182	62
6		129	54	16	132	120	106	26	82	145	94
7		96	94	17	142	170	111	27	161	185	98
8		94	113	18	124	122	96	28	98	155	45
9		55	86	19	86	124	142	29	96	185	68
10		106	104	20	129	115	55	30	132	118	98
								31	111	255	.....

Daily discharge, in second-feet, of Ashuelot River at Hinsdale, N. H., for the years ending Sept. 30, 1914–1916—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1914–15.												
1	90	34	142	142	460	1,670	310	1,100	170	273	695	350
2	139	65	102	111	460	1,430	305	1,430	191	520	660	300
3	134	79	90	46	460	770	282	1,380	179	1,050	660	291
4	36	90	170	111	520	770	291	1,380	179	1,320	1,910	264
5	142	96	155	106	400	590	310	1,050	155	1,050	3,580	155
6	134	75	120	170	400	520	264	810	72	810	3,000	185
7	124	90	203	555	520	440	350	660	96	660	730	179
8	68	86	170	490	520	350	430	695	111	900	810	191
9	34	102	185	296	400	340	520	590	142	4,870	1,430	155
10	134	134	118	400	400	490	810	520	209	4,150	1,260	158
11	55	150	185	310	400	460	1,100	520	150	3,290	1,430	142
12	106	82	161	350	325	375	2,170	490	179	2,300	1,320	60
13	134	65	115	460	278	350	2,440	400	111	1,260	1,320	203
14	124	68	155	350	300	300	2,300	350	118	960	1,210	209
15	98	111	111	282	400	400	1,550	340	124	660	1,050	247
16	111	155	82	179	1,380	430	950	320	161	625	900	191
17	102	170	111	161	1,670	400	730	330	170	660	855	155
18	209	155	96	660	1,380	375	625	400	161	730	810	161
19	106	161	111	1,790	1,050	320	345	350	124	810	660	60
20	96	150	90	2,440	660	300	330	345	68	660	625	179
21	111	179	127	2,300	350	310	400	264	161	770	625	223
22	127	106	90	660	325	239	460	255	129	660	695	730
23	86	111	102	375	950	330	490	215	161	590	950	540
24	79	127	104	264	730	350	400	200	142	460	950	340
25	96	106	52	278	3,860	345	375	185	122	590	790	350
26	118	72	52	375	5,000	320	460	170	134	278	625	129
27	96	68	52	375	4,150	239	460	191	90	430	490	179
28	77	75	49	340	2,720	350	375	243	124	660	490	223
29	75	51	55	340	.....	340	340	212	142	660	400	235
30	94	94	55	291	.....	350	695	134	170	770	350	215
31	65	.....	170	310	.....	330	.....	152	.....	730	350	.....
1915–16.												
1	191	245	350	855	1,490	1,790	4,010	1,610	520	625	625	460
2	200	235	375	660	1,000	1,320	4,440	1,320	460	625	282	400
3	96	215	340	730	1,050	1,050	3,860	1,100	460	660	231	400
4	300	235	273	660	1,000	810	3,220	1,000	660	730	264	273
5	400	215	200	520	1,000	695	2,580	950	900	695	310	296
6	400	235	167	400	1,000	730	2,440	855	1,160	770	300	273
7	350	150	197	300	900	660	2,300	730	1,000	660	243	255
8	310	191	223	243	730	730	2,170	770	1,000	590	223	300
9	286	150	155	223	555	660	1,910	770	1,000	430	320	264
10	200	161	182	197	460	630	1,670	695	1,160	400	400	255
11	278	134	209	255	325	590	1,670	625	1,430	350	400	260
12	239	161	264	490	215	520	1,430	590	1,670	350	350	215
13	273	170	286	730	206	460	1,380	590	1,430	340	330	200
14	255	86	255	590	215	400	1,610	520	1,430	320	286	161
15	239	191	223	555	300	300	1,790	555	1,320	350	310	300
16	215	350	203	520	255	300	2,170	490	1,210	235	310	2,170
17	264	400	265	555	300	291	2,170	695	1,320	188	310	2,300
18	255	300	325	590	375	291	2,240	1,490	1,430	200	273	2,040
19	239	340	900	695	255	350	2,300	2,170	1,670	167	264	1,320
20	260	375	1,100	1,000	255	400	2,720	1,670	1,910	161	227	770
21	273	375	1,050	1,160	278	430	2,580	1,260	2,040	155	179	660
22	215	460	900	1,380	300	460	2,300	950	2,300	247	155	490
23	155	460	900	1,670	235	460	2,440	900	1,380	330	231	590
24	129	390	900	1,430	325	460	2,860	730	1,100	375	520	730
25	161	325	730	1,320	400	460	3,290	810	810	350	660	1,000
26	170	264	1,260	1,430	2,040	460	3,000	810	770	375	660	520
27	278	239	2,200	1,790	2,720	490	2,300	660	810	2,860	590	460
28	375	215	3,140	1,910	2,720	520	2,040	590	730	2,170	400	460
29	375	182	2,860	2,040	2,170	1,790	2,170	520	695	1,670	400	460
30	264	278	1,910	1,790	.....	3,290	1,670	590	660	1,380	345	730
31	255	.....	1,210	1,320	.....	3,860	.....	520	.....	1,000	375	.....

NOTE.—Discharge ascertained by comparison with adjacent drainage basins Sept. 20, 1914; Mar. 7, 31, Apr. 7, May 31, June 14, 24, July 14, Aug. 3, 25, Sept. 23, Oct. 14, 22, 31, Nov. 1, 24, Dec. 17, 27, 1915; and Apr. 4, 18, 1916. Stage-discharge relation affected by ice Dec. 16–29, 1914; Feb. 1–15, 1915; and Jan. 9–11, 15–21, Feb. 3–25, Mar. 8–14, 1916. Discharge ascertained by correcting gage heights for backwater by means of observer's notes and climatic data.

Monthly discharge of Ashuelot River at Hinsdale, N. H., for the years ending Sept. 30, 1914–1916.

[Drainage area, 440 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1914.					
July 11–31	209	82	125	0.284	0.21
August	255	55	134	.305	.35
September	231	45	102	.232	.26
1914–15.					
October	209	34	103	.234	.27
November	179	34	104	.236	.26
December	203	49	115	.264	.30
January	2,440	46	494	1.12	1.29
February	5,000	278	1,090	2.48	2.58
March	1,670	239	470	1.07	1.23
April	2,440	264	696	1.58	1.76
May	1,430	134	506	1.15	1.33
June	209	68	142	.323	.36
July	4,870	273	1,100	2.50	2.88
August	3,580	350	1,020	2.32	2.68
September	730	60	233	.530	.59
The year	5,000	34	504	1.15	15.53
1915–16.					
October	400	96	255	0.580	0.67
November	460	86	258	.586	.65
December	3,140	155	760	1.73	1.99
January	2,040	197	903	2.05	2.36
February	2,720	206	796	1.81	1.95
March	3,860	291	828	1.88	2.17
April	4,440	1,380	2,420	5.50	6.14
May	2,170	490	888	2.02	2.33
June	2,300	460	1,150	2.61	2.91
July	2,860	155	637	1.45	1.67
August	660	155	348	.791	.91
September	2,300	161	634	1.44	1.61
The year	4,440	86	820	1.86	25.36

MILLERS RIVER NEAR WINCHENDON, MASS.

LOCATION.—At the steel highway bridge known as Nolans Bridge, about half a mile below the mouth of Sip Pond Brook and 2 miles west of Winchendon, Worcester County.

DRAINAGE AREA.—80.0 square miles.

RECORDS AVAILABLE.—June 5 to September 30, 1916.

GAGES.—Chain gage on downstream side of bridge read by Arthur Lehman. Foxboro water-stage recorder installed July 27, 1916.

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

CHANNEL AND CONTROL.—Channel covered with gravel and alluvial deposits. Control for low and medium stages is about 100 feet below gage, and is clearly defined.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period June 5 to September 30, 5.53 feet at 6 p. m. June 19 (discharge by extension of rating curve, 677 second-feet); minimum stage recorded during period, 2.81 feet at 6 p. m. July 2 and 7 a. m. July 17 (discharge by extension of rating curve, 14 second-feet).

REGULATION.—The distribution of flow is affected by operation of power plants at Winchendon and by storage in Lake Monomonac and other reservoirs.

ACCURACY.—Stage-discharge relation apparently permanent. Rating curve fairly well defined between 20 and 300 second-feet. Chain gage read to hundredths twice daily. Operation of water-stage recorder unsatisfactory, but sufficient records were obtained by it to indicate that the mean gage height from chain gage readings represented fairly well the mean for the day. Daily discharge ascertained by applying mean of twice-daily gage heights to rating table. Results fair.

Discharge measurements of Millers River near Winchendon, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 22	Hardin Thweatt	4.13	226	Aug. 8	H. W. Fear	3.74	137
30	do	3.64	160	23	do	2.97	23.2
June 2	do	3.93	172	23	do	2.98	24.0
30	do	4.23	249	24	do	3.54	90
July 28	do	4.85	324				

Daily discharge, in second-feet, of Millers River near Winchendon, Mass., for the year ending Sept. 30, 1916.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	.....	59	91	63	16	188	a 15	77	220
2	.....	a 15	86	50	17	357	82	54	a 73
3	.....	133	84	a 27	18	a 249	80	56	149
4	.....	99	102	22	19	504	71	29	188
5	135	200	39	46	20	300	55	a 28	109
6	125	123	a 30	73	21	165	52	35	78
7	123	135	80	68	22	288	a 41	39	68
8	92	92	89	60	23	195	42	48	105
9	125	a 37	80	42	24	97	111	74	a 149
10	133	99	78	a 22	25	a 99	58	31	330
11	a 180	172	63	48	26	288	86	44	185
12	402	105	61	66	27	208	172	a 19	84
13	399	100	a 33	71	28	178	354	52	83
14	330	95	58	59	29	137	208	41	95
15	243	68	109	125	30	117	a 83	77	178
					31	.....	149	99	.....

a Sunday.

Monthly discharge of Millers River near Winchendon, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 80 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
June 5-30	504	92	218	2.72	2.63
July	354	15	103	1.29	1.49
August	109	19	60.9	.761	.88
September	330	22	97.8	1.22	1.36

MILLERS RIVER AT ERVING, MASS.

LOCATION.—At downstream end of chair factory at Erving, Franklin County, about 8 miles above the confluence of Millers River with Connecticut River and below all important tributaries.

DRAINAGE AREA.—372 square miles.

RECORDS AVAILABLE.—August 1, 1914, to September 30, 1916.

GAGES.—Vertical staff attached to downstream end of factory; read by C. H. Gary. Automatic water-stage recorder installed in gage house on right bank July 1, 1915; gage heights referenced to gage datum by a hook gage inside the well.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Channel covered with coarse gravel and boulders; control section is a short distance below the gage and is practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 4.95 feet at 8.15 a. m. April 2 (discharge, 3,830 second-feet); minimum stage during year from water-stage recorder, 0.95 foot at noon December 14 (discharge, 4.5 second-feet).

1914–1916: Maximum stage recorded, 5.6 feet at 4 p. m. February 25, 1915 (discharge, 5,160 second-feet);[1] minimum stage, practically no flow at various times during 1915, water being held back by dams above the gage.

ICE.—River freezes over below the gage at various times during the winter; ice considerably broken by rising and falling stages due to power operation.

REGULATION.—Distribution of flow affected by operation of various power plants and storage reservoirs above the station.

ACCURACY.—Stage-discharge relation practically permanent except when ice is present. Rating curve well defined below 4,000 second-feet. Staff gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights from water-stage recorder to rating table. For periods when continuous gage-height record was not obtained the staff gage records were used with corrections as determined by various comparisons with the water-stage recorder. Results good, except for times of ice effect, for which they are fair.

Discharge measurements of Millers River at Erving, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 3	Hardin Thweatt	1.59	94	Feb. 3	R. S. Barnes	3.45	1,200
Dec. 30	do	3.61	1,440	Mar. 20	Hardin Thweatt	2.92	720
31	do	[a] 3.63	1,300	21	do	3.04	819
Jan. 6	do	3.15	907	Apr. 2	do	4.96	3,850
7	do	3.29	969	3	do	4.94	3,820
7	do	3.25	908	5	do	4.33	2,530
21	Pierce and Barnes	[a] 3.20	555	6	do	4.24	2,280
Feb. 2	R. S. Barnes	3.85	1,670	6	do	4.14	2,110
2	do	3.68	1,490	Aug. 10	do	2.60	444
3	do	3.46	1,200				

[a] Stage discharge relation affected by ice.

[1] Supersedes maximum published in Water-Supply Paper 415.

Daily discharge, in second-feet, of Millers River at Erving, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	224	252	280	1,250	1,260	2,240	3,590	1,350	618	540	686	360
2	176	187	268	812	1,200	1,720	3,710	1,150	558	425	534	264
3	147	190	252	852	1,130	1,340	3,470	1,010	480	395	504	166
4	305	190	220	941	1,050	1,180	2,920	950	450	618	385	160
5	213	260	101	708	950	960	2,420	932	435	658	375	228
6	355	292	244	740	700	941	2,160	828	644	716	300	236
7	213	44	213	836	700	844	1,880	672	686	606	335	205
8	330	166	220	1,050	950	708	1,690	772	672	522	276	244
9	272	180	236	1,230	860	788	1,490	844	612	450	492	240
10	232	198	240	1,850	630	724	1,450	852	700	528	430	116
11	264	190	232	1,030	630	679	1,540	756	878	522	425	244
12	248	191	63	860	510	686	1,760	651	1,190	558	380	205
13	256	173	272	724	510	672	1,910	612	1,120	445	310	220
14	228	41	202	724	630	693	1,910	425	923	474	340	183
15	248	240	288	700	630	582	1,990	510	852	390	335	390
16	355	256	430	570	570	558	1,840	582	740	280	310	1,120
17	141	268	456	700	450	740	1,800	1,000	941	345	330	1,030
18	276	240	450	570	510	923	1,720	1,990	1,320	320	272	780
19	410	280	700	510	510	672	1,450	1,800	1,470	370	190	796
20	325	540	852	510	450	658	1,380	1,390	1,440	300	81	700
21	310	440	860	450	450	618	1,240	1,020	1,260	355	272	498
22	292	365	860	510	450	564	1,170	1,050	1,120	410	288	410
23	330	350	796	1,050	450	606	1,590	860	990	252	202	480
24	48	335	748	860	510	716	1,910	905	686	445	292	828
25	260	248	644	846	510	606	2,070	820	570	486	445	869
26	202	284	1,220	914	2,710	644	1,780	686	905	510	340	748
27	198	248	2,410	1,150	2,920	764	1,680	679	960	1,000	198	606
28	194	187	1,850	1,540	3,240	1,370	1,470	480	820	1,520	375	516
29	209	236	1,560	1,560	2,920	1,630	1,480	570	693	1,410	380	420
30	205	240	1,260	1,270	.....	2,240	1,390	510	522	1,040	405	700
31	74	.....	1,220	1,250	.....	3,360	.....	570	.....	780	360	.....

NOTE.—Stage-discharge relation affected by ice Jan. 15–24 and Feb. 4–25, 1916; discharge ascertained by means of gage heights, one discharge measurement, observer's notes regarding ice conditions, and weather records.

Monthly discharge of Millers River at Erving, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 372 sqnare miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	410	48	243	0.653	0.75
November	540	41	244	.656	.73
December	2,410	63	633	1.70	1.96
January	1,850	450	922	2.48	2.86
February	3,240	450	1,000	2.69	2.90
March	3,360	558	1,010	2.72	3.14
April	3,710	1,170	1,930	5.19	5.79
May	1,990	425	878	2.36	2.72
June	1,470	435	842	2.26	2.52
July	1,520	252	570	1.53	1.76
August	686	81	350	.941	1.08
September	1,120	116	465	1.25	1.40
The year	3,710	41	755	2.03	27.61

SIP POND BROOK NEAR WINCHENDON, MASS.

LOCATION.—About 50 feet above highway bridge one-fourth mile below the Massachusetts-New Hampshire State line, 1½ miles below the outlet of Sip Pond, and 3 miles northwest of Winchendon, Worcester County.

DRAINAGE AREA.—18.8 square miles.

RECORDS AVAILABLE.—May 29 to September 30, 1916.

GAGES.—Sloping staff gage on right bank; read by W. G. Greenall. Stevens 8-day water-stage recorder temporarily installed June 30, used except when removed for safety at times of high water.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel rough and covered with boulders immediately above and below gage. Control clearly defined. Considerable aquatic vegetation in the channel during summer months.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period May 29 to September 30, 3.71 feet at 4 p. m. July 28 (discharge by extension of rating curve, 82 second-feet); minimum stage recorded during period, 1.88 feet at 7 a. m. September 15 (discharge by extension of rating curve, 5 second-feet).

REGULATION.—The distribution of flow is considerably affected by operation of mills at State Line, N. H., and by storage in Pearly Pond and Sip Pond.

ACCURACY.—Stage-discharge relation changed slightly at about the time of installation of water-stage recorder; two rating curves have been used, one applicable May 22 to June 29, and the other July 30 to September 30; curves practically parallel, differing by 0.10 foot in gage height, and fairly well defined between 9 and 60 second-feet. Sloping staff gage read to hundredths twice daily. Operation of water-stage recorder satisfactory from the time of its installation June 30, except when it was removed for safety at times of high water. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good.

Discharge measurements of Sip Pond Brook near Winchendon, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 22	Hardin Thweatt	2.99	51	Aug. 8	H. W. Fear	2.30	16.5
30	do	2.22	16.6	8	Hardin Thweatt	2.36	18.1
June 2	do	2.32	20.9	24	H. W. Fear	2.11	9.8
30	do	2.45	22.8	Sept. 17	Hardin Thweatt	2.62	28.7
July 24	do	2.40	20.7				

Daily discharge, in second-feet, of Sip Pond Brook near Winchendon, Mass., for the year ending Sept. 30, 1916.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1	.....	22	16	30	11	16	.....	40	7.7	15	37
2	.....	26	14	26	12	17	.....	42	12	15	31
3	.....	18	22	22	8.5	18	.....	56	13	14	46
4	.....	14	34	19	7.5	19	.....	67	12	15	44
5	.....	24	41	20	12	20	.....	69	9.7	8	34
6	.....	25	32	13	12	21	.....	65	13	14	31
7	.....	24	24	16	10	22	.....	55	14	13	25
8	.....	22	17	20	6.6	23	.....	46	10	15	31
9	.....	22	19	22	12	24	.....	30	16	18	57
10	.....	25	24	20	5.6	25	.....	34	14	15	70
11	.....	50	18	16	10	26	.....	46	18	12	53
12	.....	57	18	12	10	27	.....	42	27	8.7	35
13	.....	52	20	10	9.2	28	.....	38	94	16	31
14	.....	53	16	15	8.2	29	30	31	78	19	29
15	.....	43	12	16	15	30	26	21	58	15	47
						31	30	.....	45	11	.....

NOTE.—Daily discharge based on twice-daily reading of sloping staff gage for the following periods: May 29 to June 29, July 28-31, and Sept. 25-27; for all other days water-stage recorder was used.

Monthly discharge of Sip Pond Brook near Winchendon, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 18.8 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
May	30	26	28.7	1.53	0.17
June	69	14	38.6	2.05	2.29
July	94	7.7	24.8	1.322	1.52
August	30	8.0	16.2	.862	.99
September	70	5.6	25.0	1.33	1.48

PRIEST BROOK NEAR WINCHENDON, MASS.

LOCATION.—At highway bridge 3 miles above confluence of Priest Brook with Miller River and 3½ miles west of Winchendon, Worcester County.

DRAINAGE AREA.—18.8 square miles.

RECORDS AVAILABLE.—May 25 to September 30, 1916.

GAGE.—Sloping staff on left bank 200 feet below highway bridge; read by R. D. Hutchinson.

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

CHANNEL AND CONTROL.—Channel above the station is straight, with fairly uniform section and gravel bottom. Control is formed by the foundation of an old dam 30 feet below the gage and is permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period May 25 to September 30, 4.26 feet at 7 p. m. July 27 (discharge, 176 second-feet); minimum stage recorded during period, 2.40 feet at 7 p. m. August 22, 7 p. m. September 11, 7 a. m. and 7 p. m. September 14, and at 7 a. m. September 15 (discharge, by extension of rating curve, 2.0 second-feet).

REGULATION.—Flow not appreciably affected by regulation.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 5 and 180 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good.

Discharge measurements of Priest Brook near Winchendon, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 22	Hardin Thweatt	3.23	33.9	July 28	Hardin Thweatt	4.18	161
30	do	3.11	25.6	Aug. 8	H. W. Fear	2.66	6.1
June 2	do	3.09	25.6	24	do	3.08	27.0
30	do	2.99	20.4	Sept. 18	Hardin Thweatt	3.56	65

Daily discharge, in second-feet, of Priest Brook near Winchendon, Mass., for the year ending Sept. 30, 1916.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1	.....	26	19	28	6.2	16	.....	28	17	12	127
2	.....	24	18	22	7.7	17	.....	39	16	10	62
3	.....	17	30	19	2.6	18	.....	70	16	8.0	58
4	.....	31	48	28	2.5	19	.....	74	16	6.8	50
5	.....	28	45	20	2.6	20	.....	78	12	15	40
6	.....	24	33	20	4.2	21	.....	72	16	5.0	33
7	.....	33	34	8.8	12	22	.....	62	16	3.0	31
8	.....	30	21	4.8	5.6	23	.....	46	23	10	35
9	.....	27	22	25	11	24	.....	38	20	23	92
10	.....	30	22	27	3.8	25	33	32	20	12	62
11	.....	59	27	18	2.1	26	28	51	21	12	47
12	.....	36	22	16	3.4	27	24	46	85	3.0	38
13	.....	48	18	14	4.0	28	20	31	144	14	31
14	.....	41	20	18	2.0	29	21	26	74	16	31
15	.....	32	18	20	8.0	30	27	22	41	10	57
						31	33	.....	34	9.6	.....

Monthly discharge of Priest Brook near Winchendon, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 18.8 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
May 25–31	33	20	26.6	1.41	0.37
June	78	17	40.0	2.13	2.38
July	144	12	31.2	1.66	1.91
August	28	3.0	14.8	.786	.91
September	127	2.0	29.1	1.55	1.73

OTTER RIVER NEAR GARDNER, MASS.

LOCATION.—At concrete-arch bridge just above outlet of Wilder and Kneeland brooks about 1 mile west of Gardner, Worcester County.

DRAINAGE AREA.—20.0 square miles.

RECORDS AVAILABLE.—June 28 to September 30, 1916.

GAGE.—Vertical staff bolted to downstream side of highway culvert; read by Alfred Cavalier.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—The growth of aquatic vegetation in the channel during the summer months seriously affects the control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period June 29 to September 30, 2.24 feet at 6.30 a. m. July 28 (discharge, 50 second-feet); minimum stage recorded during period, 0.68 foot at 6.30 p. m. August 17 (discharge, 8.6 second-feet).

REGULATION.—The operation of a filter plant one-fourth mile above the gage causes occasional fluctuations in discharge.

ACCURACY.—Stage-discharge relation seriously affected by growth of aquatic vegetation, and frequent discharge measurements are required. The form of the standard curve is fairly well defined. Gage read to hundredths twice daily. Daily discharge ascertained by method of shifting control, applying corrected gage heights to rating table for the standard curve. Results fair.

Discharge measurements of Otter River near Gardner, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 28	Hardin Thweatt	1.61	48.2	Aug. 22	H. W. Fear	1.06	13.1
July 28	do	2.20	47.5	26	do	1.21	20.4
Aug. 9	do	1.33	23.0	Sept. 18	Hardin Thweatt	1.24	16.9
9	H. W. Fear	1.33	23.0				

Daily discharge, in second-feet, of Otter River near Gardner, Mass., for the year ending Sept. 30, 1916.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1		35	30	18	16		28	18	16
2		30	31	16	17		25	9.4	18
3		30	25	19	18		28	10	18
4		40	23	17	19		31	14	17
5		38	20	15	20		30	12	16
6		42	19	14	21		27	11	17
7		37	17	12	22		31	12	15
8		30	19	16	23		35	13	13
9		25	23	17	24		35	19	16
10		23	22	15	25		33	17	16
11		33	23	13	26		35	15	14
12		38	17	15	27		44	15	17
13		35	15	12	28	48	48	16	18
14		30	15	11	29	42	42	20	19
15		30	19	10	30	35	35	20	25
					31		31	18	

Monthly discharge of Otter River near Gardner, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 20.0 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
June 27-30	48	35	41.7	2.08	0.23
July	48	23	33.4	1.67	1.92
August	31	9.4	18.0	.900	1.04
September	25	10	15.8	.790	.88

EAST BRANCH OF TULLY RIVER NEAR ATHOL, MASS.

LOCATION.—At highway bridge half a mile below the mouth of Lawrence Brook and 3½ miles north of Athol, Worcester County.

DRAINAGE AREA.—50.2 square miles.

RECORDS AVAILABLE.—June 13 to September 30, 1916.

GAGE.—Vertical staff on downstream side of right abutment; read by W. A. Thompson.

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

CHANNEL AND CONTROL.—Two channels under bridge, one channel above; about 200 feet below the gage the channel is divided by an island, and the control sections are formed by rocks and boulders in the two channels; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period June 13 to September 30, 2.94 feet at 7 p. m. July 28 (discharge, by extension of rating curve, 300 second-feet); minimum stage recorded during period, 0.46 foot at 6.30 a. m. September 15 (discharge, by extension of rating curve, 10 second-feet).

DIVERSIONS.—About half a mile below the station water is diverted through a canal into Packard Pond. A discharge measurement July 1, 1916, near the outlet into Packard Pond, showed a flow of 10.7 second-feet diverted through the canal.

REGULATION.—Flow not seriously affected by regulation.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 35 and 200 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good.

Discharge measurements of East Branch of Tully River near Athol, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 13	Hardin Thweatt	2.10	151	Aug. 25	H. W. Fear	1.54	74
July 1	do	1.32	51	Sept. 20	Hardin Thweatt	1.86	121
Aug. 9	H. W. Fear	1.37	52				

Daily discharge, in second-feet, of East Branch of Tully River near Athol, Mass., for the year ending Sept. 30, 1916.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1		54	105	26	16	100	28	26	228
2		41	79	20	17	122	29	21	231
3		57	59	16	18	193	26	16	177
4		80	47	15	19	200	20	14	140
5		92	37	14	20	205	18	14	112
6		85	31	14	21	188	17	14	89
7		69	23	16	22	159	18	13	70
8		55	24	16	23	134	44	13	76
9		49	50	18	24	110	51	64	157
10		54	60	14	25	96	44	78	141
11		49	47	12	26	117	49	57	110
12		43	41	12	27	124	156	38	76
13	151	35	38	11	28	103	289	42	69
14	135	47	41	11	29	84	222	52	61
15	117	43	36	15	30	74	162	44	113
					31		129	34	

Monthly discharge of East Branch of Tully River near Athol, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 50.2 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
June 13–30	205	74	134	2.67	1.79
July	289	17	69.5	1.38	1.59
August	105	13	40.6	.809	.93
September	231	11	69.3	1.38	1.54

MOSS BROOK AT WENDELL DEPOT, MASS.

LOCATION.—About one-fourth mile above confluence with Millers River and one-fourth mile from Wendell Depot, Franklin County.

DRAINAGE AREA.—12.2 square miles.

RECORDS AVAILABLE.—June 7 to September 30, 1916. From June 4 to October 16, 1909, records were obtained at a station near the mouth of the stream, and from April 25 to August 27, 1910, at a weir a short distance below the present location.

GAGE.—Sloping staff on left bank; read by C. M. Porter.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel composed principally of ledge rock and boulders. Control permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period June 7 to September 30, 2.16 feet at 8 a. m. June 18 (discharge by extension of rating curve, 46 second-feet); minimum stage recorded during period, 0.89 foot at 6.15 p. m. September 14, and 7.15 a. m. September 15 (discharge by extension of rating curve, 1.0 second-foot).

REGULATION.—Flow not affected by regulation.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 4 and 20 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good.

Discharge measurements of Moss Brook at Wendell Depot, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 8	Hardin Thweatt	1.59	16.0	Aug. 10	H. W. Fear	1.26	5.8
8	do	1.58	16.1	10	Hardin Thweatt	1.26	6.2
July 1	do	1.39	9.4	26	H. W. Fear	1.19	4.7

Daily discharge, in second-feet, of Moss Brook at Wendell Depot, Mass., for the year ending Sept. 30, 1916.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	.....	9.7	8.6	2.5	16	15	6.6	3.0	36
2	.....	8.1	7.0	2.2	17	34	6.6	2.7	21
3	.....	16	6.1	1.9	18	44	6.6	2.2	11
4	.....	13	5.2	1.6	19	37	5.2	2.0	10
5	.....	12	4.8	1.5	20	40	4.3	2.1	7.5
6	.....	10	4.6	1.7	21	30	5.2	2.0	6.1
7	20	8.1	4.5	2.0	22	24	7.5	1.8	4.8
8	16	7.8	6.1	1.8	23	20	17	1.7	10
9	17	11	7.0	1.4	24	15	12	9.2	17
10	22	12	5.7	1.2	25	20	8.1	5.2	11
11	28	8.6	4.6	1.2	26	27	15	4.2	7.3
12	28	8.4	4.8	1.0	27	21	38	3.8	5.9
13	22	8.1	7.0	1.0	28	16	24	5.9	4.8
14	18	10	5.2	1.0	29	13	17	5.7	4.8
15	15	8.1	3.5	6.6	30	11	12	4.0	19
					31	.....	10	3.0	.....

Monthly discharge of Moss Brook, at Wendell Depot, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 12.2 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
June 7–30	44	11	23.0	1.89	1.69
July	38	4.3	11.2	.918	1.06
August	9.2	1.7	4.62	.379	.44
September	36	1.0	6.83	.560	.62

DEERFIELD RIVER AT CHARLEMONT, MASS.

LOCATION.—One mile below the village of Charlemont, Franklin County.

DRAINAGE AREA.—362 square miles.

RECORDS AVAILABLE.—June 19, 1913, to September 30, 1916.

GAGES.—Friez water-stage recorder on left bank, referenced to gage datum by a hook gage inside the well; an outside sloping staff gage is used for auxiliary readings.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Channel covered with coarse gravel and boulders; fairly uniform section; control practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 8.1 feet at 3 p. m. December 26 (discharge, 11,500 second-feet); minimum stage during year from water-stage recorder, 1.58 feet at 5 p. m. September 4 (discharge, 68 second-feet).

1913–1916: Maximum stage, 15.7 feet on July 8, 1915 (discharge computed from extension of rating curve, 45,000 second-feet); minimum stage recorded, 1.35 feet on September 21 and November 3, 1914 (discharge, 23 second-feet).

ICE.—River usually frozen over during the greater part of the winter; ice jams occasionally form below the gage, causing several feet of backwater.

REGULATION.—Flow during low and medium stages largely regulated by a storage reservoir at Somerset, Vt. Several power plants above the station cause diurnal fluctuation.

ACCURACY.—Stage-discharge relation practically permanent except when ice is present. Rating curve well defined. The operation of the water-stage recorder was satisfactory throughout the year except for short periods as shown in the footnote to the daily-discharge table. Daily discharge ascertained as follows: Oct. 1 to Dec. 10, by applying rating table to mean gage height of each 2-hour period; Dec. 11 to July 2, by applying rating table to mean gage height as determined by averaging gage heights for twelve 2-hour periods each day, except when stage-discharge relation was affected by ice (see footnote to daily-discharge table); July 3 to Sept. 30, by discharge integrator. Results excellent.

Discharge measurements of Deerfield River at Charlemont, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 1	Hardin Thweatt	2.62	589	Apr. 5	Hardin Thweatt	3.87	1,950
Jan. 23	R. S. Barnes	[a]5.84	3,790	28	R. S. Barnes	4.58	2,870
31	do	3.55	1,450	29	do	4.38	2,480
Apr. 4	Hardin Thweatt	4.42	2,680	June 12	Hardin Thweatt	2.98	840

[a] Stage discharge relation affected by ice.

Daily discharge, in second-feet, of Deerfield River at Charlemont, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	547	719	760	730	3,950	723	5,440	3,040	460	370	570	415
2	507	718	648	678	2,550	715	6,780	2,950	394	336	578	350
3	485	658	514	655	1,470	678	3,480	2,400	570	457	659	315
4	591	549	388	466	1,050	400	2,480	2,180	1,200	653	572	254
5	538	669	370	605	862	500	1,970	1,840	708	463	619	295
6	1,010	498	382	1,050	915	605	2,110	1,330	942	391	551	387
7	679	403	605	960	915	435	2,040	1,270	708	305	340	474
8	647	468	663	620	549	435	1,590	1,360	514	315	509	410
9	560	588	745	435	663	400	1,330	2,180	753	305	554	357
10	398	540	663	535	723	336	1,210	1,340	822	481	452	310
11	443	443	570	535	598	370	1,180	978	753	369	330	294
12	591	549	305	535	461	400	1,900	822	897	335	255	354
13	612	420	577	570	290	370	2,180	626	678	631	203	365
14	586	358	830	640	383	370	2,110	388	528	1,650	191	362
15	608	685	838	435	570	370	1,970	619	521	755	307	965
16	600	1,050	822	400	715	260	2,250	598	542	336	285	1,510
17	502	647	862	500	570	285	3,040	4,460	2,480	485	504	648
18	489	417	1,900	370	500	310	3,390	3,210	2,320	400	457	283
19	660	764	3,760	400	370	370	2,400	1,410	1,470	496	263	340
20	634	2,580	1,900	605	260	310	2,790	1,270	1,900	594	316	392
21	661	1,360	1,250	605	570	285	2,630	1,060	1,470	435	684	377
22	517	1,060	915	1,150	640	310	3,300	846	1,110	730	523	340
23	507	812	870	3,210	500	285	4,460	951	888	700	450	370
24	304	694	870	1,970	570	260	4,880	1,060	700	555	467	478
25	475	587	626	1,360	1,360	285	3,660	806	549	735	300	393
26	644	590	4,880	1,770	6,150	400	3,760	670	888	905	296	389
27	1,250	554	3,760	3,950	2,710	790	2,870	514	605	1,180	275	363
28	766	481	2,110	7,170	1,050	1,360	2,870	507	472	943	456	300
29	586	626	1,410	3,570	753	2,110	2,550	619	453	618	437	359
30	562	952	1,000	1,840	.....	2,960	3,040	485	407	351	385	730
31	641	.....	775	1,530	.....	4,880	.....	678	.....	360	446	.....

NOTE.—Stage-discharge relation affected by ice Jan. 8–23, Feb. 15–25, and Mar. 2–29; discharge ascertained by means of gage heights, one discharge measurement, comparisons with power-plant records at Shelburne Falls, and weather records. No record by water-stage recorder Feb. 15–17, May 18–20, June 21–23, 30, July 1, 26; record interpolated graphically.

Monthly discharge of Deerfield River at Charlemont, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 362 square miles.]

Month.	Observed discharge (second-feet).			Gain or loss in storage at Somerset, Vt. (millions of cubic feet).[a]	Discharge without storage (second-feet).		Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.		Mean.	Per square mile.	
October	1,250	304	600	−288	492	1.36	1.57
November	2,580	358	715	− 52	695	1.92	2.14
December	4,880	305	1,180	−143	1,130	3.12	3.60
January	7,170	370	1,290	+230	1,380	3.81	4.39
February	6,150	260	1,130	+116	1,180	3.26	3.52
March	4,880	260	728	+ 78	757	2.09	2.41
April	6,780	1,180	2,860	+576	3,080	8.51	9.50
May	4,460	388	1,370	+464	1,540	4.25	4.90
June	2,480	394	890	+183	961	2.65	2.96
July	1,650	305	569	− 47	552	1.52	1.75
August	659	191	427	−648	185	.511	.59
September	1,510	254	439	−335	310	.856	.96
The year	7,170	191	1,010	.....	1,010	2.79	38.29

[a] The increase or decrease of water held in storage at Somerset, Vt., during the month has been computed by engineers of the Geological Survey from data of storage increase or decrease furnished by the company operating the reservoir.

WARE RIVER AT GIBBS CROSSING, MASS.

LOCATION.—Between the highway and electric railway bridges at Gibbs Crossing about three-fourths of a mile above the mouth of Beaver Brook and 3 miles below Ware, Hampshire County.

DRAINAGE AREA.—201 square miles.

RECORDS AVAILABLE.—August 20, 1912, to September 30, 1916.

GAGES.—Barrett & Lawrence water-stage recorder on the right bank referred to gage datum by a hook gage inside of well; inclined staff gage used for auxiliary readings.

DISCHARGE MEASUREMENTS.—Made from the electric railway bridge or by wading.

CHANNEL AND CONTROL.—Channel rough and subject to a growth of aquatic vegetation during the summer months. Control free from weeds and at ordinary stages well defined at a section near the gage; at high stages the control is probably at the dam at Thorndike, 4 miles below the gage.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 5.15 feet at 10 a. m. March 31 (discharge, 2,370 second-feet); minimum stage during year from water-stage recorder, 1.42 feet at 12 noon October 31, and at 5 a. m. November 8 (discharge, 18 second-feet).

1912–1916: Maximum open-water stage recorded, 5.9 feet on March 2, 1914 (discharge, 2,770 second-feet); minimum stage recorded, 1.20 feet on October 26, 1914 (discharge, 5.0 second-feet).

ICE.—Ice usually forms on the river for short periods during the winter and affects the stage-discharge relation; the large diurnal variation in flow prevents a rigid ice cover, and the backwater effect is variable.

REGULATION.—Flow affected by operation of mills at Ware, which at low stages causes a large variation in discharge on days when the mills are in operation, and a low discharge on Sundays and holidays.

ACCURACY.—Stage-discharge relation practically permanent except during ice periods. Rating curve well defined. The operation of water-stage recorder was satisfactory throughout the year except for short periods, as shown in footnote to the discharge table. Daily discharge ascertained as follows: October 1 to April 28 by applying rating table to mean daily gage heights; April 29 to September 30 by discharge integrator. Results good.

Discharge measurements of Ware River at Gibbs Crossing, Mass., during the year ending Sept. 30, 1916.

[Made by Hardin Thweatt.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Jan. 19	[a] 3.39	406	Mar. 28	3.62	1,060
19	[a] 3.10	223			

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Ware River at Gibbs Crossing, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	72	79	116	468	522	1,040	2,160	810	360	300	500	135
2	51	87	120	393	494	790	2,240	700	310	255	420	90
3	29	81	109	408	358	668	2,100	620	210	330	360	40
4	68	79	81	398	353	557	1,680	725	265	415	300	100
5	68	76	37	333	373	487	1,240	720	360	390	210	110
6	79	54	123	550	324	487	1,160	620	430	425	275	120
7	105	21	95	557	383	450	1,110	555	410	355	285	110
8	125	60	97	398	368	432	1,020	575	385	325	300	110
9	105	72	99	311	272	378	956	490	350	300	415	75
10	130	71	101	324	297	408	967	455	380	375	390	35
11	142	69	79	338	268	383	1,020	420	560	360	320	90
12	127	74	44	306	256	315	1,070	380	690	305	245	100
13	93	54	83	311	204	338	1,090	355	650	240	228	100
14	81	24	120	315	236	363	1,120	325	590	245	260	100
15	89	85	159	256	236	343	1,200	375	490	165	280	130
16	79	140	137	236	220	329	1,120	380	440	160	190	95
17	54	130	113	200	200	329	1,030	635	565	140	170	145
18	132	116	183	200	220	315	945	1,130	790	135	180	175
19	99	123	1,000	200	220	302	820	990	880	110	115	220
20	105	153	923	236	200	343	763	860	835	85	75	150
21	103	211	620	306	200	297	718	680	690	95	180	125
22	107	228	432	373	200	284	745	600	590	50	140	120
23	69	232	368	860	193	280	912	530	510	260	135	80
24	28	171	333	620	221	302	1,060	540	420	460	130	45
25	107	111	276	522	306	256	1,030	500	360	360	120	145
26	91	162	850	536	1,410	378	965	425	540	385	85	130
27	109	89	1,230	676	1,820	564	900	365	505	835	100	130
28	107	99	1,080	860	1,440	901	840	325	480	1,640	140	130
29	83	145	870	763	1,310	1,300	885	380	440	1,120	165	130
30	54	137	628	550	.....	1,640	845	365	385	755	165	90
31	20	.....	438	522	.....	2,240	.....	370	.....	605	130	.....

NOTE.—Stage-discharge relation affected by ice Jan. 16–20 and Feb. 14–22; discharge ascertained by means of gage heights, two discharge measurements, and weather records. No record by water-stage recorder Apr. 26–27, July 3–10, and Sept. 27–28; flow estimated by comparison with records at stations in adjacent drainage basins.

Monthly discharge of Ware River at Gibbs Crossing, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 201 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	142	20	87.5	0.435	0.50
November	232	21	108	.537	.60
December	1,230	37	353	1.76	2.03
January	860	200	430	2.14	2.47
February	1,820	193	452	2.25	2.43
March	2,240	256	566	2.82	3.25
April	2,240	718	1,120	5.57	6.21
May	1,130	325	555	2.76	3.18
June	880	210	496	2.47	2.76
July	1,640	50	393	1.96	2.26
August	500	75	226	1.12	1.29
September	220	35	112	.557	.62
The year	2,240	20	407	2.02	27.60

SWIFT RIVER AT WEST WARE, MASS.

LOCATION.—About 1,000 feet below the old wooden dam opposite the WestWare station of the Boston & Albany Railroad, about 6 miles downstream from Enfield, Hampshire County, and 3 miles below the confluence of East and West branches of Swift River.

DRAINAGE.—186 square miles.

RECORDS AVAILABLE.—July 15, 1910, to September 30, 1916.

GAGES.—Barrett & Lawrence water-stage recorder on left bank, referenced to gage datum by means of a hook gage inside the well; an inclined staff gage is used for auxiliary readings. Prior to August 25, 1912, a chain gage on footbridge 600 feet upstream from the present station.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Gravel and alluvial deposits; some aquatic vegetation in channel during summer. Control practically permanent at ordinary stages; at high stages the control is probably at the dam at Bondsville, 4 miles below the gage.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 8.45 feet at 12.30 noon April 3 (discharge, 1,970 second-feet); minimum stage during year from water-stage recorder, 1.64 feet at 1.30 a. m. December 14 (discharge, 47 second-feet).

1910–1916: Maximum stage recorded, 9.1 feet on February 26, 1915 (discharge by extension of rating curve, 2,240 second-feet); minimum stage recorded, 1.36 feet on September 22, 1914 (discharge, 22 second-feet).

ICE.—River usually freezes over for short periods during the winter and the stage-discharge relation is somewhat affected by the ice.

REGULATION.—Operation of mills at Enfield, 6 miles above the station, affects distribution of flow at low and medium stages, but has only a slight effect when the mean daily discharge is over 200 second-feet.

ACCURACY.—Stage-discharge relation appears to have changed slightly, the greatest change being for the high stages when the control is influenced by backwater from the dam at Bondsville. Rating curve well defined below 1,200 second-feet. No record by water-stage recorder December 31 to January 3, and February 24 to March 29. Apart of the old timber dam above the station was carried out by high water on April 3, leaving débris at the gage which affected the operation of water-stage recorder until July 20; gage heights during this period corrected by the aid of reading by observer on outside staff gage, and by comparison with hydrographs of near-by streams. Daily discharge ascertained by applying rating table to mean daily gage heights determined by inspection of gage-height graph, or, for days of considerable fluctuation, by averaging the mean gage heights of 4-hour periods. Results from December 31 to July 20 are only fair, but are good for the remainder of the year.

Discharge measurements of Swift River at West Ware, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 27	Hardin Thweatt	4.10	630	Mar. 30	Hardin Thweatt	5.55	1,070
27	do	4.12	585	July 20	do	2.48	181
27	do	4.15	604	Aug. 12	do	2.77	220
Mar. 30	do	5.11	968	12	H. W. Fear	2.81	220

Daily discharge, in second-feet, of Swift River at West Ware, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	89	101	156	665	625	985	1,590	565	272	232	461	182
2	96	104	152	591	565	840	1,740	550	262	210	340	162
3	110	101	137	518	490	770	1,770	535	243	232	270	143
4	109	102	128	444	460	690	1,590	520	255	280	228	136
5	110	104	121	397	420	635	1,400	475	304	342	200	125
6	130	100	117	447	390	625	1,200	442	368	447	188	132
7	127	98	115	420	365	590	1,100	425	394	433	174	136
8	154	98	120	394	340	545	965	433	394	330	176	128
9	182	84	117	368	315	470	895	447	355	280	217	121
10	188	85	109	355	305	460	848	420	338	304	234	120
11	156	85	109	332	290	440	830	368	355	280	241	123
12	149	86	98	324	280	395	865	325	490	255	236	109
13	130	82	94	314	265	420	930	280	505	243	221	109
14	121	84	82	330	255	410	1,040	250	447	255	202	109
15	127	110	100	292	250	360	1,120	262	368	221	182	127
16	145	123	101	280	245	340	1,100	330	363	180	174	248
17	141	143	112	255	240	335	1,040	447	433	170	164	314
18	136	166	215	240	235	320	930	690	520	170	150	325
19	127	168	402	220	230	300	848	882	610	180	137	297
20	136	194	550	210	210	320	725	830	690	150	118	262
21	143	225	610	210	215	300	690	655	707	147	132	234
22	137	277	550	187	220	300	772	550	640	160	109	200
23	136	232	447	410	220	290	708	475	550	208	121	188
24	127	210	376	475	230	300	778	447	447	257	160	270
25	109	184	333	505	290	275	812	420	389	228	196	307
26	101	156	595	505	830	370	795	394	447	239	202	325
27	109	150	848	610	1,200	535	725	368	461	363	194	300
28	96	145	1,100	742	1,100	785	640	330	381	610	186	262
29	107	143	1,000	830	1,000	900	610	312	330	830	213	245
30	100	150	812	742	.....	1,000	580	304	267	812	223	292
31	96	.....	738	672	.....	1,290	.....	292	.....	625	208	.....

NOTE.—Stage-discharge relation affected by ice Jan. 7–10, 15–19, and Feb. 4–24; discharge ascertained by means of gage heights, observer's notes, and weather records. No record by water-stage recorder Dec. 31 to Jan. 3, and Feb. 24 to Mar. 29; flow estimated by comparison with hydrographs of near-by streams.

Monthly discharge of Swift River at West Ware, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 186 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	188	89	127	0.683	0.79
November	277	82	136	.731	.82
December	1,100	82	340	1.83	2.11
January	830	210	429	2.31	2.66
February	1,200	210	417	2.24	2.42
March	1,290	275	535	2.88	3.32
April	1,770	580	988	5.31	5.92
May	882	250	452	2.43	2.80
June	707	243	420	2.26	2.52
July	830	147	312	1.68	1.94
August	461	109	202	1.09	1.26
September	325	109	201	1.08	1.20
The year	1,770	82	379	2.04	27.76

QUABOAG RIVER AT WEST BRIMFIELD, MASS.

LOCATION.—At the two-span highway bridge, in Hampden County, near the West Brimfield station of the Boston & Albany Railroad; one-third of a mile above the mouth of Blodgett Mill Brook.

DRAINAGE AREA.—150 square miles.

RECORDS AVAILABLE.—August 23, 1909, to September 30, 1916.

GAGES.—Stevens continuous water-stage recorder at downstream end of center pier of bridge, referred to gage datum by means of a hook gage inside of well. Vertical staff is used for auxiliary readings. Prior to August 19, 1912, a vertical staff on upstream side of right abutment of bridge at same datum as present gage.

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

CHANNEL AND CONTROL.—Stream bed covered with boulders, gravel, and alluvial deposits; control practically permanent.

EXTREMES OF DISCHARGE.—Maximum open-water stage during year from water-stage recorder, 4.23 feet at 7.45 a. m. April 3 (discharge, 1,210 second-feet); (a stage of 5.05 feet was recorded at 12 noon January 19, but the water was held back by an ice jam); minimum stage during year from water-stage recorder, 1.72 feet at 4.30 a. m. September 15 (discharge, 20 second-feet).

1909–1916: Maximum stage recorded, 4.9 feet on March 1, 1910 (discharge, 1,660 second-feet); minimum stage recorded, 1.40 feet on September 17 and 18, 1910 (discharge, 2.5 second-feet).

ICE.—Ice usually forms on the river for short periods during the winter and affects the stage-discharge relation; the large diurnal variation in flow prevents a rigid ice cover, and the backwater effect is variable.

REGULATION.—Flow affected by operation of power plants at West Warren, 3 miles above station, which at low stages causes a large variation in discharge on days when the mills are in operation and a low discharge on Sundays and holidays.

ACCURACY.—Stage-discharge relation practically permanent except during ice periods. Rating curve well defined. The operation of the water-stage recorder was satisfactory throughout the year except for short periods as shown in the footnote to daily-discharge table. Daily discharge ascertained as follows: October 1 to March 28, by applying rating table to mean daily gage heights determined by planimeter; March 29 to September 30, by discharge integrator. Results excellent.

Discharge measurements of Quaboag River at West Brimfield, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 17	Hardin Thweatt	[a] 2.93	175	Mar. 29	Hardin Thweatt	3.40	660
Jan. 17	do	[a] 2.90	186	Aug. 11	H. W. Fear	2.72	256

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Quaboag River at West Brimfield, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	59	101	103	340	380	774	1,045	486	215	202	423	120
2	61	96	98	293	360	756	1,080	454	200	190	400	102
3	56	87	98	270	350	749	1,100	426	177	220	378	104
4	63	87	96	200	270	709	1,090	452	184	200	351	105
5	78	98	65	350	350	682	1,040	425	189	204	320	123
6	94	81	105	417	325	661	975	403	211	193	306	109
7	100	69	87	391	325	640	887	389	207	173	288	105
8	110	87	83	365	230	575	842	383	207	159	310	113
9	110	94	67	340	293	483	800	343	225	151	330	88
10	94	83	73	315	250	444	755	326	246	167	302	100
11	118	69	73	340	250	423	745	297	295	162	283	119
12	110	71	60	293	145	407	735	254	338	158	271	97
13	100	69	73	302	145	380	703	263	340	155	256	90
14	101	46	90	293	210	340	750	259	334	156	243	84
15	105	105	110	176	175	315	761	263	327	141	226	98
16	110	94	125	270	175	293	732	245	313	135	215	163
17	90	89	176	250	145	293	705	431	370	147	206	151
18	100	87	210	230	175	270	641	455	395	122	194	156
19	110	110	401	200	175	250	579	418	427	129	180	156
20	110	154	284	230	175	250	575	405	453	121	169	146
21	120	133	250	250	175	250	551	386	429	146	168	142
22	130	145	210	297	175	270	551	380	421	131	155	145
23	130	125	210	380	175	250	587	365	393	188	143	123
24	110	118	222	401	175	250	584	353	363	198	162	130
25	136	110	238	370	210	254	550	325	362	190	148	131
26	125	130	391	391	797	302	530	308	376	220	138	112
27	123	98	306	417	688	417	510	280	330	440	135	105
28	113	98	455	407	783	537	523	259	303	588	148	102
29	110	125	455	380	774	640	521	260	271	500	135	110
30	91	110	325	385	.....	825	507	226	239	484	131	137
31	77	.....	293	385	.....	985	.....	235	.....	463	128	.....

NOTE.—Stage-discharge relation affected by ice Dec. 14–18, 21–23; Dec. 31 to Jan. 4; Jan. 7–12, 16–21; Feb. 9–25; and Mar. 15–24; discharge ascertained by means of gage heights, 2 discharge measurements, observer's notes, and weather records. No record by water-stage recorder Oct. 5, 7–9, 12–13, 16–24, and Dec. 10–13; flow estimated by comparison with records at stations on near-by streams.

Monthly discharge of Quaboag River at West Brimfield, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 150 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	136	56	101	0.673	0.78
November	154	46	99.0	.660	.74
December	455	60	188	1.25	1.44
January	417	176	320	2.13	2.46
February	797	145	305	2.03	2.19
March	985	250	473	3.15	3.63
April	1,100	507	732	4.88	5.44
May	486	226	347	2.31	2.66
June	453	177	305	2.03	2.26
July	588	121	220	1.47	1.70
August	423	128	234	1.56	1.80
September	163	84	119	.793	.88
The year	1,100	46	287	1.91	25.98

WESTFIELD RIVER AT KNIGHTVILLE, MASS.

LOCATION.—At single-span steel highway bridge known locally as Pitcher Bridge, in Knightville, Hampshire County, 1 mile north of outlet of Norwich Lake, and about 3 miles above confluence with Middle Branch of Westfield River.

DRAINAGE AREA.—162 square miles.

RECORDS AVAILABLE.—August 26, 1909, to September 30, 1916.

GAGE.—Chain attached to downstream side of highway bridge; read by J. A. Burr.

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

CHANNEL AND CONTROL.—Channel rough, composed of boulders and ledge rock; control practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.24 feet at 8 a. m. February 26 (discharge, determined by extension of rating curve, 2,910 second-feet); minimum stage recorded during year, 1 foot at 5 p. m. September 13, and 7 a. m. September 14 (discharge, 28 second-feet).

1909–1916: Maximum open-water stage recorded, 8.9 feet on March 27, 1913 (discharge, 5,100 second-feet); (a gage height of 9.4 feet was recorded at 9.15 a. m. January 22, 1910, but channel was probably obstructed by ice at that time); minimum stage recorded, 0.60 foot on August 10, 1913 (discharge, 4 second-feet).

ICE.—Ice usually forms in the river early in the winter, affecting the stage-discharge relation, but is generally carried out by the first sudden rise in stage, leaving the channel clear; these conditions may be repeated several times during the winter.

REGULATION.—Flow not seriously affected by regulation.

ACCURACY.—Stage-discharge relation has probably remained permanent, except during ice periods, although individual discharge measurements have at times appeared erratic; the rough and irregular channel causes difficulty in securing accurate discharge measurements. Rating curve fairly well defined below 2,000 second-feet. Gage read to hundredths twice daily, except during the winter, when it is read once daily. Daily discharge ascertained by applying rating table to mean daily gage heights. Results good.

Discharge measurements of Westfield River at Knightville, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Dec. 23	Hardin Thweatt	[a] 2.38	300
Jan. 25	....do	2.83	497
Mar. 26	....do	2.38	316

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Westfield River at Knightville, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	88	116	201	420	1,440	580	1,990	610	176	112	118	53
2	94	112	179	395	920	470	2,060	523	156	101	99	48
3	204	104	172	395	670	445	1,310	470	158	238	87	46
4	129	112	129	330	495	395	1,310	495	550	222	79	44
5	121	112	129	395	550	372	1,180	420	372	153	90	46
6	222	129	129	855	495	330	1,240	373	310	143	88	40
7	158	112	129	550	470	330	1,180	350	255	123	76	60
8	372	104	129	610	310	310	985	495	222	103	70	50
9	238	108	179	272	350	310	790	395	330	272	199	38
10	179	99	166	238	350	310	790	350	372	207	123	30
11	139	97	141	238	310	272	855	310	395	171	110	32
12	121	90	129	222	310	255	1,380	291	420	134	104	35
13	112	90	129	255	291	272	1,180	255	255	148	94	26
14	101	87	129	291	207	272	1,500	207	255	310	79	25
15	158	153	129	238	222	238	1,440	222	207	163	67	153
16	207	255	129	222	192	222	1,310	255	204	116	61	855
17	156	179	129	207	238	238	1,310	1,210	670	104	59	196
18	129	131	350	192	222	222	1,050	985	580	151	56	134
19	121	238	1,180	153	222	238	1,050	580	395	125	50	121
20	131	730	790	192	222	255	985	420	550	94	38	94
21	174	445	495	222	207	255	920	350	330	148	42	79
22	143	255	372	350	207	272	1,050	291	291	143	36	71
23	116	207	330	1,240	238	272	1,310	445	238	148	88	82
24	97	183	272	790	238	222	1,380	372	196	134	310	207
25	97	166	310	580	470	238	1,050	330	238	99	123	121
26	94	153	2,280	855	2,580	330	855	272	255	174	82	90
27	272	158	1,180	1,710	1,570	495	730	238	238	790	64	79
28	207	158	920	2,280	855	790	855	207	187	395	103	71
29	158	166	670	1,310	670	985	920	201	158	255	118	60
30	139	272	495	855	.....	1,380	730	222	134	158	80	522
31	116	.....	420	790	.....	1,920	.....	222	.....	134	59	.....

NOTE.—Stage-discharge relation affected by ice Dec. 5–18, 22–24; Jan. 10–22; and Feb. 13–24; discharge ascertained by means of gage heights, 2 discharge measurements, observer's notes, and weather records.

Monthly discharge of Westfield River at Knightville, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 162 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	372	88	155	0.957	1.10
November	730	87	177	1.09	1.22
December	2,280	129	404	2.49	2.87
January	2,280	153	569	3.51	4.05
February	2,580	192	535	3.30	3.56
March	1,920	222	435	2.69	3.10
April	2,060	730	1,160	7.16	7.99
May	1,210	201	399	2.46	2.84
June	670	134	303	1.87	2.09
July	790	94	186	1.15	1.33
August	310	36	92	.568	.66
September	855	25	117	.722	.81
The year	2,580	25	376	2.32	31.62

WESTFIELD RIVER NEAR WESTFIELD, MASS.

LOCATION.—At the point known locally as Trap Rock Crossing, about 3 miles east of Westfield, Hampden County, 1 mile below the mouth of Big Brook, and 2 miles below the mouth of Westfield Little River.

DRAINAGE AREA.—496 square miles.

RECORDS AVAILABLE.—June 27, 1914, to September 30, 1916.

GAGES.—Stevens continuous water-stage recorder on right bank, with hook gage inside well; an inclined staff gage is used for auxiliary readings.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Channel covered with gravel and alluvial deposits; riffle of boulders about 200 feet below gage forms control at low and medium stages. At high stages control is probably formed by crest of storage dam at Mittineague, 3 miles below the station.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 11.73 feet at 12 p. m. April 1 (discharge, 8,850 second-feet); minimum stage during year from water-stage recorder, 3.19 feet at 9 p. m. September 2 (discharge, 101 second-feet).

1914–1916: Maximum stage recorded, 17.4 feet on August 4, 1915 (discharge, by extension of rating curve, 17,400 second-feet); minimum stage recorded, 3.02 feet on September 24, 1914 (discharge, 46 second-feet).

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

DIVERSIONS.—Water is diverted from Westfield Little River and carried to Springfield for municipal use.

REGULATION.—Several power plants above the station cause some diurnal fluctuation of flow; the nearest dam is at Westfield.

ACCURACY.—Stage-discharge relation practically permanent except during ice periods. Rating curve well defined. The operation of the water-stage recorder was satisfactory throughout the year except for short periods as shown in the footnote to daily-discharge table. Daily discharge ascertained as follows: October 1 to July 2, by applying rating table to mean daily gage heights determined by planimeter; July 3 to September 30, by discharge integrator. Results excellent.

Discharge measurements of Westfield River near Westfield, Mass., during the year ending Sept. 30, 1916.

[Made by Hardin Thweatt.]

Date.		Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 20		[a] 4.83	530
26		6.46	2,260
Mar. 25		4.49	668

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Westfield River near Westfield, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	252	308	540	1,120	3,000	1,400	6,280	1,330	545	460	422	247
2	252	292	445	1,120	2,210	1,190	6,850	1,160	495	390	387	172
3	340	308	430	1,050	1,630	1,120	4,260	1,050	415	690	370	233
4	390	288	415	990	1,360	1,020	3,430	1,050	930	768	290	141
5	348	308	260	990	1,260	900	2,800	990	810	587	255	181
6	390	300	360	1,830	1,260	810	3,100	930	1,020	525	258	226
7	460	248	320	1,430	1,260	840	2,900	870	750	450	290	218
8	500	300	340	1,050	930	900	2,350	1,020	666	408	355	220
9	654	264	320	810	930	870	2,030	990	960	420	350	232
10	465	248	300	750	900	870	1,910	930	1,080	625	432	131
11	440	332	260	720	780	780	2,120	840	1,190	585	353	219
12	320	248	280	660	720	690	3,210	720	1,160	515	271	227
13	332	240	268	660	630	780	3,000	666	840	477	270	174
14	312	184	320	690	580	750	3,780	565	750	690	274	181
15	300	292	280	530	530	684	4,390	690	642	658	345	410
16	372	690	292	530	530	648	3,210	750	720	420	237	1,990
17	332	560	300	580	530	654	3,000	2,550	1,990	465	238	785
18	348	430	430	580	480	690	2,800	2,600	1,670	418	237	498
19	300	684	2,600	555	455	654	2,210	1,550	1,220	470	220	445
20	328	1,670	2,120	480	455	690	2,120	1,190	1,360	375	263	315
21	368	1,630	1,550	480	430	666	1,990	990	1,020	370	215	305
22	360	750	1,190	900	405	648	2,080	870	930	480	213	265
23	288	605	1,050	4,520	405	630	2,120	870	810	817	152	388
24	248	540	960	2,120	405	666	2,600	900	720	628	375	360
25	292	470	870	2,350	1,120	690	1,990	900	720	485	465	435
26	300	485	4,650	1,830	6,280	840	1,910	750	960	540	387	335
27	300	455	3,900	3,900	3,430	1,330	1,710	672	840	1,290	274	269
28	490	400	2,500	5,860	2,400	1,950	1,710	570	666	1,270	265	248
29	372	470	1,830	3,320	1,550	2,600	1,910	648	590	810	337	254
30	352	605	1,430	1,990	.....	3,900	1,550	580	500	552	290	805
31	280	.....	1,190	1,870	.....	6,140	.....	648	.....	515	278	.....

NOTE.—Stage-discharge relation affected by ice Jan. 10–21 and Feb. 13–24; discharge ascertained by means of gage heights, 2 discharge measurements, and weather records. No record by water-stage recorder Nov. 16–18, Dec. 17–24, Mar. 9–10, and May 4–6; daily discharge estimated by comparison with records at Knightville and Goss Heights.

Monthly discharge of Westfield River near Westfield, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 496 square miles.]

Month.	Observed discharge in second-feet.			Diversion from Westfield Little River (millions of gallons).	Total discharge (second-feet).		Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.		Mean.	Per square mile.	
October	654	248	358	332.4	375	0.756	0.87
November	1,670	184	487	309.3	503	1.01	1.13
December	4,650	260	1,030	313.2	1,050	2.12	2.44
January	5,860	480	1,490	362.1	1,500	3.02	3.48
February	6,280	405	1,270	309.4	1,290	2.60	2.80
March	6,140	630	1,190	346.4	1,210	2.44	2.81
April	6,850	1,550	2,840	340.5	2,860	5.77	6.44
May	2,600	565	995	354.2	1,010	2.04	2.35
June	1,990	415	899	342.6	917	1.85	2.06
July	1,290	370	586	362.3	604	1.22	1.41
August	465	152	302	372.5	321	.647	.75
September	1,990	131	364	350.3	382	.770	.86
The year	6,850	131	982	4,095.2	999	2.01	27.40

NOTE.—The effect of storage in Borden Brook reservoir not taken into account in computing the total discharge.

MIDDLE BRANCH OF WESTFIELD RIVER AT GOSS HEIGHTS, MASS.

LOCATION.—At highway bridge in Goss Heights, Hampshire County, about 1½ miles above village of Huntington, and half a mile above confluence of Middle and North branches of Westfield River.

DRAINAGE AREA.—53 square miles.

RECORDS AVAILABLE.—July 14, 1910, to September 30, 1916.

GAGES.—Water-stage recorder on upstream side of bridge abutment on right bank, with hook gage inside of well. Inclined staff is used for auxiliary readings. Prior to September 8, 1912, a chain gage on upstream side of bridge was used.

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

CHANNEL AND CONTROL.—Channel covered with coarse gravel and boulders; control somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 7.7 feet on February 26, but channel was obstructed by ice at that time; maximum discharge probably occurred at 8 a. m. December 26 (discharge, by extension of rating curve, 2,900 second-feet); minimum stage during year from water-stage recorder, 0.89 foot at 4 a. m. November 14 (discharge, 2.3 second-feet).

1910–1916: Maximum open-water stage recorded, 7.33 feet at 9 p. m. July 8, 1915 (discharge, by extension of rating curve, 4,500 second-feet); (a gage height of 7.7 feet was recorded on February 26, 1916, but channel was obstructed by ice at that time); minimum stage recorded, 0.70 foot on October 26–27, 1914 (discharge, practically zero).

ICE.—River usually frozen over during the greater part of the winter; ice jams occasionally form below the gage causing several feet of backwater.

REGULATION.—Flow slightly affected at times by operation of small power plant about 2 miles above station.

ACCURACY.—Stage-discharge relation changed during high water in January, 1916. Rating curve used previous to January 22 was well defined below 1,300 second-feet; curve used after that date well defined by discharge measurements below 400 second-feet and very nearly parallel to the old curve, above 400 second-feet, the new curve was extended as a parallel curve. Stage-discharge relation seriously affected by ice during December, January, February, and March. Two different water-stage recorders were used during the year, but the results were not entirely satisfactory on account of stopping of the clock. Daily discharge ascertained by applying rating table to mean daily gage heights determined by inspection of gage height graph. Results fair.

Discharge measurements of Middle Branch of Westfield River at Goss Heights, Mass., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 23	Hardin Thweatt	[a] 2.60	80	May 12	Hardin Thweatt	1.22	70
Jan. 25	do	1.70	181	June 1	C. H. Pierce	1.11	44.3
26	do	2.04	317	July 19	Hardin Thweatt	.92	19.1
May 12	do	1.22	70	Aug. 14	H. W. Fear	.84	12.2

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Middle Branch of Westfield River at Goss Heights, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	8.4	10	23	124	510	238	1,030	143	54	30	22	12
2	8.9	5.6	21	117	291	188	1,000	125	43	26	22	11
3	14	9.4	12	104	220	158	645	115	60	78	20	11
4	15	9.4	12	104	188	140	475	110	135	56	20	9.5
5	16	6.0	12	124	143	125	440	100	84	40	18	9.5
6	18	6.4	10	263	117	110	460	86	112	34	18	9.5
7	15	6.4	9	173	93	98	415	89	70	26	18	9
8	35	6.0	11	104	82	86	304	146	62	21	18	9
9	35	5.2	12	80	72	78	252	107	100	26	30	9
10	21	4.8	9	80	62	72	224	84	125	31	24	9
11	16	4.8	9	92	58	86	271	78	158	31	18	9
12	9.4	4.8	9	80	52	62	500	64	135	26	15	9
13	6.4	2.9	12	104	50	58	400	56	93	22	15	8
14	7.9	2.9	12	104	48	52	655	48	76	50	14	8
15	12	14	12	38	48	48	595	60	64	34	12	50
16	18	32	12	47	46	46	475	68	86	24	11	158
17	18	12	80	47	46	44	470	520	238	19	30	56
18	19	7.4	611	47	46	43	410	304	176	20	25	34
19	8.4	24	742	47	46	41	291	191	125	20	15	28
20	12	109	421	47	46	40	287	149	143	16	12	24
21	14	51	256	80	44	38	271	125	105	21	11	20
22	12	33	158	221	44	37	313	105	96	26	11	18
23	9.4	23	65	635	44	35	450	146	72	26	11	18
24	11	20	57	255	44	35	440	152	62	21	42	30
25	12	20	204	182	188	35	291	117	86	17	20	28
26	8.9	18	1,040	340	1,370	43	252	98	107	40	18	22
27	26	13	426	835	595	117	217	86	68	98	16	18
28	23	13	238	965	435	255	224	80	54	100	14	16
29	16	24	158	655	340	540	220	74	41	41	18	16
30	12	33	143	220	.....	835	170	70	34	28	16	80
31	12	.....	130	234	.....	965	.....	66	.....	24	13	.....

NOTE.—Stage-discharge relation affected by ice Dec. 4–18, 21–24; Jan. 7–22; Feb. 5 to Mar. 29; discharge ascertained by means of gage heights, 3 discharge measurements, weather records, and comparison with other records in the Westfield River basin. No record by water-stage recorder, July 30–31; Aug. 1–11, 23–27; Sept. 11–15, 18–30; daily discharge estimated by comparison with records at Knightville and Westfield.

Monthly discharge of Middle Branch of Westfield River at Goss Heights, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 53 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	35	6.4	15.2	0.287	0.33
November	109	2.9	17.7	.334	.37
December	1,040	9.0	159	3.00	3.46
January	965	38	211	3.98	4.59
February	1,370	44	185	3.49	3.76
March	965	35	153	2.89	3.33
April	1,030	170	415	7.83	8.74
May	520	48	121	2.28	2.63
June	238	34	95.5	1.80	2.01
July	100	17	34.6	.653	.75
August	42	11	18.3	.345	.40
September	158	8.0	25.0	.472	.53
The year	1,370	2.9	120	2.26	30.90

WEST BRANCH OF WESTFIELD RIVER AT CHESTER, MASS.

LOCATION.—At steel highway bridge about 500 feet above the Boston & Albany Railroad bridge in the town of Chester, Hampden County, and about 400 feet below the mouth of Walker Brook.

DRAINAGE AREA.—73 square miles.

RECORDS AVAILABLE.—September 29 to December 18, 1915. Two discharge measurements in 1910 and 1911.

GAGE.—Chain gage attached to upstream side of bridge read by Elmer Hunt.

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

CHANNEL AND CONTROL.—Channel covered with coarse gravel and boulders. Riffles about 300 feet below the station form the control section.

EXTREMES OF STAGE.—Maximum stage recorded during period September 29 to December 18, 1915, 3.70 feet at 4 p. m. December 17; minimum stage recorded, 2.28 feet at 8 a. m. November 2.

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

REGULATION.—Several small power developments on the main stream and Walker Brook above the station affect the distribution of flow at low stages.

ACCURACY.—Gage read to hundredths twice daily. Data insufficient to warrant determination of daily discharge; results of discharge measurements and twice-daily gage heights are given.

Discharge measurements of West Branch of Westfield River at Chester, Mass., during 1910–1915.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1910.		*Feet.*	*Sec.-ft.*	1915.		*Feet.*	*Sec.-ft.*
Oct. 15	W. G. Hoyt		33.2	Sept. 29	Hardin Thweatt	2.44	35.3
				Nov. 9	do	2.68	48.1
1911.							
Apr. 15	do	[a] 4.48	651				

[a] Water surface referenced to iron beam in bridge and later reduced to present datum of gage.

Gage height, in feet, of West Branch of Westfield River at Chester, Mass., for the years ending Sept. 30, 1915–16.

Day.	September.				October.				November.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage. height.	Time.	Gage height.
1					7.30	2.33	6.00	2.34	7.30	2.56	5.00	2.42
2					8.00	2.35	6.00	2.68	8.00	2.28	5.00	2.55
3					8.00	2.74	6.00	2.65	8.00	2.60	5.00	2.58
4					7.30	2.60	5.30	2.58	8.00	2.52	5.00	2.60
5					7.00	2.44	5.30	2.55	8.00	2.54	5.00	2.68
6					8.00	2.63	5.30	2.92	8.00	2.54	5.00	2.58
7					7.00	2.65	6.00	2.63	8.00	2.58	5.00	2.55
8					7.30	2.62	6.00	3.14	8.00	2.58	5.00	2.62
9					7.30	2.92	5.30	2.86	7.30	2.53	5.00	2.70
10					8.30	2.34	5.30	2.61	8.00	2.78	5.00	2.78
11					8.00	2.63	5.30	2.54	8.00	2.79	5.00	2.78
12					7.00	2.30	5.30	2.58	8.00	2.80	5.00	2.80
13					7.30	2.45	5.30	2.44	8.00	2.83	5.00	2.90
14					7.30	2.40	5.30	2.54	8.00	2.55	5.00	2.56
15					7.30	2.55	5.30	2.54	8.00	2.90	4.30	3.40
16					8.00	2.66	5.30	2.64	8.00	2.90	5.00	2.52
17					8.00	2.55	5.00	2.55	8.00	2.93	5.00	2.90
18					8.00	2.63	5.30	2.58	8.00	2.90	5.00	2.97
19					7.30	2.50	5.00	2.48	8.00	3.00	5.00	3.50
20					7.00	2.50	5.30	2.47	8.00	3.57	5.00	3.37
21					7.00	2.71	5.00	2.80	8.00	3.08	5.00	3.05
22					7.30	2.55	5.00	2.62	8.00	3.10	5.00	3.06
23					8.00	2.58	5.30	2.54	8.00	3.03	5.00	2.99
24					8.30	2.47	5.30	2.50	7.30	3.02	5.00	2.98
25					8.00	2.48	5.30	2.42	8.00	3.00	5.00	2.97
26					7.30	2.52	5.00	2.53	8.00	2.80	5.00	2.70
27					8.00	3.18	5.00	3.06	8.00	2.90	4.30	2.93
28					8.00	2.90	5.00	2.79	8.30	2.78	4.45	2.78
29			3.00	2.45	8.00	2.86	5.00	2.70	7.30	2.78	5.00	3.05
30	7.30	2.35	6.00	2.31	8.00	2.76	5.00	2.62	8.00	3.15	5.00	3.07
31					8.00	2.56	5.00	2.65				

Day.	December.				Day.	December.			
	A. M.		P. M.			A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.		Time.	Gage height.	Time.	Gage height.
1	8.00	2.93	5.00	3.00	11	8.30	3.10	4.30	3.14
2	8.00	2.98	5.00	2.98	12	7.30	3.11	4.30	3.20
3	8.00	2.89	4.30	2.91	13	7.30	3.37	4.30	3.20
4	8.00	3.00	4.30	3.01	14	8.00	3.31	3.00	3.35
5	8.00	3.04	4.30	3.05	15	8.00	3.35	5.00	3.45
6	8.00	3.09	5.00	3.10	16	8.00	3.35	4.30	3.51
7	8.00	2.88	5.00	2.81	17	9.00	3.67	4.00	3.70
8	8.00	3.04	5.00	2.78	18	8.30	3.60		
9	8.30	2.90	4.45	3.01	19				
10	8.00	3.04	4.30	3.00	20				

WESTFIELD LITTLE RIVER NEAR WESTFIELD, MASS.

LOCATION.—At the diversion dam of the Springfield waterworks, in the town of Russell, Hampden County, 3 miles below the confluence of Pebble and Borden brooks, and about 3 miles west of Westfield. Originally (July, 1905, to December, 1909) a short distance below Borden Brook near Cobble Mountain.

DRAINAGE AREA.—43 square miles at original site; 48 square miles at present site.

RECORDS AVAILABLE.—July 13, 1905, to September 30, 1916.

DETERMINATION OF DISCHARGE.—At the original site below Borden Brook (used 1905–1909) the discharge was determined by methods commonly employed at current-meter gaging stations. From August, 1906, to September, 1907, a 30-foot weir was maintained a short distance below the gage.[1]

Since March 1, 1910, high-water flow determined from continuous records of head on concrete diversion dam (crest length, 155.4 feet), for which coefficients have been deduced from experiments at Cornell University; low-water flow, less than 163 second-feet, determined from continuous record of head on a 12-foot sharp-crested weir without end contractions, the crest being 2.55 feet below that of the dam. Water diverted to city of Springfield is measured by a 54-inch Venturi meter, using continuous record chart. Daily record corrected for storage in a reservoir on Borden Brook about 5 miles above station, but owing to the time required for water to reach the dam and the natural storage along the stream the record as corrected does not represent exactly the natural flow of the stream at all times.

EXTREMES OF DISCHARGE.—Maximum discharge for 24 hours recorded during year, 864 second-feet, February 26; minimum discharge for 24 hours recorded, 0.4 second-foot, September 14.

1909–1916: Maximum discharge for 24 hours, 1,490 second-feet, March 28, 1914; minimum discharge apparently zero at various times when the water released from the reservoir was equal to or greater than the total flow at the diversion dam.

DIVERSIONS.—Record of water diverted at station for municipal supply of Springfield included in records as published.

COOPERATION.—Data collected and compiled under the direction of E. E. Lochridge, chief engineer, board of water commissioners, Springfield, Mass.

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[1] Results obtained by weir and current-meter methods are compared in U. S. Geol. Survey Water Supply Papers 201, pp. 105-110, and 241, pp. 164-168.

Daily discharge, in second-feet, of Westfield Little River near Westfield, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	13.4	19.6	40.3	107	193	136	696	112	35.3	28.4	43.9	10.5
2	24.3	20.4	35.2	101	171	99.2	615	102	25.2	32.4	32.2	10.6
3	23.6	24.4	33.1	86.4	128	80.1	340	82.2	25.6	85.5	24.8	8.8
4	28.7	20.8	25.1	67.7	107	70.7	273	124	38.3	53.3	21.6	6.8
5	21.5	20.6	24.0	89.7	98.0	50.5	315	102	105	46.5	16.9	22.2
6	31.5	21.9	25.3	167	89.2	43.3	381	83.7	93.4	44.1	14.6	15.6
7	30.3	20.1	22.7	117	88.7	43.8	360	87.1	68.1	32.6	15.4	11.4
8	71.3	20.8	21.5	82.1	58.5	54.9	326	83.6	69.5	32.2	22.9	8.5
9	60.3	20.3	24.7	61.3	64.4	44.4	247	77.6	155	60.5	26.0	4.0
10	42.5	21.2	20.1	62.2	59.9	42.3	217	69.8	177	62.6	21.3	7.9
11	32.8	16.1	17.4	70.9	49.0	49.9	268	63.1	168	56.5	20.4	9.5
12	28.9	14.6	16.0	63.5	53.0	40.7	507	47.8	134	46.2	24.3	4.5
13	24.4	17.0	16.2	69.8	46.4	52.1	381	42.7	102	77.4	17.6	7.4
14	22.4	14.4	31.5	60.4	45.4	49.0	663	39.8	74.6	92.1	14.9	.4
15	21.9	49.6	63.0	42.0	52.5	48.9	610	50.0	63.3	69.8	13.3	164
16	21.4	56.6	124	55.4	42.8	46.6	489	87.0	98.5	46.3	[a]18.7	166
17	19.3	87.7	257	41.8	44.8	44.0	398	407	311	39.7	24.1	73.9
18	20.8	32.4	473	45.6	41.7	43.9	413	262	230	57.1	6.0	42.9
19	17.0	84.8	316	47.0	42.1	43.7	390	149	169	40.3	5.0	28.2
20	23.3	169	236	52.2	40.1	26.5	301	112	174	25.2	5.1	22.9
21	44.1	107	162	61.0	38.0	45.0	260	99.8	120	40.4	3.2	15.9
22	35.8	66.8	122	236	40.2	28.4	321	78.2	95.5	78.0	7.4	13.4
23	27.6	60.0	105	283	41.7	35.8	386	87.3	81.1	150	23.6	91.8
24	22.6	44.2	102	151	45.1	25.5	369	82.5	67.0	86.1	82.0	48.4
25	19.7	46.2	142	161	381	60.9	268	71.1	91.4	63.1	21.9	29.9
26	19.6	41.6	824	230	864	69.7	235	49.9	106	147	17.3	21.1
27	27.9	37.3	368	408	351	95.0	173	49.8	66.6	258	13.4	18.7
28	30.4	38.0	243	464	187	162	196	48.0	58.0	216	30.0	19.6
29	27.4	42.0	180	286	172	180	200	46.3	45.8	86.1	23.2	60.4
30	25.5	52.5	147	181	.....	394	154	43.8	35.1	70.4	20.1	155
31	22.0	.....	106	175	.....	549	.....	44.0	.....	60.4	3.8	.....

[a] Discharge interpolated.

Monthly discharge of Westfield Little River near Westfield, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 48 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	71.3	13.4	28.5	0.594	0.68
November	169	14.4	42.9	.894	1.00
December	824	16.0	139	2.90	3.34
January	464	41.8	133	2.77	3.19
February	864	38.0	125	2.60	2.80
March	549	25.5	88.9	1.85	2.13
April	696	154	358	7.46	8.32
May	407	39.8	93.1	1.94	2.24
June	311	25.2	103	2.15	2.40
July	258	25.2	73.7	1.54	1.78
August	82.0	3.2	20.5	.427	.49
September	166	.4	36.7	.765	.85
The year	864	.4	103	2.15	29.22

BORDEN BROOK NEAR WESTFIELD, MASS.

LOCATION.—At the outlet of Borden Brook reservoir in the town of Granville, 2 miles above the confluence of Borden and Pebble brooks and about 8 miles west of Westfield.

DRAINAGE AREA.—8 square miles.

RECORDS AVAILABLE.—January 1, 1910, to September 30, 1916.

DETERMINATION OF DISCHARGE.—Flow determined from a continuous record of the head on a 5-foot sharp-crested weir without end contractions. The results are then corrected for the apparent gain or loss in stored water in the reservoir but no allowance is made for evaporation.

EXTREMES OF DISCHARGE.—Maximum 24-hour flow recorded during year, 142 second-feet on April 1; minimum apparent flow, 0.0 second-feet at various times when the apparent storage release was equal to or greater than the measured flow at the weir.

1910–1916: Maximum 24-hour flow recorded, 294 second-feet on October 21, 1911; minimum apparent flow, 0.0 second-feet.

COOPERATION.—Records furnished by the board of water commissioners of Springfield through E. E. Lochridge, chief engineer.

Daily discharge, in second-feet, of Borden Brook near Westfield, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July	Aug.	Sept.
1	.....	0.2	.....	19	32	50	142	6.3	0.4	.....	3.3	.....
2	.....	.2	.....	16	30	29	96	12	.....	3.3	1.2	.....
3	.....	.2	.....	15	15	13	66	.....	.....	2.5	.....	.....
4	9.3	.2	.....	14	19	15	66	25	.....	.....	.....	.....
5	.....	.2	.....	1.4	16	13	59	18	34	.....	.....	.....
6	.....	.1	.....	8.6	14	.....	59	5.4	12	.....	.....	.....
7	.1	.....	.....	8.6	12	4.6	50	12	13	.....	.....	.....
8	.2	.....	.....	8.1	.....	5.0	50	13	16	.....	.....	.....
9	.3	.....	.....	7.6	4.3	5.0	40	11	30	.....	.....	.....
10	.4	.....	.....	7.6	5.0	4.6	50	8.6	26	.....	.....	.....
11	.4	.....	.....	7.6	5.0	3.5	40	6.2	31	.....	.....	.....
12	.4	.....	.....	7.6	4.6	2.5	59	.....	17	.....	.....	.....
13	.4	.....	.....	7.2	4.3	2.2	50	.....	18	25	.....	.....
14	.4	.....	.....	6.7	4.3	1.9	115	.....	2.0	2.9	.....	.....
15	.4	.1	.5	6.7	4.3	1.6	78	.....	4.6	12	.....	67
16	.4	.2	.7	6.7	4.3	1.6	50	27	20	8.2	.....	11
17	.3	.1	1.2	5.8	4.3	1.6	59	87	34	5.0	17	11
18	.2	.1	63	5.0	4.3	1.6	40	50	29	3.9	.....	11
19	.2	40	46	5.0	3.2	1.6	50	32	32	4.2	.....	.....
20	.2	24	29	5.0	1.7	6.3	31	18	31	.....	.....	.....
21	.2	24	34	5.0	.....	18	31	19	14	.....	.....	.....
22	.2	12	32	7.8	.....	.....	31	17	5.4	19	.....	.....
23	.2	19	14	11	.....	.....	46	15	9.0	7.0	.....	22
24	.2	3.5	17	11	.....	25	28	4.2	6.8	10	11	.....
25	.2	5.0	107	38	129	75	8.7	11	22	11	.....	.....
26	.2	3.2	101	59	108	29	18	.....	15	28	.....	11
27	.2	2.2	62	92	49	16	19	3.6	.....	40	.....	.....
28	.2	2.2	51	75	44	48	29	4.4	5.7	22	11	.....
29	.2	2.8	35	40	50	37	21	4.4	3.2	12	.....	27
30	.2	2.8	30	28	.....	102	19	4.4	.....	3.5	.....	.....
31	.2	.....	14	32	.....	124	.....	4.4	.....	7.2	.....	.....

NOTE.—Discharge determined by subtracting from the quantity of water passing over the weir the quantity apparently released from the reservoir, or by adding the amount apparently stored in the reservoir, as indicated by elevation of water surface in the reservoir. As no allowance has been made for evaporation and seepage from the reservoir, the results show the natural flow at the outlet of the reservoir only approximately. For days for which discharge is not given, the amount apparently released from storage was equal to or greater than the amount passing over the weir.

Monthly discharge of Borden Brook near Westfield, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 8 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	9.3	.....	0.51	0.064	0.07
November	40	.....	4.74	.592	.66
December	107	.....	20.6	2.58	2.97
January	92	1.4	18.3	2.29	2.64
February	129	.....	19.5	2.44	2.63
March	124	.....	20.6	2.58	2.97
April	142	8.7	50.0	6.25	6.97
May	87	.....	13.5	1.69	1.95
June	34	.....	14.4	1.80	2.01
July	40	.....	7.31	.914	1.05
August	17	.....	1.40	.175	.20
September	67	.....	5.33	.666	.74
The year	142	.....	14.6	1.82	24.86

NOTE.—For months for which no minimum is given see footnote to daily discharge.

FARMINGTON RIVER NEAR NEW BOSTON, MASS.

LOCATION.—At highway bridge a quarter of a mile below Clam River and about 1 mile south of New Boston, Berkshire County.

DRAINAGE AREA.—92.7 square miles.

RECORDS AVAILABLE.—May 27, 1913, to September 30, 1916.

GAGES.—Barrett & Lawrence water-stage recorder on left bank, downstream side of bridge, with hook gage inside the well; vertical staff on bridge abutment is used for auxiliary readings.

DISCHARGE MEASUREMENTS.—Made from a cable or by wading.

CHANNEL AND CONTROL.—Channel rocky and filled with boulders; control practically permanent, except as affected by removal of rocks in measuring section.

EXTREMES OF DISCHARGE.—Maximum open-water stage during year from water-stage recorder, 6.72 feet at 10 a. m. December 26 (discharge, by extension of rating curve, 2,120 second-feet). A stage of 8.75 was recorded at 4 a. m. February 26, but the water was held back by an ice jam. Minimum stage during year from water-stage recorder, 2.80 feet at 2 p. m. September 22 (discharge, 36 second-feet).

1913–1916: Maximum open water stage from water-stage recorder, 7.64 feet on October 26, 1913 (discharge, 3,200 second-feet); minimum stage from water-stage recorder, 2.22 feet on August 27, 1913 (discharge, 4.4 second-feet).

ICE.—River usually frozen over during greater part of winter; ice jams occasionally form below the gage causing several feet of backwater.

REGULATION.—Flow affected by storage in Otis reservoir about 5 miles above New Boston and by operation of a woodworking shop just above the station.

ACCURACY.—Stage-discharge relation practically permanent, except when ice is present. Rating curve well defined. The operation of water-stage recorder was satisfactory throughout the year except for short periods as shown in footnote to daily discharge table. Daily discharge ascertained by applying rating table to mean daily gage heights determined by inspection of gage height graph or, for days of considerable fluctuation, by averaging the means of four-hour periods. Results only fair for winter but good for open-water periods.

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Discharge measurements of Farmington River near New Boston, Mass., during the year ending Sept. 30, 1916.

[Made by Hardin Thweatt.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Dec. 20	4.54	427	Jan. 21	4.06	253

Daily discharge, in second-feet, of Farmington River near New Boston, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	40	93	77	320	625	320	1,220	320	96	64	70	118
2	51	84	71	320	435	224	1,220	238	88	63	63	118
3	61	84	68	286	337	197	875	197	87	112	60	114
4	65	82	66	269	254	141	710	224	151	131	56	112
5	61	85	66	302	254	141	550	185	131	105	102	112
6	88	78	63	415	238	162	550	173	151	99	110	114
7	77	77	60	356	210	162	500	151	122	84	114	110
8	107	75	56	286	162	131	445	151	118	77	122	107
9	112	85	54	253	162	122	395	141	120	122	141	107
10	98	47	52	224	151	112	356	141	118	141	120	108
11	80	76	51	210	151	105	356	122	122	122	112	102
12	81	77	50	185	151	105	500	114	131	107	107	99
13	78	68	48	173	151	105	575	106	131	162	105	99
14	75	85	47	173	141	98	710	100	122	337	105	98
15	73	102	46	151	173	90	945	105	122	141	102	141
16	45	141	45	151	151	90	710	114	131	106	102	320
17	40	107	44	141	131	90	710	356	254	100	102	131
18	39	104	238	141	112	100	625	356	269	106	98	141
19	40	112	550	131	112	90	525	269	210	96	96	62
20	65	269	455	151	131	90	455	210	210	80	94	51
21	86	151	395	254	122	100	415	173	173	99	96	46
22	56	122	356	375	122	100	435	162	162	112	110	37
23	55	98	337	575	105	100	525	185	141	108	122	40
24	68	85	302	435	112	120	525	185	131	105	197	64
25	94	75	254	375	210	110	478	162	131	93	141	52
26	131	67	1,060	525	650	120	415	141	210	114	131	41
27	162	65	875	840	525	130	375	122	131	151	131	41
28	116	65	680	1,140	435	175	375	122	112	118	122	35
29	112	67	525	710	415	240	415	122	100	94	131	46
30	105	85	435	500	.....	650	356	118	82	78	131	141
31	100	.....	375	455	.....	980	.....	114	.....	70	122	.....

NOTE.—Stage-discharge relation affected by ice Dec. 7–18, Jan. 9–20, Feb. 13–26, and Mar. 15–29: discharge ascertained by means of gage heights, observer's notes, weather records, and comparison of gage-height graph with similar hydrographs for stations in nearby drainage basins. No record by water-stage recorder Dec. 10–13 and Apr. 7–8, 18; daily discharge estimated by comparison with records at stations on near-by streams.

Monthly discharge of Farmington River near New Boston, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 92.7 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	162	39	79.4	0.857	0.99
November	269	47	93.7	1.01	1.13
December	1,060	44	252	2.72	3.14
January	1,140	131	349	3.76	4.34
February	650	105	239	2.58	2.78
March	980	90	177	1.91	2.20
April	1,220	356	575	6.20	6.92
May	356	100	174	1.88	2.17
June	269	82	142	1.53	1.71
July	337	63	113	1.22	1.41
August	197	56	110	1.19	1.37
September	320	35	96.9	1.05	1.17
The year	1,220	35	200	2.16	29.33

HOUSATONIC RIVER BASIN.

HOUSATONIC RIVER NEAR GREAT BARRINGTON, MASS.

LOCATION.—At highway bridge about one-fourth mile northeast of Van Deusenville station of New York, New Haven & Hartford Railroad (Berkshire division) and 2 miles north of Great Barrington, Berkshire County.

DRAINAGE AREA.—280 square miles.

RECORDS AVAILABLE.—May 17, 1913, to September 30, 1916.

GAGE.—Inclined staff attached to concrete anchorages on downstream side of left abutment of highway bridge; vertical high-water section attached to bridge abutment; read by Martin Love.

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

CHANNEL AND CONTROL.—Bed composed of sand and gravel; control practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 8.0 feet at 5 p. m. March 31 (discharge, by extension of rating curve, 5,300 second-feet); minimum stage recorded during year, 0.8 foot at 7 a. m. November 7 (discharge, 22 second-feet).

1913–1916: Maximum stage recorded, 8.0 feet on March 31, 1916 (approximate discharge, 5,300 second-feet). Zero flow recorded at various times caused by storage of water at Housatonic.

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

REGULATION.—Storage above dam of a paper mill at Housatonic, about a mile above station, causes low flow on Sundays and holidays.

ACCURACY.—Stage-discharge relation evidently changed during the high water of December, 1915. Rating curve used before December 26 well defined below 1,700 second-feet; curve used after that date fairly well defined by discharge measurements below 1,400 second-feet and by shape of old curve. Stage-discharge relation affected by ice for a few days in February. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying the rating table to mean daily gage heights. Results fair.

Discharge measurements of Housatonic River near Great Barrington, Mass., during the year ending Sept. 30,1916.

[Made by Hardin Thweatt.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Dec. 22	3.09	996	Sept. 13	1.67	181
Jan. 23	3.56	1,250	13	1.65	179

Daily discharge, in second-feet, of Housatonic River near Great Barrington, Mass., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	355	180	210	1,060	2,080	730	3,500	990	340	390	280	160
2	180	225	315	850	2,160	700	4,200	820	340	300	205	65
3	122	153	335	990	1,920	640	3,900	760	280	300	220	57
4	375	180	255	790	1,600	550	3,140	640	365	365	190	120
5	275	210	112	820	1,200	390	2,420	610	415	415	220	110
6	195	150	153	990	820	490	1,920	760	550	390	116	96
7	225	48	165	990	920	465	1,920	465	550	340	240	90
8	355	165	225	920	820	280	1,680	610	440	220	190	205
9	255	180	210	670	790	520	1,280	550	390	300	220	140
10	210	180	275	700	730	520	1,360	550	340	260	205	102
11	295	195	100	730	550	520	1,280	550	300	415	175	110
12	335	240	67	700	415	415	1,130	440	300	340	128	150
13	315	195	87	490	390	390	1,760	390	440	300	140	100
14	275	150	122	390	390	520	1,760	320	390	415	260	122
15	275	100	165	340	390	465	2,960	205	300	520	190	550
16	75	125	150	340	390	490	2,780	390	280	190	190	390
17	150	315	141	520	490	415	2,510	520	240	240	190	520
18	225	295	195	490	640	390	2,240	700	365	300	140	390
19	255	315	840	340	640	365	1,920	990	465	390	140	365
20	275	255	1,820	440	465	440	1,680	520	465	300	48	280
21	255	255	1,190	365	490	490	1,520	365	440	300	124	260
22	165	195	1,050	550	580	465	1,360	490	465	365	140	190
23	75	110	910	1,200	465	440	1,360	610	136	260	160	112
24	100	147	875	990	465	465	1,600	490	190	300	220	51
25	150	275	550	1,060	580	390	1,760	580	260	260	175	108
26	195	210	3,700	1,130	670	300	1,600	390	300	280	132	160
27	165	210	3,140	1,600	1,130	490	1,280	415	440	320	73	175
28	255	87	3,050	3,050	1,060	700	1,280	220	365	280	160	92
29	225	165	2,330	3,140	790	1,280	1,060	365	340	150	150	160
30	135	165	2,080	2,600	.....	1,680	990	340	205	220	220	240
31	125	.....	1,280	1,760	.....	3,900	.....	300	.....	280	160	.....

NOTE.—Stage-discharge relation affected by ice Feb. 13–16; discharge ascertained by means of gage heights, observer's notes, and weather records.

Monthly discharge of Housatonic River near Great Barrington, Mass., for the year ending Sept. 30, 1916.

[Drainage area, 280 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	375	75	222	0.793	0.91
November	315	48	189	.675	.75
December	3,700	67	842	3.01	3.47
January	3,140	340	1,000	3.57	4.12
February	2,160	390	829	2.96	3.19
March	3,900	280	655	2.34	2.70
April	4,200	990	1,970	7.04	7.86
May	990	205	527	1.88	2.17
June	550	136	357	1.28	1.43
July	520	150	313	1.12	1.29
August	280	48	174	.621	.72
September	550	51	189	.675	.75
The year	4,200	48	604	2.16	29.36

HOUSATONIC RIVER AT FALLS VILLAGE, CONN.

LOCATION.—About half a mile below the power plant of the Connecticut Power Co. at Falls Village, Litchfield County, 23 miles north of Gaylordsville.

DRAINAGE AREA.—644 square miles.

RECORDS AVAILABLE.—July 11, 1912, to September 30, 1916.

GAGES.—Stevens continuous water-stage recorder on left bank; staff gage inside the well and vertical staff on river bank 25 feet upstream; chain gage 300 feet upstream used for auxiliary readings.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel deep and fairly uniform in cross section; one channel at all stages. Control not clearly defined except at low stages; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 11.45 feet at 10 a. m., April 3 (discharge, 6,960 second-feet); stage practically zero flow at various times during August and September, owing to storage of water above power plant.

1912–1916: Maximum stage recorded, 13.3 feet on March 29, 1914 (discharge, 8,830 second-feet); minimum stage recorded, zero flow at various times owing to storage of water above power plant.

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

REGULATION.—The flow at low water is completely regulated by the power plant at Falls Village.

ACCURACY.—Stage-discharge relation practically permanent, open-water rating curve used throughout the year. Rating curve developed for chain gage and well defined between 200 and 3,000 second-feet, above 3,000 second-feet curve extended by logarithmic plotting, using results of 3 float measurements made between gage heights 12 and 13 feet, rating table for gage heights from water-stage recorder derived from chain gage rating curve by applying a correction for slope between the two gages. Operation of water-stage recorder satisfactory throughout the year except for occasional days as indicated in the footnote to the daily discharge table. Daily discharge ascertained as follows: October 1 to

July 31 by applying rating table to mean daily gage heights determined by planimeter; August 1 to September 30, by use of discharge integrator. Results excellent.

COOPERATION.—All discharge measurements and computations prior to March 1, 1916, made by engineers of Stone & Webster Engineering Corporation.

Discharge measurements of Housatonic River at Falls Village, Conn., during the year ending Sept. 30, 1916.

[Made by Hardin Thweatt.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Aug. 18	2.78	657	Aug. 19	2.68	639

Daily discharge, in second-feet, of Housatonic River at Falls Village, Conn., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	436	520	412	2,740	3,740	1,980	5,830	1,800	920	576	700	395
2	512	388	428	2,340	3,650	1,740	6,620	1,620	720	274	570	250
3	297	424	432	1,880	3,360	1,560	6,720	1,440	675	423	560	70
4	678	420	408	2,120	2,910	1,390	6,080	1,560	603	945	590	200
5	492	404	220	2,060	2,590	1,310	5,150	1,500	1,040	1,020	530	350
6	460	311	460	2,170	2,320	1,140	4,360	1,390	1,040	770	300	335
7	583	202	396	2,430	1,960	1,170	3,840	1,120	945	770	580	285
8	583	384	380	2,200	1,640	1,310	3,610	1,310	845	720	470	235
9	725	400	356	1,870	1,660	1,250	3,250	1,170	970	340	640	300
10	294	380	484	1,650	1,580	1,120	3,040	1,220	820	945	550	100
11	632	360	412	1,550	1,460	1,020	2,830	1,070	403	1,040	550	265
12	472	283	269	1,490	1,260	1,100	2,690	1,020	970	870	450	230
13	547	300	504	1,430	1,110	1,120	2,970	795	745	1,020	150	240
14	468	193	945	1,540	1,200	1,040	3,180	540	698	2,300	650	230
15	472	408	619	1,540	1,120	1,040	4,060	945	698	1,860	565	360
16	460	432	496	1,400	1,290	1,200	4,360	820	675	1,190	530	1,220
17	193	408	480	1,180	1,320	1,200	4,140	1,020	603	1,070	360	1,280
18	440	440	845	1,420	1,240	1,120	3,840	1,680	630	1,020	430	920
19	404	556	1,830	1,500	1,450	1,070	3,540	1,680	1,070	1,100	370	540
20	538	855	2,880	1,360	1,370	1,070	3,250	1,440	1,070	920	133	685
21	534	664	3,050	1,340	1,340	895	2,900	1,220	1,070	995	460	535
22	476	755	2,770	1,440	1,000	995	2,690	1,120	970	820	325	410
23	444	516	2,480	2,760	1,080	920	2,760	945	870	284	255	640
24	193	664	2,230	2,850	1,160	845	2,900	1,120	720	698	410	280
25	360	255	2,040	2,550	1,180	795	2,900	1,120	274	630	435	410
26	392	560	3,800	2,480	2,650	698	2,690	995	870	795	440	425
27	392	480	5,340	3,170	2,910	1,100	2,420	845	820	1,120	120	460
28	380	238	5,670	4,290	2,560	1,500	2,230	459	870	1,170	540	420
29	464	596	5,220	4,770	2,230	2,300	2,160	1,070	745	770	325	460
30	534	420	4,360	4,690	.....	3,110	1,980	415	720	522	405	935
31	199	.....	3,560	4,100	.....	4,590	.....	970	.....	630	395	.....

NOTE.—Jan. 2-3, record from water-stage recorder unreliable; discharge estimated.

Monthly discharge of Housatonic River at Falls Village, Conn., for the year ending Sept. 30, 1916.

[Drainage area, 644 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	725	193	450	0.699	0.81
November	855	193	441	.685	.76
December	5,670	220	1,730	2.69	3.10
January	4,770	1,180	2,270	3.52	4.06
February	3,740	1,000	1,870	2.90	3.13
March	4,590	698	1,380	2.14	2.47
April	6,720	1,980	3,630	5.64	6.29
May	1,800	415	1,140	1.77	2.04
June	1,070	274	802	1.25	1.40
July	2,300	274	890	1.38	1.59
August	700	120	445	.691	.80
September	1,280	70	449	.697	.78
The year	6,720	70	1,290	2.00	27.23

POMPERAUG RIVER AT BENNETTS BRIDGE, CONN.

LOCATION.—About one-fifth mile above the confluence of the Pomperaug with Housatonic River, one-fourth mile north of Bennetts Bridge, New Haven County, and 1 mile east of the Sandy Hook Railroad station.

DRAINAGE AREA.—89.3 square miles.

RECORDS AVAILABLE.—July 30, 1913, to September 30, 1916.

GAGE.—Inclined staff in three parts, attached to rock ledge and to tree on right bank; read by W. H. Ingram.

DISCHARGE MEASUREMENTS.—Made from cable at gage or by wading.

CHANNEL AND CONTROL.—Channel irregular and covered with gravel and boulders. Control is formed by large rocks about 100 feet below the gage and is sharply defined.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.4 feet at 5 p. m. December 26 (discharge, 2,080 second-feet); minimum stage recorded, 0.92 foot at 7 a. m. September 13, 14, and 15 (discharge, 19 second-feet).

1913–1916: Maximum stage recorded, 7.4 feet March 2, 1914 (discharge, 2,520 second-feet); minimum stage recorded, 0.68 foot September 20, 1914 (discharge, 7.7 second-feet).

ICE.—Ice forms on control and river below the gage, affecting the stage-discharge relation.

REGULATION.—Power plants at South Britain, 2½ miles above the station, cause a small diurnal fluctuation at low stages.

ACCURACY.—Control has been changed at various times in previous years due to obstructions. Rating curve well defined below 400 second-feet; above that it is parallel to 1913 and 1914 curves. Gage read to quarter-tenths twice-daily, except in winter, when it was read once a day. Discharge ascertained by applying rating table to mean daily gage heights. Results good.

Discharge measurements of Pomperaug River at Bennetts Bridge, Conn., during the year ending Sept. 30, 1916.

[Made by Hardin Thweatt.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Dec. 21	[a] 2.74	223	Mar. 27	2.86	318
Jan. 22	[a] 3.11	161	Aug. 17	1.26	385
Mar. 27	2.80	295			

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Pomperaug River at Bennetts Bridge, Conn., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	48	54	72	220	257	282	1,100	135	109	62	48	33
2	78	54	67	245	220	232	1,050	126	87	57	42	29
3	112	51	65	232	208	208	800	118	84	144	40	27
4	84	48	58	175	220	197	605	126	106	115	38	27
5	77	51	56	197	197	175	470	118	100	83	36	28
6	89	51	56	605	175	165	380	115	164	72	36	23
7	77	47	51	270	208	154	350	110	103	64	36	25
8	197	47	47	245	165	154	308	109	135	54	45	25
9	165	48	47	220	154	154	350	154	118	61	97	25
10	106	50	47	208	154	154	365	110	115	96	61	22
11	87	47	47	197	144	144	320	101	115	92	96	20
12	77	47	47	197	135	135	295	87	126	92	66	20
13	70	46	47	208	126	165	282	79	96	87	50	20
14	67	45	47	220	118	154	440	75	83	232	41	21
15	74	60	47	197	118	135	410	95	75	106	37	22
16	65	97	47	175	118	135	295	112	75	79	33	106
17	61	71	56	175	118	154	270	500	470	68	35	41
18	57	61	154	175	118	154	258	258	258	67	32	33
19	54	88	535	165	118	118	220	175	220	57	30	61
20	62	257	270	165	110	118	197	135	245	51	28	44
21	78	135	245	154	110	110	197	116	154	51	27	33
22	70	112	197	154	103	106	220	106	154	54	27	30
23	61	97	175	154	103	106	258	144	116	55	27	30
24	56	89	175	154	103	106	220	154	101	50	61	30
25	55	84	175	208	103	103	197	126	118	47	41	29
26	52	79	2,010	270	1,520	115	175	103	175	91	33	27
27	82	72	680	425	570	295	164	91	110	126	32	26
28	78	74	500	410	380	605	164	112	96	115	41	24
29	70	75	425	282	320	950	164	175	83	71	62	25
30	61	78	320	245	.....	1,730	144	144	70	58	41	175
31	57	.....	220	245	.....	1,270	.....	144	.....	55	34	.....

NOTE.—Stage-discharge relation affected by ice Dec. 6–25, Jan. 8–24, and Feb. 12–25. Discharge ascertained from gage heights corrected for backwater by means of two discharge measurements, observer's notes, and weather records.

Monthly discharge of Pomperaug River at Bennetts Bridge, Conn., for the year ending Sept. 30, 1916.

[Drainage area, 89.3 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	197	48	78.3	0.877	1.01
November	257	45	73.8	.826	.92
December	2,010	47	225	2.52	2.90
January	605	154	232	2.60	3.00
February	1,520	103	224	2.51	2.71
March	1,730	106	283	3.17	3.66
April	1,100	144	356	3.99	4.45
May	500	75	137	1.53	1.76
June	470	70	135	1.51	1.68
July	232	47	81.0	.907	1.05
August	97	27	43.6	.488	.56
September	175	20	36.0	.403	.45
The year	2,010	20	159	1.78	24.15

HUDSON RIVER BASIN.

HUDSON RIVER NEAR INDIAN LAKE, N. Y.

LOCATION.—About 1 mile below the mouth of Cedar River, 1½ miles above the mouth of Indian River and 6 miles northeast of Indian Lake village, Hamilton County.

DRAINAGE AREA.—418 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 30 to September 30, 1916.

GAGE.—Gurley printing water-stage recorder on right bank. Inspected by John A. Bolton.

DISCHARGE MEASUREMENTS.—Made from cable about 100 yards below gage or by wading.

CHANNEL AND CONTROL.—Solid ledge overlain with coarse gravel; probably permanent.

ICE.—Stage-discharge relation affected by ice.

REGULATION.—Some diurnal fluctuation due to logging operations for a short time during the spring months. Seasonal distribution of flow is natural.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined between 75 and 600 second-feet. Operations of recorder satisfactory. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good.

Discharge measurements of Hudson River near Indian Lake, N. Y., during the year ending Sept. 30, 1916.

[Made by O. W. Hartwell.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Aug. 31	1.54	87	Aug. 31	1.54	86

HUDSON RIVER AT THURMAN, N. Y.

LOCATION.—At Delaware & Hudson Railroad bridge near Thurman railroad station, Warren County, about half a mile below mouth of Schroon River and about 13 miles above the mouth of Sacandaga River.

DRAINAGE AREA.—1,550 square miles.

RECORDS AVAILABLE.—September 1, 1907, to September 30, 1916.

GAGE.—Chain, at upstream side of center of left bridge span; S. H. Spencer, observer.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge.

CHANNEL AND CONTROL.—Sand and gravel; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.77 feet at 4 p. m. May 18 (discharge, 16,900 second-feet); minimum stage, 2.43 feet at 8 a. m. and 4 p. m. September 29 (discharge, 704 second-feet).

1907–1916: Maximum stage, 12.5 feet during the late evening of March 27, 1913, determined by leveling from flood marks (approximate discharge, 46,000 second-feet), minimum stage recorded, 2.12 feet at 8.55 a. m. and 6.20 p. m. September 30, 1913 (discharge, 290 second-feet).

ICE.—Stage-discharge relation seriously affected by ice. Gage observations usually suspended. Discharge estimated from records at North Creek and River bank.

REGULATION.—Discharge is regulated to some extent by the storage reservoirs at Indian Lake and Schroon Lake and the mills on the Schroon River.

ACCURACY.—Stage-discharge relation practically permanent affected by ice during large part of the period from December to March, inclusive. Rating curve well defined between 550 and 20,000 second-feet. Gage read to hundreds twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Results good. Estimated results during frozen period fairly good.

Discharge measurements of Hudson River at Thurman, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 8	O. W. Hartwell	3.47	2,270	May 24	O. W. Hartwell	6.51	11,800
Feb. 17	E. D. Burchard	[a] 5.15	2,140	Aug. 10	A. H. Davison	3.00	1,340

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Hudson River at Thurman, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,080	1,550	1,940	9,000	8,440	3,860	1,940	1,020	1,080
2	1,150	1,380	1,840	11,400	7,430	3,460	1,460	1,020	1,080
3	1,080	1,460	1,640	9,860	8,440	3,080	1,840	905	1,020
4	1,150	1,460	1,550	9,140	7,100	3,080	2,040	960	1,150
5	1,150	1,220	1,460	8,100	8,100	3,080	2,150	850	1,220
6	2,370	1,220	1,300	7,760	7,100	2,840	1,840	1,220	1,150
7	2,720	1,150	1,150	7,430	5,580	2,720	1,740	1,220	1,150
8	2,370	1,300	1,080	6,470	4,140	2,600	1,460	1,220	1,020
9	1,640	1,150	1,150	6,170	4,140	2,480	1,220	1,460	1,020
10	1,380	1,150	960	5,580	5,580	2,840	1,550	1,220	1,020
11	1,460	1,150	.....	5,580	3,200	2,480	1,300	1,300	1,080
12	1,220	1,150	.....	5,870	5,290	2,840	1,220	1,220	960
13	1,220	1,150	.....	6,170	3,200	2,960	1,220	1,220	1,080
14	1,460	960	.....	5,870	2,370	2,840	2,370	1,220	960
15	1,460	1,220	.....	5,870	2,370	2,600	2,260	1,150	1,300
16	1,460	1,640	.....	5,870	6,470	2,600	1,940	1,080	1,300
17	1,300	1,940	.....	6,780	7,760	3,080	1,840	1,080	1,150
18	1,300	1,640	.....	8,100	16,200	2,480	1,300	905	960
19	1,460	1,550	.....	7,430	13,700	3,860	1,080	1,080	610
20	1,640	2,370	.....	6,470	9,500	3,590	1,020	1,220	960
21	1,940	2,600	.....	5,870	8,440	4,140	905	1,150	1,020
22	1,940	2,260	.....	5,870	8,100	3,200	850	1,300	1,020
23	1,380	2,040	.....	9,140	5,580	2,840	960	1,460	1,460
24	1,150	1,740	.....	12,500	11,000	2,840	1,300	1,380	1,940
25	1,080	1,550	.....	11,700	6,170	2,480	1,740	1,380	1,460
26	960	1,220	.....	10,200	6,470	2,600	1,220	1,080	1,220
27	1,550	1,150	.....	9,860	7,100	2,260	960	1,220	1,150
28	1,460	1,150	.....	9,860	4,140	2,370	1,020	1,380	720
29	1,640	1,550	.....	10,200	4,140	2,260	850	1,220	720
30	1,550	1,840	.....	7,760	8,440	2,260	805	960	760
31	1,460	.....	.....	.....	5,000	.....	1,220	1,020	.....

NOTE.—Daily discharge Dec. 11 to Mar. 31, not computed because of ice. No gage-height record Dec. 15 to Apr. 1. Daily discharge Apr. 1, estimated.

Monthly discharge of Hudson River at Thurman, N. Y., for the year ending Sept. 30 1916.

[Drainage area, 1,550 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,720	960	1,490	0.961	1.11
November	2,600	960	1,500	.968	1.08
December	.....	.....	1,320	.852	.98
January	.....	.....	2,610	1.68	1.94
February	.....	.....	3,450	2.23	2.40
March	.....	.....	3,100	2.00	2.31
April	12,500	5,580	7,930	5.12	5.71
May	16,200	2,370	6,800	4.39	5.06
June	4,140	2,260	2,890	1.86	2.08
July	2,370	805	1,440	.929	1.07
August	1,460	850	1,170	.755	.87
September	1,940	610	1,090	.703	.78
The year	16,200	610	2,890	1.86	25.39

NOTE.—Mean discharge Dec. 11 to Mar. 31 estimated by comparison with records of flow of adjacent streams; discharge Dec. 11–31 estimated at 1,280 second-feet. The monthly discharge in second-feet per square mile and the run-off depth in inches shown by the table do not represent the natural flow from the basin because of artificial storage. The yearly discharge and run-off doubtless represent more nearly the natural flow.

HUDSON RIVER AT MECHANICVILLE, N. Y.

LOCATION.—At the Duncan dam of the West Virginia Pulp & Paper Co., in Mechanicville, Saratoga County, 3,700 feet above Anthony Kill and 1½ miles below Hoosic River and about 19 miles above Mohawk River.

DRAINAGE AREA.—4,500 square miles.

RECORDS AVAILABLE.—1888 to September 30, 1916.

GAGE.—Water-stage recorder at the dam, installed in 1910; previous to that date staff gage.

COMPUTATIONS OF DISCHARGE.—Discharge over spillway determined from a rating curve based on United States Geological Survey coefficients for dams of ogee section. Discharge through turbines estimated from records of their operation.

EXTREMES OF DISCHARGE.—Maximum daily discharge during year, 35,800 second-feet April 2; minimum daily discharge, 882 second-feet August 27.

1888–1916: Maximum discharge recorded, 120,000 second-feet at 6 a. m. March 28, 1913.[1] The plant is occasionally shut down and the flow of the river stored in the pond so that the discharge below the station becomes practically zero.

DIVERSIONS.—Water diverted above this station into the Champlain canal. During 1915 a barge canal lock through the Duncan dam was completed and put into operation. No correction was made for these two diversions.

COOPERATION.—Records computed and furnished by Mr. W. J. Barnes, engineer of the West Virginia Pulp & Paper Co.

Daily discharge, in second-feet, of Hudson River at Mechanicville, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,833	3,655	5,577	7,410	21,614	9,720	32,839	18,189	7,467	4,197	2,422	1,551
2	3,279	4,507	5,536	6,919	18,378	9,360	35,845	16,151	6,929	4,265	2,111	1,217
3	2,000	3,357	5,247	7,465	14,994	10,173	31,820	15,570	6,580	7,117	2,219	999
4	3,230	3,572	4,746	6,918	17,353	8,571	31,626	14,948	7,078	6,807	2,217	1,023
5	3,231	4,243	3,963	6,148	14,174	8,316	28,624	14,230	7,264	7,464	1,668	1,673
6	4,192	3,505	3,937	7,600	13,442	8,751	25,761	12,413	5,975	6,610	1,099	1,889
7	5,363	2,223	3,760	7,517	14,964	7,892	24,349	11,920	5,423	4,227	1,877	2,074
8	5,158	3,194	3,595	6,277	10,835	7,822	21,869	11,514	5,632	5,728	1,574	1,657
9	5,156	3,420	2,919	4,761	9,044	7,263	19,780	12,494	4,892	4,751	1,798	1,495
10	4,259	3,686	2,714	6,865	9,746	6,891	18,134	11,434	4,425	4,073	2,103	902
11	4,341	3,232	2,564	6,248	7,943	5,971	16,409	9,441	4,831	4,107	2,223	1,147
12	4,481	2,513	2,290	6,768	6,420	6,515	16,953	8,025	5,905	3,905	1,881	1,703
13	4,266	2,852	3,009	6,810	6,250	7,149	17,569	7,240	5,554	3,474	930	1,854
14	4,069	1,573	2,761	6,347	6,517	6,482	19,968	6,701	5,823	4,257	1,934	1,770
15	4,101	2,786	2,954	5,955	6,454	6,238	20,777	6,424	5,465	4,062	1,966	1,926
16	4,147	2,699	2,647	4,534	6,525	6,248	19,640	6,517	5,621	3,961	1,814	2,406
17	6,484	3,110	2,464	6,107	6,733	4,806	19,938	14,790	5,520	4,397	1,847	2,056
18	4,540	4,554	6,945	5,679	7,005	6,085	22,223	24,379	9,261	4,026	1,557	3,021
19	4,644	5,075	11,741	5,209	6,435	5,874	20,678	26,977	11,076	3,975	1,389	2,829
20	4,753	4,978	10,201	4,973	5,329	7,096	19,028	19,646	10,961	3,144	1,209	2,140
21	5,025	7,181	7,501	5,287	6,471	7,164	18,987	18,594	10,592	2,287	1,495	1,912
22	4,502	8,209	6,827	8,622	5,292	6,605	19,781	17,848	9,845	2,172	1,189	2,034
23	5,347	7,826	5,871	13,405	5,862	5,677	21,526	14,577	8,657	1,443	1,275	1,864
24	4,243	6,893	8,778	11,395	6,505	5,500	25,230	14,087	6,854	2,811	1,927	1,086
25	4,111	4,956	6,746	11,964	7,407	6,355	25,625	14,244	6,774	2,787	1,584	2,438
26	4,138	4,831	22,719	12,804	13,024	5,774	25,639	11,549	6,873	3,529	1,490	3,231
27	3,843	4,638	18,341	19,762	14,361	6,937	23,864	10,289	6,697	3,531	882	3,102
28	3,984	2,426	13,030	25,693	13,067	9,258	24,021	8,277	6,980	3,041	1,592	2,531
29	3,843	4,303	8,859	25,628	11,010	16,442	20,447	7,822	6,176	2,180	2,205	2,392
30	5,140	6,072	9,552	24,315	.....	26,389	19,549	8,270	5,785	1,544	2,649	1,705
31	3,512	.....	7,623	24,899	.....	32,955	.....	9,225	.....	3,011	1,758	.....

NOTE.—See "Diversions" above.

[1] Highest known flood prior to this time occurred April, 1869. Calculated discharge, 70,000 second-feet. See Water Supply Paper 65, p. 51, and report of U. S. Board of Engineers on Deep Waterways, Pt. I, pp. 377–388.

Monthly discharge of Hudson River at Mechanicville, N. Y., for the year ending Sept. 30, 1916.

[Drainage area, 4,500 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	6,484	2,000	4,300	0.956	1.10
November	8,209	1,573	4,200	.933	1.04
December	22,719	2,290	6,630	1.47	1.70
January	25,693	4,534	10,000	2.22	2.56
February	21,614	5,292	10,100	2.24	2.42
March	32,955	4,806	8,910	1.98	2.28
April	35,845	16,409	22,900	5.09	5.68
May	26,977	6,424	13,000	2.89	3.33
June	11,076	4,425	6,900	1.53	1.71
July	7,464	1,443	3,930	.873	1.01
August	2,422	882	1,710	.380	.44
September	3,231	902	1,920	.427	.48
The year	35,845	882	7,850	1.74	23.75

NOTE.—The monthly discharge in second-feet per square mile and the run-off in depth in inches shown by the table do not represent the natural flow in the basin because of artificial storage. See "Diversions" above.

CEDAR RIVER NEAR INDIAN LAKE, N. Y.

LOCATION.—At the steel highway bridge about 2 miles west of Indian Lake village, Hamilton County, 8 miles by river above Rock River, 10 miles by river below Wakely dam and about 12 miles above the mouth of river.

DRAINAGE AREA.—85 square miles. (Measured on topographic maps.)

RECORDS AVAILABLE.—July 15, 1911, to September 30, 1916.

GAGE.—Chain, at downstream side of bridge; Chauncy Hill, observer.

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

CHANNEL AND CONTROL.—Gravel and large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 12.15 feet at 6 p. m. May 17 (discharge about 3,700 second-feet); minimum stage 2.2 feet at 7 p. m. September 7 (discharge, 8 second-feet).

1911–1916: Maximum stage recorded, 12.15 feet at 6 p. m. May 17, 1916 (discharge, about 3,700 second-feet); minimum stage recorded, 2.10 feet at 4 p. m. September 27, 1915 (discharge, about 5 second-feet).

ICE.—Stage-discharge relation affected by ice.

REGULATION.—Cedar River flow is controlled by a lumberman's dam (Wakely dam) which is used to make flood waves during the spring for log-driving.

ACCURACY.—Stage-discharge relation practically permanent. Affected by ice from December to March. Rating curve well defined between 15 and 600 second-feet. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Results good except during log-driving operations in the spring.

Discharge measurements of Cedar River near Indian Lake, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 15	E. D. Burchard	3.25	94	May 27	C. C. Covert	3.70	165
15	....do	3.25	96	Aug. 20	....do	2.90	54

Daily discharge, in second-feet, of Cedar River near Indian Lake, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.	Sept.
1	27	107	.....	344	320	86	60	33
2	27	80	.....	450	308	100	57	28
3	27	80	.....	538	370	114	54	28
4	27	107	.....	1,340	478	100	62	27
5	344	80	.....	320	422	86	80	21
6	478	86	.....	308	370	86	60	15
7	296	86	.....	204	396	86	52	10
8	370	80	.....	478	450	100	60	18
9	370	86	.....	478	602	86	100	24
10	272	86	.....	538	478	62	80	24
11	184	100	.....	602	422	68	74	24
12	122	74	.....	1,210	370	68	74	24
13	80	56	.....	272	344	184	74	24
14	74	74	.....	146	344	296	62	74
15	86	370	.....	164	226	296	62	74
16	80	668	634	1,820	248	184	54	62
17	100	422	422	2,700	284	114	54	54
18	80	478	450	1,780	215	100	50	50
19	93	272	248	1,030	184	100	42	38
20	68	114	248	1,420	204	44	50	38
21	100	260	296	634	204	44	44	34
22	86	396	422	924	174	74	47	40
23	86	272	478	1,780	164	138	54	40
24	74	164	924	634	130	308	54	40
25	80	184	2,800	570	146	272	54	34
26	80	204	2,700	508	114	86	54	27
27	100	184	2,800	508	114	80	44	30
28	74	204	450	100	100	68	44	27
29	86	272	396	886	86	68	36	42
30	86	248	2,600	320	86	74	36	34
31	74	.....	.....	146	.....	62	36	.....

NOTE.—Discharge Dec. 1-4 not computed because of effect of ice. No gage-height record Dec. 5 to Apr. 15.

Monthly discharge of Cedar River near Indian Lake, N. Y., for the year ending Sept. 30, 1916.

[Drainage area, 85 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	478	27	133	1.56	1.80
November	668	56	196	2.31	2.58
April 16-30	2,800	248	1,060	12.48	6.96
May	2,700	100	746	8.78	10.12
June	602	86	278	3.27	3.65
July	308	44	117	1.38	1.59
August	100	36	56.9	.670	.77
September	74	10	34.6	.407	.45

NOTE.—The monthly discharge in second-feet per square mile and the run-off in depth in inches shown by the table do not represent the natural flow from the basin because of artificial storage.

INDIAN LAKE RESERVOIR NEAR INDIAN LAKE, N. Y.

LOCATION.—At the masonry storage dam at the outlet of Indian Lake, about 2 miles south of Indian Lake village, Hamilton County, and about 7½ miles above the mouth of Indian River.

DRAINAGE AREA.—131 square miles, including about 9.3 square miles of water surface of Indian Lake at the elevation of the spillway of the dam (measured on topographic map).

RECORDS AVAILABLE.—Records of stage and gate openings July 22, 1900, to September 30, 1916.

GAGE.—Elevation of water surface in reservoir determined by a chain gage at the dam; prior to November 17, 1911, a staff gage was used or readings were obtained by measuring down from a bench mark; read once daily by Lester Sevarie. Sluice-gate openings determined by graduated scales near gate stems in gatehouse.

STORAGE DAM.—The masonry storage dam was completed in 1899 and replaced a lumbering dam at the same site. The spillway is in 5 sections, having a total effective length of 88.7 feet, a mean crest elevation of 33.38 feet above reservoir gage datum, and 1,650 feet above mean sea level. There are two logways, one 15 feet wide with bottom at elevation 24.12 feet reservoir gage datum, the other 14 feet wide with bottom at elevation 32.48 feet reservoir gage datum. The discharge at ordinary stages is through one or both of two 5-foot circular sluice gates, controlled independently, and taking water from separate wells in the gatehouse.

DETERMINATION OF DISCHARGE.—Discharge over the spillway is determined by means of a rating curve based on experiments made in the hydraulic laboratory of Cornell University.[1] Rating curves for the sluice gates have been determined from current-meter measurements at the gaging station on Indian River three-fourths mile below the dam. The results are withheld for further study.

EXTREMES OF STAGE.—Maximum stage recorded during year, 36.8 feet May 18–19; minimum stage recorded, 17.05 feet September 30.

1900–1916: Maximum stage recorded, 38.8 feet March 28, 1913; minimum stage recorded, 2.0 feet March 9–18, 1907; and January 3–17, 1910.

REGULATION.—At ordinary stages the flow of Indian River is completely regulated by the reservoir. Water is held in storage until needed to supplement the flow of the upper Hudson during the low water period. The storage capacity is about 4.7 billion cubic feet, equivalent to a flow of about 600 second-feet for 90 days.

[1] See U. S. Geol. Survey Water-Supply Paper 200, pages 190–192.

Daily gage height, in feet, of Indian Lake Reservoir at Indian Lake, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	32.85	31.0	28.55	29.15	31.55	30.8	23.65	35.45	35.1	34.4	33.65	24.65
2	32.75	30.75	28.7	29.25	31.8	30.9	24.2	35.65	35.0	34.35	33.5	24.3
3	32.65	30.55	28.85	29.35	32.0	30.95	24.7	35.85	34.95	34.5	33.35	23.9
4	32.55	30.3	28.95	29.45	32.15	30.95	25.25	35.95	34.9	34.45	33.15	23.5
5	32.8	30.0	29.0	29.5	32.3	30.75	25.65	36.0	34.85	34.4	33.0	23.1
6	33.0	29.8	29.05	29.6	32.45	30.6	25.85	35.95	34.75	34.4	32.8	22.8
7	33.1	29.6	29.1	29.75	32.6	30.45	26.2	35.85	34.65	34.35	32.6	22.4
8	33.3	29.4	29.15	29.85	32.65	30.25	26.4	35.75	34.6	34.3	32.4	22.05
9	33.35	29.2	29.25	29.95	32.7	30.05	26.65	35.7	34.7	34.25	32.15	21.7
10	33.4	29.0	29.35	30.1	32.75	29.85	26.85	35.65	34.7	34.2	31.9	21.45
11	33.45	28.8	29.25	30.2	32.8	29.55	27.0	35.6	34.7	34.15	31.75	21.0
12	33.5	28.6	29.15	30.25	32.85	29.15	27.25	35.55	34.7	34.1	31.45	20.65
13	33.35	28.4	28.9	30.3	32.9	28.8	27.55	35.4	34.65	34.35	31.15	20.3
14	33.2	28.2	28.8	30.35	32.95	28.4	27.85	35.3	34.6	34.45	30.9	19.9
15	33.1	28.0	28.7	30.4	33.0	28.0	28.15	35.2	34.5	34.45	30.65	19.8
16	33.0	27.8	28.6	30.5	32.85	27.6	28.5	35.4	34.45	34.4	30.4	19.5
17	32.9	27.6	28.5	30.6	32.7	27.25	29.05	36.1	34.8	34.35	30.25	19.3
18	32.8	27.4	28.45	30.65	32.5	26.85	29.5	36.8	34.9	34.3	29.95	19.35
19	32.7	27.0	28.65	30.7	32.25	26.5	30.1	36.8	34.95	34.25	29.6	19.1
20	32.6	27.4	28.7	30.5	32.0	26.15	30.5	36.65	35.0	34.2	29.3	18.7
21	32.45	27.55	28.75	30.3	31.75	25.8	30.95	36.4	35.05	34.15	28.9	18.45
22	32.35	27.65	28.8	30.15	31.4	25.45	31.45	36.25	35.00	34.1	28.5	17.9
23	32.35	27.75	28.85	30.0	31.05	25.15	32.05	36.05	34.95	34.15	28.1	17.8
24	32.4	27.85	28.9	29.85	30.7	24.75	32.65	35.95	34.85	34.2	27.5	17.8
25	32.4	27.9	28.8	29.7	30.4	24.35	33.2	35.85	34.8	34.25	27.3	17.5
26	32.25	28.05	28.75	29.65	30.2	23.95	33.8	35.7	34.75	34.2	26.8	17.4
27	32.05	28.1	28.7	29.75	30.3	23.6	34.25	35.6	34.6	34.15	26.45	17.3
28	31.85	28.15	28.65	30.1	30.5	23.25	34.7	35.45	34.55	34.1	26.05	17.2
29	31.6	28.25	28.8	30.65	30.7	23.0	35.0	35.3	34.5	34.05	25.7	17.1
30	31.4	28.4	28.95	30.95	.....	22.85	35.2	35.25	34.45	33.9	25.35	17.05
31	31.2	.....	29.05	31.25	.....	23.2	.....	35.2	.....	33.8	25.0	.....

Gate openings, in inches, at Indian Lake Reservoir near Indian Lake, N. Y., for the year ending Sept. 30, 1915.

Date.	Sluice gate A open.	Sluice gate B open.
Oct. 1, 12 a. m., to Oct. 7, 3 p. m	30	.....
Oct. 12, 1 p. m., to Oct. 18, 6 p. m	30	.....
Oct. 18, 6 p. m., to Oct. 22, 7 a. m	60	.....
Oct. 25, 3 p. m., to Nov. 20, 1 p. m	60	.....
Dec. 10, 6 p. m., to Dec. 18, 5 p. m	30	.....
Dec. 25, 6 a. m., to Dec. 28, 11 a. m	60	.....
Jan. 19, 3 p. m., to Jan. 26, 6 p. m	60	.....
Feb. 15, 4 p. m., to Feb. 16, 10 a. m	36	.....
Feb. 16, 10 a. m., to Feb. 26, 12 m	60	.....
Feb. 21, 3 p. m., to Feb. 26, 12 m	.....	30
Mar. 4, 10 a. m., to Mar. 30, 1 p. m	60	.....
Mar. 10, 12 m., to Mar. 30, 1 p. m	.....	60
July 29, 3 p. m., to Aug. 4, 1 p. m	30	.....
Aug. 4, 1 p. m., to Aug. 12, 3 p. m	60	.....
Aug. 12, 3 p. m., to Sept. 16, 7 p. m	.....	60
Aug. 17, 4 p. m., to Aug. 20, 1 p. m	20	.....
Aug. 20, 1 p. m., to Aug. 24, 6 p. m	50	.....
Aug. 24, 6 p. m., to Aug. 31, 7 p. m	30	.....
Aug. 31, 7 p. m., to Aug. 10, 7 a. m	40	.....
Sept. 10, 7 a. m. to Sept. 16, 7 p. m	60	.....
Sept. 18, 4 p. m., to Sept. 25, 4 p. m	.....	60
Sept. 18, 4 p. m., to Sept. 30, 12 p. m	60	.....

INDIAN RIVER NEAR INDIAN LAKE, N. Y.

LOCATION.—About three-quarters of a mile below the dam at the outlet of Indian Lake, 1 mile above Big Brook, 2 miles south of Indian Lake village, Hamilton County, and 6½ miles above the mouth.

DRAINAGE AREA.—132 square miles.

RECORDS AVAILABLE.—July 1, 1912, to June 30, 1914; June 5 to September 30, 1916; also miscellaneous measurements in 1911.

GAGE.—Gurley repeating water-stage recorder installed August 30, 1916, on right bank in a pool about 150 feet above the rapids which form the control. Prior to August 30, 1916, a vertical staff at same location and datum was used. Gage read by Lester Sevarie.

DISCHARGE MEASUREMENTS.—Made from a cable about 75 feet below the gage, or by wading.

CHANNEL AND CONTROL.—Rough and rocky; practically permanent.

EXTREMES OF DISCHARGE.—1912–1916: Maximum stage recorded, 7.8 feet at 4 p. m. March 28, 1913 (discharge about 3,460 second-feet); practically no flow when gates at Indian Lake are closed.

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

REGULATION.—At ordinary stages the discharge is completely regulated by operation of the sluice gates at Indian Lake dam.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice. Rating curve well defined between 15 and 1,250 second-feet. Gage read to half tenths twice weekly. Discharge October 1 to August 29, ascertained by applying gage heights to rating table. Discharge August 30 to September 30 ascertained by applying mean daily gage heights, obtained from recorder graph by inspection, to rating table, except on days of considerable fluctuation for which mean discharge was ascertained by weighting discharge for irregular intervals.

Discharge measurements of Indian River near Indian Lake N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 15	E. D. Burchard	2.45	403
15	....do	2.44	402
June 26	O. W. Hartwell	2.00	270

Daily discharge, in second-feet, of Indian River near Indian Lake, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1			10			35						810
2				13	35		4			212	369	810
3	369	564						603				810
4									307			810
5			13	14		564	4			200		788
6	385				35						603	788
7		564						643	278			788
8			16			564						767
9				14	37		4			189	603	746
10	385	564						526				746
11									264			746
12			322	16		897	4			189		746
13	385				35						603	725
14		436						453	250			725
15			322			853						725
16				16	603		8			200	603	725
17	385	526						1,030				338
18									264			53
19			14	564		853	16			178		607
20	603				603						603	704
21		11						1,030	292			684
22			14			853						684
23				603	897		18			168	810	684
24		11						603				664
25									264			578
26			603	603		853	224			158		232
27	603				32						767	232
28		10						489	250			230
29			11			853						227
30				32			250			402	788	222
31	903							369			788	

NOTE.—Mean discharge for September, 613 second-feet.

SCHROON RIVER AT RIVERBANK, N. Y.

LOCATION.—At the steel highway bridge near Riverbank post office, Warren County, near Tumblehead Falls, about 9 miles below Schroon Lake and about 9 miles north of Warrensburg.

DRAINAGE AREA.—534 square miles.

RECORDS AVAILABLE.—September 2, 1907 to September 30, 1916.

GAGE.—Chain, on upstream side of bridge; read by J. H. Roberts.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Gravel; occasionally shifting. Logs become lodged on the control for a portion of nearly every year.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.02 feet at 8 a. m. May 19 (discharge, about 3,600 second-feet; stage-discharge relation affected by logs lodged on the control); minimum stage recorded, 1.16 feet at 3 p. m. September 29 and 30 (discharge, 89 second-feet).

1907–1916: Maximum stage recorded, 10.7 feet at 5 p. m. March 28, 1913 (discharge, about 13,500 second-feet); minimum stage recorded, 0.85 foot at 5 p. m. October 17, 1909 (discharge, 28 second-feet).

ICE.—Stage-discharge relation affected by ice.

REGULATION.—Flow affected by storage in Schroon and Brant lakes.

ACCURACY.—Stage-discharge relation probably permanent during the year except as follows: Affected by ice for portions of the period from December to March, and by logs on the control for short periods in April, May, and June. Rating curve well defined between 150 and 4,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Results good for periods when the stage-discharge relation is not affected by ice or logs. Results fairly good for other periods.

Discharge measurements of Schroon River at Riverbank, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 13	E. D. Burchard	2.32	450	Apr. 5	O. W. Hartwell	[b] 5.43	2,950
Dec. 29	do	2.16	379	27	A. H. Davison	5.56	3,330
Jan. 12	do	[a] 3.00	705	May 25	O. W. Hartwell	[b] 4.77	2,070
26	do	2.72	648	June 2	C. C. Covert	[b] 3.60	1,050
Feb. 16	do	[a] 3.57	876	Aug. 9	A. H. Davison	1.60	2.00
Mar. 4	do	[a] 3.73	1,290				

[a] Stage-discharge relation affected by ice.
[b] Stage-discharge relation affected by logs lodging on control.

Daily discharge, in second-feet, of Schroon River at Riverbank, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	388	427	535	535	1,640	1,550	1,740	2,370	1,060	745	216	142
2	388	407	535	560	1,740	1,370	2,150	2,260	1,060	690	216	158
3	333	407	535	585	1,740	1,370	2,720	2,040	990	718	232	158
4	351	388	535	610	1,640	1,290	2,960	1,940	990	745	201	140
5	369	407	512	635	1,550	1,210	2,960	1,840	990	690	216	281
6	388	388	535	635	1,370	1,130	2,960	1,840	1,290	662	201	248
7	468	369	512	662	1,370	1,130	2,840	1,550	1,130	447	216	248
8	468	369	512	662	1,370	1,060	2,720	1,460	1,210	447	201	232
9	490	369	490	690	1,290	990	2,480	1,550	1,460	635	201	216
10	468	388	512	690	1,130	990	2,370	1,460	1,370	585	201	172
11	468	388	468	772	1,130	920	2,150	1,290	745	560	186	186
12	468	351	468	718	990	800	2,150	1,210	1,290	512	186	186
13	468	333	468	635	920	800	2,150	1,210	1,210	512	186	164
14	468	316	447	610	860	800	2,150	800	1,060	490	186	186
15	468	333	490	585	860	745	2,260	1,060	1,060	535	172	186
16	468	351	468	560	860	745	2,260	860	1,210	388	172	201
17	427	369	460	535	800	690	2,260	1,550	920	248	186	161
18	407	333	447	535	772	800	2,370	3,080	990	248	172	186
19	468	369	447	512	745	800	2,480	3,600	1,290	248	172	172
20	468	388	468	512	718	800	2,370	3,600	1,290	232	145	158
21	490	333	468	535	690	745	2,260	3,340	1,130	232	172	150
22	468	447	468	585	662	772	2,260	2,840	1,060	248	172	145
23	468	447	447	610	662	718	2,480	2,600	1,290	232	172	172
24	447	447	447	610	662	662	2,960	2,370	1,210	248	169	216
25	447	333	447	610	635	662	3,340	2,150	1,060	232	158	201
26	447	216	388	718	772	610	3,470	1,840	920	232	150	169
27	447	125	351	800	1,130	635	3,340	1,840	920	232	145	172
28	427	468	333	860	1,210	635	3,080	1,740	860	232	153	140
29	427	512	407	1,130	1,460	860	2,840	1,290	800	232	161	93
30	427	535	535	1,370	.....	920	2,720	1,130	772	232	148	93
31	407	.....	535	1,550	.....	1,290	.....	1,130	.....	216	132	.....

NOTE.—Discharge Dec. 12–17, Dec. 29 to Jan. 22, Feb. 14–24, Mar. 30 to Apr. 24, and May 15 to June 11 estimated, because of backwater from ice or logs, from discharge measurements, weather records, and study of gage-height graph.

SACANDAGA RIVER AT HADLEY, N. Y.

LOCATION.—About half a mile west of railroad station at Hadley, Saratoga County, a mile above mouth of river, and 4½ miles below site of proposed storage dam at Conklingville.

DRAINAGE AREA.—1,060 square miles. Measured on topographic maps.

RECORDS AVAILABLE.—January 1, 1911, to September 30, 1916. September 13, 1907, to December 31, 1910, at upper bridge station; September 24, 1909, to midsummer of 1911 at lower bridge station.

GAGE.—Gurley graph water-stage recorder in a concrete shelter on the left bank, installed January 6, 1916, replacing a Barrett and Lawrence recorder, inspected by J. E. Kelly.

HOOSIC RIVER NEAR EAGLE BRIDGE, N. Y.

LOCATION.—Half a mile below Walloomsac River and 1½ miles above Owl Kill and Eagle Bridge, Rensselaer County.

DRAINAGE AREA.—512 square miles. (Measured on topographic maps.)

RECORDS AVAILABLE.—August 13, 1910, to September 30, 1916. September 25, 1903, to December 31, 1908, at Buskirk, 4 miles below present station.

GAGE.—Inclined staff on left bank near residence of James Russell; prior to August 17, 1914, chain gage, 400 feet above present site. Gage read by Mrs. Vashti Russell.

DISCHARGE MEASUREMENTS.—Made from cable half mile below gage or by wading.

CHANNEL AND CONTROL.—Gravel; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 12.0 feet at noon December 26 (discharge, about 13,000 second-feet); minimum stage recorded, 2.75 feet at 7.30 a. m. and 5 p. m. September 10 (discharge, 54 second-feet).

1910–1916: Maximum stage not recorded, as gage used prior to August 17, 1914, could not be reached at high stages; minimum stage recorded, 6.1 feet at 5 p. m. September 14, 1913 (discharge, practically zero).

ICE.—Stage-discharge relation affected by ice.

REGULATION.—Flow affected by storage on Walloomsac River and at Hoosick Falls, about 2 miles above gage.

ACCURACY.—Stage-discharge relation probably permanent during year, except as affected by ice during a large part of period, December to March. Rating curve well defined between 75 and 7,000 second-feet. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good except for periods of low water, when semidaily gage heights may not indicate the true mean and during periods when the stage-discharge relation is affected by ice. Results fair for the latter periods.

Discharge measurements of Hoosic River near Eagle Bridge, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 11	A. H. Davison	3.58	312	Jan. 28	E. D. Burchard	8.61	6,000
11	do	3.40	260	28	do	8.65	6,220
11	E. D. Burchard	3.56	306	29	do	7.14	3,890
20	do	4.82	1,160	29	do	6.96	3,590
20	do	5.00	1,260	Feb. 21	do	[a] 4.53	594
Dec. 24	A. H. Davison	5.41	1,710	Mar. 9	A. H. Davison	[a] 7.20	646
Jan. 5	do	4.94	1,250	25	do	[a] 5.48	370
28	E. D. Burchard	8.36	5,660	May 31	E. D. Burchard	4.34	736

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Hoosic River near Eagle Bridge, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	420	498	645	1,690	4,170	1,160	6,390	2,120	678	325	395	165
2	370	370	585	1,490	2,820	1,040	8,440	1,900	615	260	325	240
3	420	445	615	1,490	2,230	960	5,090	1,790	525	820	240	133
4	470	395	555	1,290	2,010	845	3,330	1,590	860	645	260	83
5	395	445	395	1,290	1,690	810	3,070	1,290	710	645	260	182
6	780	498	585	2,230	1,490	775	2,700	1,390	820	445	220	200
7	555	370	470	1,690	1,590	705	2,820	1,160	678	370	105	220
8	615	445	470	1,290	1,390	670	2,230	1,390	585	302	280	182
9	555	420	420	1,080	1,490	638	1,900	2,340	555	260	525	149
10	470	420	420	920	1,490	605	1,900	1,590	585	420	302	95
11	498	325	420	845	1,260	575	1,900	1,290	525	348	260	200
12	370	420	325	775	1,040	545	2,340	1,020	645	348	220	182
13	420	445	585	705	880	545	2,340	1,020	585	555	220	165
14	348	302	395	670	810	515	2,700	900	645	1,390	325	182
15	555	445	445	638	740	485	4,020	900	555	710	260	220
16	780	820	420	638	670	458	2,940	860	615	470	182	1,160
17	498	710	525	605	638	430	3,200	1,490	615	555	182	470
18	645	555	2,120	605	605	430	3,600	2,340	1,290	525	200	420
19	420	525	5,730	605	605	402	2,700	1,790	980	445	165	302
20	445	1,060	3,070	638	605	402	2,580	1,390	1,160	445	119	280
21	395	678	2,230	880	605	375	2,580	1,160	860	348	165	220
22	420	900	1,900	4,170	605	375	3,070	1,060	710	420	165	200
23	445	555	1,790	3,880	605	375	3,460	1,060	645	710	182	200
24	280	645	1,690	2,460	605	375	3,600	1,240	498	555	182	420
25	470	525	1,390	2,120	670	375	2,940	980	445	470	165	395
26	395	710	8,640	2,340	4,930	375	2,940	900	780	525	182	220
27	645	585	5,410	3,600	1,900	458	2,460	780	645	980	119	182
28	585	525	3,460	5,730	1,490	670	2,340	678	555	585	302	182
29	525	678	2,580	3,740	1,300	1,300	2,120	678	445	470	325	182
30	470	745	2,120	2,460	.....	4,930	2,010	585	420	395	240	348
31	585	.....	1,690	2,340	.....	6,390	.....	780	.....	420	220	.....

NOTE.—Discharge, Jan. 9–20 and Feb. 11 to Mar. 29, estimated because of ice, from discharge measurements, weather records and study of gage-height graph. No gage-height record Dec. 22, 23, Jan. 24–26, and Feb. 15–28; discharge estimated.

Monthly discharge of Hoosic River near Eagle Bridge, N. Y., for the year ending Sept. 30, 1916.

[Drainage area, 512 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	780	280	491	0.959	1.09
November	1,060	302	549	1.07	1.11
December	8,640	325	1,680	3.28	3.78
January	5,730	605	1,770	3.46	3.99
February	4,930	605	1,410	2.75	2.97
March	4,930	375	935	1.83	2.11
April	8,440	1,900	3,120	6.09	6.80
May	2,340	585	1,270	2.48	2.86
June	1,290	420	674	1.32	1.47
July	1,390	260	521	1.02	1.18
August	525	105	235	.459	.53
September	1,160	83	259	.506	.56
The year	8,640	83	1,070	2.09	28.53

MOHAWK RIVER AT VISCHER FERRY DAM, N. Y.

LOCATION.—At the Vischer Ferry dam of the Barge Canal (Lock No. 7), 1 mile above Stony Creek and Vischer Ferry, about 7 miles below Schenectady, Schenectady County and about 11 miles above mouth.

DRAINAGE AREA.—3,400 square miles. (Measured on topographic maps).

RECORDS AVAILABLE.—June 24, 1913, to September 30, 1916.

GAGES.—Stevens water-stage recorder (showing head on crest of spillway) in the southerly corner of the basin near upper end of Barge canal lock; inclined staff at foot of an old bridge abutment about 100 feet above Vischer Ferry, read June 24 to December 16, 1913 and May 24 to June 2, 1914; staff gage in masonry of outer lock wall, just above upper gates, read March 30 to May 23, 1914 and March 30 to August 17, 1916. Datum of staff gage 12.1 feet lower than that of recorder. Gurley water-stage recorder in the northerly (out stream) corner of the basin, used December 17, 1913 to March 29, 1914 and May 24, 1914 to February 23, 1916. This gage was destroyed by ice April 2, 1916, and the record from February 24 to date was lost with it. Water-stage recorder inspected by an engineer from Albany office of United States Geological Survey; staff gage read by lock tenders.

DISCHARGE MEASUREMENTS.—Made by wading below the dam at low water during 1913–14. During the spring of 1915 the Crescent dam (next downstream) was closed, making further measurements impossible. No provision for measurements at medium and high stages.

CHANNEL AND CONTROL.—The control is the crest of the spillway.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 19.0 feet (staff gage in masonry of outer lock) at 2 p. m. April 2 (discharge, about 113,000 second-feet); Minimum stage from water-stage recorder, 0.37 feet at 11.20 a. m. September 4 (discharge, 1,050 second-feet).

1913–1916: Maximum stage recorded, 7.6 feet just before noon March 28, 1914, determined by leveling from flood marks (discharge, estimated by New York state engineer, 140,000 second-feet). This stage lasted but a few moments and was caused by the breaking of an ice jam near Schenectady.

DIVERSIONS.—Water was diverted into Erie canal at temporary lock in north end of dam prior to December, 1914.

Barge Canal Lock No. 7, at the south end of dam, was put in operation May 15, 1915. The following tables of discharge include the flow over the spillway and through the lock and water wheels.

REGULATION.—Flow affected by operation of dams upstream.

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined between 400 and 2,500 second-feet, based on theoretic coefficients for higher stages. Operation of the water-stage recorder fairly satisfactory for periods when the record is available. Gage in masonry of outer lock wall; read hourly March 30 to April 2 inclusive and twice daily April 3 to August 17, 1916. Mean daily gage height based on semi-daily observations; probably somewhat in error during periods of low water. Daily discharge ascertained by applying mean daily gage height to rating table; for days of considerable fluctuation by averaging the hourly discharge. Results fairly good for periods of low water when the water-stage recorders were in operation; fair for other periods excepting March, for which they may be poor.

No discharge measurements made during the year.

Daily discharge, in second-feet, of Mohawk River at Vischer Ferry dam, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4,710	3,340	6,040	6,220	19,600	7,220	50,200	10,100	4,230	2,610	3,380	1,740
2	2,960	3,310	6,830	6,820	19,600	6,920	70,000	9,560	3,380	3,010	1,820	1,670
3	4,450	2,760	4,960	10,300	13,000	6,620	40,100	9,010	5,120	4,230	2,220	1,510
4	5,270	2,380	3,860	11,400	9,460	6,420	32,400	10,100	3,800	8,060	1,880	1,460
5	4,970	3,010	2,980	10,900	8,120	6,020	21,700	10,600	5,130	5,120	1,890	1,480
6	9,170	3,410	2,740	17,200	8,420	5,750	24,600	9,010	6,020	3,790	1,300	1,660
7	11,400	3,330	3,300	24,600	8,420	5,570	23,100	7,010	4,680	3,380	1,560	1,740
8	8,550	2,780	3,300	17,100	7,420	5,390	16,200	7,010	4,700	2,260	1,260	1,420
9	6,160	3,240	3,540	13,500	7,220	5,120	14,600	7,510	4,680	1,900	1,880	1,560
10	5,480	3,010	5,480	9,350	7,120	4,850	13,000	4,660	4,230	2,210	1,250	1,510
11	4,240	2,510	9,790	9,570	7,020	4,760	15,600	5,110	3,380	3,790	1,240	1,080
12	3,290	2,910	5,930	9,570	6,720	4,580	21,700	3,370	1,880	1,880	1,550	1,030
13	3,120	2,450	3,380	8,520	6,420	4,400	21,700	3,370	6,030	2,220	1,580	1,120
14	3,420	2,750	2,150	8,820	6,020	4,310	17,500	2,570	5,120	1,880	1,550	1,080
15	4,980	2,830	1,870	8,320	5,570	4,220	26,800	1,880	5,560	6,020	1,260	2,090
16	8,650	6,750	2,150	7,720	5,120	4,130	21,000	4,230	4,220	3,840	1,880	3,400
17	7,750	6,540	2,820	7,020	4,670	4,130	18,900	16,800	8,040	2,610	2,240	2,080
18	5,420	5,410	3,780	6,720	4,490	4,040	17,500	26,800	7,550	2,220	2,080	1,320
19	5,060	4,330	5,840	6,120	4,220	4,040	16,200	23,100	8,530	2,980	1,630	1,080
20	6,950	9,920	9,020	6,420	4,220	4,220	14,200	15,600	7,520	2,240	1,800	880
21	8,650	11,700	7,820	7,020	4,400	5,930	12,400	10,600	7,540	2,600	1,430	1,070
22	6,050	10,200	6,420	7,320	4,940	6,520	13,600	8,540	5,130	1,890	1,380	1,250
23	4,240	8,350	5,300	21,000	4,940	6,220	19,600	10,600	5,140	1,580	1,420	2,780
24	3,970	6,240	5,120	21,000	4,760	5,840	19,600	11,800	4,230	3,390	1,200	1,900
25	3,400	5,940	4,940	16,200	4,670	5,570	16,200	8,530	3,790	2,240	1,480	1,630
26	3,080	5,310	6,720	15,400	6,120	5,300	14,200	6,520	4,240	1,880	1,880	1,670
27	3,400	5,510	15,000	21,700	7,620	5,120	13,600	6,530	3,390	3,390	1,950	2,280
28	3,810	4,780	14,100	31,600	7,520	6,820	13,600	5,130	8,540	3,800	1,740	1,810
29	3,150	5,310	11,800	32,400	7,420	18,200	13,000	6,020	6,020	3,000	1,760	2,010
30	3,070	5,940	8,220	19,600	.....	29,200	11,800	5,140	5,150	3,410	1,880	3,450
31	2,690	.....	7,020	14,900	.....	45,500	.....	3,380	.....	2,220	1,750	.....

NOTE.—No gage-height record Dec. 13, 14, Feb. 24 to Mar. 27, excepting Mar. 3, 9, 11, 17, and 21. No gage-height record Sept. 15–17 and 23–25. Discharge over spillway interpolated. Discharge Feb. 13–19, inclusive, estimated because of ice in the float well.

Monthly discharge of Mohawk River at Vischer Ferry dam, N. Y., for the year ending Sept. 30, 1916.

[Drainage orea, 3,400 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	11,400	2,690	5,210	1.53	1.76
November	11,700	2,380	4,880	1.44	1.61
December	15,000	1,870	5,880	1.73	1.99
January	32,400	6,120	13,400	3.94	4.54
February	19,600	4,220	7,420	2.18	2.35
March	45,500	4,040	7,840	2.31	2.66
April	70,000	11,800	21,500	6.33	7.06
May	26,800	1,880	8,700	2.56	2.95
June	8,540	1,880	5,230	1.54	1.72
July	8,060	1,580	3,090	.909	1.05
August	3,380	1,200	1,720	.506	.58
September	3,450	880	1,690	.497	.55
The year	70,000	880	7,200	2.12	28.82

NOTE.—The monthly discharge in second-feet per square mile and the run-off depth in inches shown by the table do not represent the natural flow from the basin because of artificial regulation and storage; the yearly discharge and run-off doubtless represent more nearly the natural flow, for probably little stored water is held over from year to year.

ALPLAUS KILL NEAR CHARLTON, N. Y.

LOCATION.—At highway bridge about half a mile southwest of the village of Charlton, Saratoga County.

DRAINAGE AREA.—24.9 square miles (measured by engineers of State of New York Conservation Commission).

RECORDS AVAILABLE.—August 12, 1913, to October 14, 1916, when station was discontinued.

GAGE.—Barrett and Lawrence hydro-chronograph on left bank, just above bridge; installed March 23, 1916; Stevens water-stage recorder in operation October 5 to December 18, 1915, inclusive. Water-stage recorder inspected by E. B. Litts.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Gravel and large boulders; shifting occasionally.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 14.12 feet at 10 p. m. March 30, stage-discharge relation affected by ice; (discharge, not computed); minimum stage from water-stage recorder, 9.42 feet at 2 p. m. August 15 (discharge, 0.3 second-feet).

1913–1916: Maximum stage from water-stage recorder, 15.3 feet at 3.30 a. m. July 27, 1915 (discharge, not determined). Practically no flow August 16 to 29 and September 5 to 21, 1913.

ICE.—Stage-discharge relation affected by ice; winter discharge not determined.

REGULATION.—Some diurnal fluctuation is caused during the spring months by the operation of a gristmill a short distance upstream.

ACCURACY.—Stage-discharge relation probably permanent between shifts at times of flood. Rating curves fairly well defined between 5 and 100 second-feet from October 1 to December 18. Rating curve used April 1 to May 17 not well defined. Rating curve used May 17 to October 14, 1916, well defined for low stages. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to the rating table mean daily gage height, determined by inspecting gage height graph or for days of considerable fluctuation, by averaging the hourly discharge. Results fair.

Discharge measurements of Alplaus Kill near Charlton, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 5	A. H. Davison	10.40	45.4	Apr. 19	A. H. Davison	10.46	63
5	do	10.69	85	19	do	10.50	67
14	O. W. Hartwell	9.98	14.5	June 2	E. D. Burchard	9.70	4.18
14	do	9.85	8.6	2	do	9.70	4.42
14	A. H. Davison	9.78	6.5	2	do	9.70	4.36
14	O. W. Hartwell	9.75	5.9	2	do	9.70	4.21
Nov. 16	E. D. Burchard	10.35	40.5	July 18	C. C. Covert	9.64	3.37
16	do	10.16	25.2	Aug. 24	do	9.64	3.28

Daily discharge, in second-feet, of Alplaus Kill near Charlton, N. Y., for the period Oct. 1, 1915, to Oct. 16, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	10	22	.....	.....	.....	.....	26	6.6	7.4	2.2	2.5	5.0
2	.....	9.8	17	.....	.....	.....	.....	23	4.6	6.6	1.4	2.7	4.0
3	.....	9.4	15	.....	.....	.....	.....	22	4.3	52	1.1	2.8	3.6
4	.....	8.0	17	.....	.....	.....	316	36	6.8	64	1.1	2.1	3.2
5	.....	16	.....	.....	.....	.....	287	23	7.7	23	1.3	2.4	3.1
6	34	21	.....	.....	.....	.....	475	23	16	13	1.3	4.0	2.8
7	18	9.4	8.0	.....	.....	.....	316	16	12	8.8	1.1	4.3	2.8
8	15	8.8	7.3	.....	.....	.....	196	28	7.4	6.8	.8	4.2	2.8
9	12	13	12	.....	.....	.....	158	42	11	6.0	1.0	3.9	3.0
10	9.4	9.0	6.4	.....	.....	.....	172	23	14	7.4	1.8	3.1	3.1
11	8.3	7.6	5.4	.....	.....	.....	202	20	15	12	1.4	2.8	3.2
12	11	7.3	.....	.....	.....	.....	339	14	13	6.8	1.3	2.2	3.2
13	6.3	9.7	.....	.....	.....	.....	202	12	11	8.8	1.3	1.8	3.8
14	7.7	6.3	.....	.....	.....	.....	308	11	8.0	16	1.4	1.4	10
15	100	36	.....	.....	.....	.....	236	11	5.7	8.2	1.0	5.8	.....
16	36	33	.....	.....	.....	.....	145	13	26	6.0	1.0	9.8	.....
17	21	17	.....	.....	.....	.....	133	460	30	4.3	1.0	5.3	.....
18	17	14	.....	.....	.....	.....	110	106	23	4.7	.8	4.4	.....
19	17	54	.....	.....	.....	.....	76	44	54	5.2	1.3	4.0	.....
20	20	125	.....	.....	.....	.....	62	23	41	4.6	1.3	3.7	.....
21	21	53	.....	.....	.....	.....	55	18	18	4.3	1.1	3.1	.....
22	13	40	.....	.....	.....	.....	104	16	14	4.3	1.0	2.8	.....
23	12	27	.....	.....	.....	.....	167	50	8.2	4.3	2.8	2.8	.....
24	11	25	.....	.....	.....	.....	133	28	8.8	4.2	7.0	2.8	.....
25	9.4	20	.....	.....	.....	.....	76	17	15	3.6	4.3	2.8	.....
26	12	18	.....	.....	.....	.....	55	12	14	3.6	3.3	2.8	.....
27	39	20	.....	.....	.....	.....	44	9.6	28	4.4	2.8	2.7	.....
28	21	18	.....	.....	.....	.....	46	8.8	96	4.2	3.1	2.5	.....
29	16	47	.....	.....	.....	.....	39	8.2	19	3.0	4.2	3.1	.....
30	14	50	.....	.....	.....	.....	32	8.0	11	2.8	3.7	7.6	.....
31	12	.....	.....	.....	.....	.....	.....	7.4	.....	2.8	3.0	.....	.....

NOTE.—Discharge Dec. 12 to Mar. 31 not determined, because of ice. Mean discharge Apr. 1-3 estimated at 520 second-feet. New rating curve used beginning Apr. 1 and a second new curve beginning May 17.

Monthly discharge of Alplaus Kill near Charlton, N. Y., for the year ending Sept. 30, 1916.

[Drainage area, 24.9 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	100	6.3	18.0	0.723	0.83
November	125	6.3	24.7	.992	1.11
December 1-11	22	5.4	11.7	.470	.19
April	.....	32	201	8.07	9.00
May	460	7.4	37.4	1.50	1.73
June	96	4.3	18.3	.735	.82
July	64	2.8	10.1	.405	.47
August	7.0	0.8	2.0	.083	.10
September	9.8	2.0	3.5	.140	.16

DELAWARE RIVER BASIN.

EAST BRANCH OF DELAWARE RIVER AT FISH EDDY, N. Y.

LOCATION.—At the railway bridge in the village of Fish Eddy, Delaware County, about 4 miles below the mouth of Beaver Hill, and 5½ miles above the confluence of East and West branches.

DRAINAGE AREA.—790 square miles (measured on post-route map).

RECORDS AVAILABLE.—November 19, 1912, to September 30, 1916. Records were obtained at Hancock, about 4 miles below from October 14, 1902, to December 31, 1912.

GAGE.—Staff, in two sections on downstream end of left pier of railroad bridge; read by J. P. Lyons.

DISCHARGE MEASUREMENTS.—Made from the highway bridge about 200 feet above the gage or by wading.

CHANNEL AND CONTROL.—Coarse gravel; occasionally shifting. During the last two years the control has scoured out during the spring freshet and then returned to its original condition later in the season.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11.8 feet at 7 a. m. April 2, stage-discharge relation affected by ice (discharge about 16,600 second-feet); minimum stage recorded during year, 1.90 feet on September 13 and 14 (discharge, 198 second-feet).

1912–1916: Maximum stage, 17.4 feet during the afternoon of March 27, 1913, determined by leveling from flood marks (discharge about 33,500 second-feet); minimum stage recorded, 1.64 feet at 5 p. m. October 12, 14, and 15, 1914 (discharge, 97 second-feet).

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

ACCURACY.—Stage-discharge relation apparently permanent except for two or three months immediately following the spring flood; affected by ice during a large part of the period from December to March, inclusive. Rating curve well defined between 200 and 20,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good during open water periods when the rating is established. Results fair during periods when the stage-discharge relation is affected by ice and when the rating is apparently shifting.

Discharge measurements of East Branch of Delaware River at Fish Eddy, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 21	E. D. Burchard	a 9.20	1,380	May 17	A. H. Davison	3.58	1,400
Feb. 19	O. W. Hartwell	a 7.27	398	17	do	3.82	1,550
29	E. D. Burchard	a 5.18	2,650	June 24	C. C. Covert	3.69	1,310
Mar. 17	do	a 7.20	1,090	Sept. 22	E. D. Burchard	2.21	306
29	do	7.05	5,830	22	do	2.21	302
Apr. 2	do	11.66	16,600	26	do	2.14	276
3	do	8.85	9,050				

a Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of East Branch of Delaware River at Fish Eddy, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	815	458	920	2,100	8,180	2,100	11,100	2,920	1,160	1,000	1,410	408
2	1,000	480	850	2,790	4,900	1,890	15,500	2,790	1,040	650	1,040	362
3	1,410	480	780	2,670	4,730	1,590	8,820	2,430	1,080	1,890	815	300
4	1,160	480	745	2,320	3,320	1,240	7,760	2,550	1,590	1,410	885	340
5	1,160	505	710	2,100	2,790	1,160	6,000	2,320	1,320	1,080	680	320
6	1,040	505	680	2,920	2,550	780	5,620	1,990	1,160	920	590	262
7	1,590	480	680	2,790	2,430	745	5,810	1,890	1,160	710	560	262
8	1,410	458	680	2,430	1,790	1,040	4,900	1,890	1,410	1,410	530	320
9	1,320	530	620	1,890	1,690	815	4,230	1,790	1,320	2,210	920	262
10	1,080	530	530	1,790	1,790	710	3,460	1,590	1,240	2,100	1,160	245
11	1,080	505	.....	1,990	1,500	650	2,920	1,160	1,160	1,240	885	228
12	960	505	.....	1,890	1,320	650	4,390	1,080	1,160	885	680	213
13	885	505	.....	2,320	1,080	650	4,730	1,160	1,160	1,690	590	198
14	850	480	.....	1,990	885	650	7,160	1,080	1,080	4,230	530	198
15	850	560	.....	1,410	710	780	8,600	1,040	960	2,100	480	680
16	885	920	.....	1,080	590	1,000	8,180	1,040	1,240	1,690	430	1,320
17	780	710	.....	920	505	1,040	7,760	1,410	1,080	1,500	430	710
18	710	650	4,230	885	458	1,000	7,160	1,790	1,890	1,320	385	650
19	745	710	5,260	885	398	960	5,620	1,590	1,890	1,160	385	530
20	710	2,210	4,230	1,080	370	920	4,560	1,240	2,320	920	340	430
21	650	1,690	2,670	1,690	350	1,280	4,560	1,160	1,890	710	300	300
22	590	1,500	2,320	9,260	370	850	5,440	1,160	1,690	710	300	300
23	560	1,410	2,100	7,560	390	815	5,810	2,210	1,410	710	300	300
24	530	1,240	1,890	4,230	480	815	4,900	2,550	1,320	620	430	281
25	480	1,160	1,890	3,320	710	850	4,390	2,320	1,410	530	408	245
26	480	1,080	6,960	2,920	9,700	1,000	4,230	1,790	1,240	3,320	300	245
27	590	1,080	4,730	6,190	5,080	1,690	4,230	1,690	1,160	5,260	650	228
28	650	1,000	3,910	11,100	4,560	4,070	4,390	1,890	1,500	3,910	650	228
29	560	1,000	2,920	8,390	2,550	5,620	3,910	1,790	1,080	2,100	590	228
30	530	1,080	2,550	5,620	.....	6,000	3,180	1,690	960	1,990	530	300
31	480	.....	2,100	4,560	.....	10,800	.....	1,410	.....	1,890	480	.....

NOTE.—Discharge Dec. 11–17, Jan. 14–22 and Feb. 13 to Mar. 27 estimated, because of ice, from discharge measurements, weather records, and study of gage-height graph. Former rating probably not applicable Apr. 14 to July 14; slightly revised for low gage-heights and used for period beginning July 15.

Monthly discharge of East Branch of Delaware River at Fish Eddy, N. Y., for the year ending Sept. 30, 1916.

[Drainage area, 790 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,590	480	856	1.08	1.24
November	2,210	458	830	1.05	1.17
December	6,960	480	1,900	2.41	2.78
January	11,100	885	3,330	4.22	4.86
February	9,700	350	2,280	2.89	3.12
March	10,800	650	1,750	2.22	2.56
April	15,500	2,920	5,980	7.57	8.45
May	2,920	1,040	1,750	2.22	2.56
June	2,320	960	1,340	1.70	1.90
July	5,260	530	1,670	2.11	2.43
August	1,410	300	602	.762	.88
September	1,320	213	363	.459	.51
The year	15,500	213	1,880	2.38	32.46

DELAWARE RIVER AT PORT JERVIS, N. Y.

LOCATION.—At the toll bridge at Port Jervis, Orange County, 1 mile above Neversink River, and 6 miles below Mongaup River.

DRAINAGE AREA.—3,250 square miles.

RECORDS AVAILABLE.—October 12, 1904, to September 30, 1916.

GAGE.—Staff, in two sections; the upper section vertical and attached to downstream end of left abutment; the lower section inclined, about 30 feet downstream from upper section. Prior to June 20, 1914, a chain gage on the bridge was used. Gage read by Mrs. Bella Fuller.

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

CHANNEL AND CONTROL.—Gravel; occasionally shifting.

EXTREMES OF DISCHARGE.—Maximum stage during year, 12 feet during the night of April 1, determined from high-water mark (discharge, 59,100 second-feet); minimum stage recorded, 1.69 feet at 8 a. m. September 13 (discharge, 870 second-feet).

1904–1916: Maximum stage recorded, 16 feet at 8 a. m. March 28, 1914 (discharge, 92,700 second-feet); minimum stage recorded, 0.60 foot at 8 a. m. September 22 and 23, 1908 (discharge, 175 second-feet).

ICE.—Stage discharge relation somewhat affected by ice.

ACCURACY.—Stage-discharge relation shifting; affected by ice during large part of January and February. Rating curve used April 2 to September 30 well defined between 1,000 and 8,000 second-feet. Probably coincides with other well-defined curves outside these limits. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good for periods when the stage-discharge relation is not affected by ice and fairly good for other periods.

Discharge measurements of Delaware River at Port Jervis, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 27	E. D. Burchard	3.97	6,190	Sept. 25	E. D. Burchard	2.57	2,200
Apr. 4	do	8.62	31,200	25	do	2.52	2,100
May 19	A. H. Davison	4.20	6,950	25	do	2.46	2,010
Sept. 24	E. D. Burchard	2.09	1,380				

Daily discharge, in second-feet, of Delaware River at Port Jervis, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,890	2,010	3,340	7,890	16,800	8,660	50,900	9,840	6,010	3,650	5,050	1,800
2	2,680	1,920	3,340	9,460	19,200	7,890	55,800	9,010	8,600	3,160	4,180	1,470
3	3,830	1,920	3,110	13,500	13,500	7,160	46,000	8,200	7,810	3,160	3,650	1,240
4	4,360	1,920	2,480	10,700	12,100	7,890	33,500	7,430	8,200	3,650	3,160	1,110
5	3,830	1,920	2,480	9,060	10,300	5,820	26,800	7,060	6,700	3,400	2,690	1,110
6	4,090	2,010	2,290	12,600	9,460	4,920	23,900	6,350	5,360	3,160	2,470	1,110
7	4,640	2,100	2,290	13,000	7,520	3,830	20,500	5,680	4,750	2,690	2,260	1,240
8	4,360	2,200	2,290	8,660	5,510	4,090	18,600	5,680	6,010	2,260	2,070	1,110
9	3,830	1,920	2,480	8,270	4,640	4,360	15,700	7,060	8,200	2,690	2,260	1,110
10	3,340	2,100	2,480	7,520	3,830	4,360	14,600	6,010	6,700	3,400	2,690	1,110
11	3,110	1,920	2,100	6,810	3,340	4,090	13,600	5,360	6,010	3,910	2,920	1,050
12	2,890	2,010	1,920	7,520	3,110	3,830	12,600	4,460	6,350	4,460	2,470	935
13	2,890	2,010	1,840	6,810	2,680	3,830	16,800	4,180	6,010	4,750	2,470	880
14	2,680	2,010	1,840	7,520	2,480	4,360	21,800	3,650	5,360	6,700	2,070	990
15	2,680	1,920	1,920	6,810	2,480	3,830	32,700	3,650	5,050	9,010	1,890	1,800
16	2,480	2,200	2,100	6,140	2,290	2,890	20,500	3,400	4,750	5,360	1,720	4,750
17	2,890	3,340	2,480	5,210	2,200	2,890	19,200	4,750	9,010	4,460	1,550	4,460
18	2,680	2,890	3,340	4,640	2,100	3,580	18,000	7,430	10,300	4,180	1,550	3,160
19	2,480	3,110	17,400	3,580	2,100	3,830	16,200	6,700	8,200	3,650	1,390	2,470
20	2,480	9,060	15,100	3,830	2,100	3,580	13,100	5,680	8,200	3,160	1,240	1,800
21	2,680	7,160	10,300	4,640	2,100	3,580	11,200	5,360	7,810	2,690	1,110	1,640
22	2,680	6,470	8,660	5,210	2,290	3,340	11,200	4,460	6,700	2,260	1,110	1,640
23	2,480	5,510	7,160	27,500	3,110	3,110	12,600	4,750	6,010	2,260	1,050	1,390
24	2,100	4,640	7,160	15,700	3,340	3,110	14,100	9,010	5,360	2,470	990	1,470
25	1,920	4,360	7,160	19,200	3,830	3,340	12,600	7,430	4,750	2,260	1,110	2,260
26	2,010	4,090	7,160	16,800	21,800	3,830	11,200	6,700	5,360	12,100	1,390	1,800
27	2,100	3,830	20,500	15,700	28,200	5,510	13,100	9,420	4,750	22,500	2,260	1,720
28	2,480	3,830	14,600	28,200	16,800	9,060	16,800	5,360	5,050	16,200	1,800	1,390
29	2,290	3,580	13,000	27,500	12,600	15,100	14,100	8,600	4,750	10,700	2,070	1,390
30	2,200	3,580	9,460	17,400	.....	27,500	11,600	7,810	4,180	7,430	2,260	1,720
31	2,100	.....	8,660	14,600	.....	46,000	.....	6,700	.....	6,010	2,070	.....

NOTE.—Discharge Dec. 13–17 and Feb. 11–21 estimated because of ice, from weather records, study of gage-height graph, and comparison with records of flow at Fish Eddy. New rating curve used for period beginning April 2.

Monthly discharge of Delaware River at Port Jervis, N. Y., for the year ending Sept. 30, 1916.

[Drainage area, 3,250 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	4,640	1,920	2,910	0.895	1.03
November	9,060	1,920	3,250	1.00	1.12
December	20,500	1,840	6,150	1.89	2.18
January	28,200	3,580	11,400	3.49	4.02
February	28,200	2,100	7,650	2.35	2.53
March	46,000	2,890	7,070	2.17	2.50
April	55,800	11,200	20,600	6.34	7.07
May	9,840	3,400	6,360	1.96	2.26
June	10,300	4,180	6,410	1.97	2.20
July	22,500	2,260	5,410	1.66	1.91
August	5,050	990	2,160	.665	.77
September	4,750	880	1,700	.523	.58
The year	55,800	880	6,740	2.07	28.17

DELAWARE RIVER AT RIEGELSVILLE, N. J.

LOCATION.—At the toll suspension bridge between Riegelsville, N. J., and Riegelsville, Pa., 600 feet above Musconetcong River, and 9 miles below Lehigh River.

DRAINAGE AREA.—6,430 square miles.

RECORDS AVAILABLE.—July 3, 1906, to September 30, 1916.

GAGE.—Staff in three sections installed November 14, 1914, on left bank (New Jersey side) at upstream side of bridge; lower section inclined, middle and upper sections vertical. Prior to November 14, 1914, chain gage attached to upstream side of bridge. Gage read by J. H. Deemer.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Large boulders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 19.3 feet at 8 a. m. April 3 (discharge, 97,700 second-feet); minimum stage recorded, 2.4 feet at 4 p. m. September 14 (discharge, 2,160 second-feet).

1906–1916: Maximum stage [1] recorded, 25.0 feet March 28, 1913 (discharge, 144,000 second-feet); minimum stage recorded, 1.78 feet November 6, 1914 (discharge 1,170 second-feet).

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

DIVERSIONS.—The Delaware division of the Pennsylvania canal diverts about 250 second-feet from Lehigh River near its mouth from about the last of March to the middle of December each year.

ACCURACY.—Discharge relation practically permanent; not seriously affected by ice during the year. Rating curve well defined. Gage read to quarter-tenths twice a day. Daily discharge obtained by applying rating curve to mean daily gage heights. Results good.

The following discharge measurement was made by H. J. Jackson:

September 1, 1916: Gage height, 3.19 feet; discharge, 3,850 second-feet. Canal was measured also and discharge found to be 233 second-feet.

Daily discharge, in second-feet, of Delaware River at Riegelsville, N. J., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4,420	3,880	6,230	14,600	22,600	17,500	90,700	19,700	10,500	8,820	13,100	3,880
2	4,710	3,630	5,920	15,000	30,400	16,700	86,100	17,500	9,500	7,490	10,900	3,390
3	5,310	3,390	5,610	20,700	25,600	13,900	90,700	15,800	8,480	9,160	9,500	2,940
4	6,850	3,390	5,310	22,600	19,300	11,600	58,800	15,000	8,820	7,490	8,480	2,840
5	6,540	3,390	5,310	18,000	16,300	10,900	49,700	14,600	11,600	7,490	7,490	2,730
6	6,540	3,390	5,010	18,800	15,400	9,500	38,700	13,900	9,840	7,170	7,170	2,530
7	6,540	3,280	4,420	24,000	14,600	7,830	36,900	12,400	9,160	6,230	6,850	2,530
8	7,490	3,390	4,420	19,700	12,000	9,500	33,300	11,600	11,600	5,610	6,540	2,730
9	6,850	3,390	4,140	13,900	10,200	8,820	29,900	11,600	12,700	5,310	5,610	2,840
10	5,920	3,390	3,880	13,100	10,500	9,160	27,700	12,400	12,700	6,230	5,920	2,530
11	5,610	3,390	3,390	13,100	9,840	8,820	25,000	11,200	11,600	9,500	5,610	2,340
12	5,010	3,390	3,160	14,200	8,820	8,160	23,000	9,840	11,600	9,500	5,610	2,530
13	4,710	3,390	3,390	14,600	7,820	8,820	26,100	9,160	10,900	9,160	5,920	2,250
14	4,710	3,280	3,160	17,100	5,310	11,600	33,300	8,150	9,840	9,160	5,610	2,250
15	4,420	3,390	2,940	12,400	6,230	10,500	54,600	8,150	9,160	12,000	5,010	2,530
16	4,140	3,880	3,160	11,200	6,540	8,820	50,400	8,150	8,820	11,200	4,140	5,920
17	4,140	4,420	4,140	10,500	7,490	7,170	38,100	9,160	18,400	8,480	4,420	8,150
18	4,140	4,710	5,310	8,150	8,150	7,170	33,900	11,600	26,600	9,840	3,880	6,230
19	4,420	5,010	15,400	6,850	7,170	7,490	31,000	12,700	21,100	8,480	3,630	5,610
20	4,710	9,160	29,900	7,170	6,230	7,490	26,100	11,600	18,800	7,820	3,390	4,420
21	5,920	13,500	21,600	7,490	6,230	7,820	22,600	10,200	17,100	6,850	3,390	3,630
22	5,010	12,000	15,800	9,500	5,920	8,480	21,600	9,160	16,300	10,200	3,160	3,390
23	5,010	10,200	13,100	14,200	6,230	7,490	23,000	9,160	14,600	7,490	2,940	3,160
24	4,420	9,160	12,700	34,500	6,540	7,490	26,100	11,200	12,400	6,540	2,940	3,160
25	3,880	8,150	12,400	23,500	7,490	7,820	22,600	13,900	10,900	6,540	2,940	2,940
26	3,880	7,490	15,400	19,700	17,100	10,900	20,700	12,000	10,900	23,000	2,940	3,880
27	3,880	7,170	29,900	21,600	31,000	15,400	21,100	10,200	10,500	63,100	2,840	3,280
28	3,880	6,850	30,400	30,400	27,100	21,600	24,500	9,160	10,200	46,400	4,140	3,050
29	4,420	6,540	26,600	43,100	19,300	33,900	26,600	9,500	12,000	29,300	3,880	2,840
30	4,140	6,230	18,800	34,500	.....	46,400	22,600	14,200	10,200	21,600	3,880	3,160
31	3,880	.....	16,300	25,600	.....	81,600	.....	12,400	.....	15,800	3,880	.....

[1] It has been estimated that the flood of Oct. 10–11, 1903, reached a stage of 41.5 feet with a corresponding discharge of 275,000 second-feet.

Monthly discharge of Delaware River at Riegelsville, N. J., for the year ending Sept. 30, 1916.

[Drainage area, 6,430 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	7,490	3,880	5,020	0.820	0.95
November	13,500	3,280	5,530	.899	1.00
December	29,900	2,940	10,900	1.71	1.97
January	43,100	6,850	18,000	2.80	3.23
February	31,000	5,310	13,000	2.02	2.18
March	81,600	7,170	14,500	2.27	2.62
April	90,700	20,700	37,200	5.82	6.49
May	19,700	8,150	11,800	1.87	2.16
June	26,600	8,480	12,600	1.99	2.22
July	63,100	5,310	13,000	2.05	2.36
August	13,100	2,840	5,350	.871	1.00
September	8,150	2,250	3,460	.575	.64
The year	90,700	2,250	12,500	1.97	26.82

NOTE.—To allow for water diverted by the canal, 250 second-feet was added to computed mean discharge Oct. 1 to Dec. 12 and Mar. 15 to Sept. 30, before computing discharge per square mile; first three columns of table therefore indicate actual quantity of water in the river; the two remaining columns represent the total run-off from drainage area above Riegelsville including the discharge of the canal.

BEAVER KILL AT COOKS FALLS, N. Y.

LOCATION.—At the covered highway bridge in Cooks Falls, Delaware County.

DRAINAGE AREA.—236 square miles (measured on post route and topographic maps).

RECORDS AVAILABLE.—July 25, 1913, to September 30, 1916.

GAGE.—Vertical staff in two sections bolted to rock on left bank under the bridge; read by J. L. Rosa.

DISCHARGE MEASUREMENTS.—Made from the bridge or by wading a short distance down stream.

CHANNEL AND CONTROL.—Coarse gravel, boulders and solid ledge; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.4 feet at 1 p. m. July 26 (discharge, 5,880 second-feet); minimum stage recorded, 0.90 foot from 7.15 a. m. September 12 to 7.10 a. m. September 13 (discharge, 49 second-feet).

1913–1916: Maximum stage recorded, 10.9 feet at 5 p. m. March 28, 1914 (discharge, about 7,770 second-feet); minimum stage recorded, 0.80 foot at 5 p. m. September 19 and from 5 p. m. October 9 to 8 a. m. October 15, 1914 (discharge, 39 second-feet).

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

ACCURACY.—Stage-discharge relation practically permanent, except as affected by ice during parts of the period from December to March inclusive. Rating curve well defined between 50 and 4,500 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good for periods when the stage-discharge is not affected by ice; fair for other periods.

Discharge measurements of Beaver Kill at Cooks Falls, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 28	E. D. Burchard	4.16	1,260	May 18	A. H. Davison	2.90	557
28	do	4.38	1,420	Sept. 22	E. D. Burchard	1.21	106
29	do	4.54	1,480	23	do	1.22	103
Apr. 3	do	5.79	2,380	23	do	1.24	104
3	do	5.92	2,520				

Daily discharge, in second-feet, of Beaver Kill at Cooks Falls, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	387	208	323	605	2,880	980	3,580	1,040	421	323	490	114
2	490	208	293	780	1,940	830	3,760	830	387	323	421	94
3	525	208	293	645	1,390	605	2,560	735	421	735	371	80
4	455	208	263	605	930	525	2,240	690	735	525	355	68
5	690	235	249	880	830	455	1,800	645	490	455	308	61
6	830	222	235	930	880	404	1,660	605	421	355	293	278
7	690	208	222	565	735	371	1,940	565	387	339	293	182
8	605	208	208	438	565	339	1,660	565	490	293	404	132
9	525	263	235	387	605	308	1,390	525	387	308	308	104
10	490	249	208	308	525	293	1,150	490	387	490	278	80
11	455	222	182	525	421	278	1,090	455	421	371	263	61
12	404	208	.....	525	404	263	1,660	421	387	355	263	49
13	387	208	.....	645	355	263	1,520	421	355	490	235	55
14	371	208	.....	565	308	278	2,640	387	355	525	208	61
15	387	339	.....	404	263	293	2,480	387	293	438	158	438
16	355	387	.....	355	222	323	2,090	323	355	387	147	565
17	323	308	.....	323	195	339	2,090	323	1,590	355	136	235
18	308	263	2,800	293	170	339	2,240	830	930	355	118	208
19	293	387	1,660	293	147	323	1,590	930	880	323	114	132
20	293	1,040	1,150	278	136	339	1,390	830	980	323	110	110
21	278	735	830	355	114	355	1,390	735	780	308	104	90
22	263	645	645	1,800	114	387	1,800	735	690	308	85	85
23	249	565	565	1,590	114	421	1,730	830	645	308	80	98
24	235	490	565	1,040	136	490	1,460	780	565	371	158	125
25	208	455	880	930	182	565	1,270	645	525	293	195	94
26	222	421	930	1,040	293	645	1,330	565	490	3,760	355	90
27	355	421	830	2,400	1,150	830	1,270	525	421	2,560	278	73
28	293	387	690	4,050	2,880	1,270	1,210	645	645	1,210	235	73
29	263	387	645	2,560	1,660	1,590	1,150	645	438	880	208	90
30	235	355	645	1,660	.....	2,160	1,090	565	387	645	158	182
31	222	.....	645	1,520	.....	3,310	.....	490	.....	525	136	.....

NOTE.—No gage-height record Dec. 12–17, Jan. 18–21, Feb. 14–27, and Mar. 5–25. Discharge estimated from weather records and comparison with records of flow at Fish Eddy.

Monthly discharge of Beaver Kill at Cooks Falls, N. Y., for the year ending Sept. 30, 1916.

[Drainage area, 236 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	830	208	390	1.65	1.90
November	1,040	208	355	1.50	1.67
December	2,800	158	562	2.38	2.74
January	4,050	278	945	4.00	4.61
February	2,880	114	709	3.00	3.24
March	3,310	263	651	2.76	3.18
April	3,760	1,090	1,810	7.67	8.56
May	1,040	323	618	2.62	3.02
June	1,590	293	555	2.35	2.62
July	3,760	293	621	2.63	3.03
August	490	80	234	.99	1.14
September	565	50	137	.58	.65
The year	3,760	50	630	2.67	36.36

WEST BRANCH OF DELAWARE RIVER AT HALE EDDY, N. Y.

LOCATION.—At the highway bridge in the village of Hale Eddy, Delaware County, 8 miles below the power dam of the Deposit Electric Co., and 8¼ miles above junction with the East Branch of Delaware River.

DRAINAGE AREA.—611 square miles (measured on Post Route Map).

RECORDS AVAILABLE.—November 15, 1912, to September 30, 1916. Records were obtained at Hancock, about 4 miles below, from October 15, 1902, to December 31, 1912.

GAGE.—Vertical staff in four sections, attached to rocks near the right abutment of the bridge and to the abutment. Gage read by William Seeley.

DISCHARGE MEASUREMENTS.—Made from cable about 400 feet below gage installed in July, 1916. Previous measurements made from the highway bridge or by wading.

CHANNEL AND CONTROL.—Coarse gravel and boulders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 12.6 feet at 8 a. m. April 2 (discharge, 17,400 second-feet); minimum stage recorded, 1.75 feet at 5 p. m. August 22 (discharge, 118 second-feet).

1912–1916: Maximum stage recorded,[1] 15.3 feet at 5 p. m. March 27, 1913 (discharge, approximately 25,000 second-feet); minimum stage recorded, 1.0 foot at 6 p. m. September 21, 1913 (discharge, 34 second-feet).

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

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined between 300 and 18,000 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good for periods during which the stage-discharge relation is not affected by ice; fair for other periods.

Discharge measurements of West Branch of Delaware River at Hale Eddy, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 18	E. D. Burchard	[a] 3.10	625	Mar. 31	E. D. Burchard	11.09	12,400
Feb. 18	O. W. Hartwell	[a] 4.59	554	Apr. 1	do	10.05	10,000
28	E. D. Burchard	4.59	1,900	5	do	7.11	4,640
Mar. 16	do	[a] 4.90	481	May 16	A. H. Davison	3.11	663
30	do	8.40	6,970	July 26	E. D. Burchard	2.63	429
31	do	9.90	10,000	Sept. 16	do	3.69	1,040
31	do	9.84	9,760	26	do	2.84	520
31	do	12.00	15,600	26	do	2.87	546

[a] Stage-discharge relation affected by ice.

[1] The observer states that on October 10, 1893, the water rose to an elevation indicated by a nail in a tree near the gage. This nail is at gage height 20.3 feet. No data available indicating whether the present rating curve is applicable to this gage height.

Daily discharge, in second-feet, of West Branch of Delaware River at Hale Eddy, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	182	302	552	1,820	4,420	1,330	10,600	1,870	855	470	552	240
2	348	280	498	2,510	3,010	1,160	16,500	1,510	720	395	420	220
3	552	260	445	2,910	2,420	925	8,000	1,420	855	370	880	200
4	445	240	420	1,980	2,060	785	7,060	1,510	1,160	370	260	182
5	552	260	395	1,900	1,740	660	4,880	1,330	925	370	260	182
6	880	260	370	4,160	1,580	605	4,580	1,160	1,000	325	220	165
7	700	240	395	2,610	1,420	530	4,580	1,160	855	240	240	152
8	552	260	395	2,060	1,000	455	3,740	1,780	1,160	240	165	552
9	470	280	370	1,420	1,000	410	3,370	1,330	1,160	240	220	260
10	420	280	325	1,420	1,000	365	2,820	1,080	1,000	1,140	280	200
11	395	280	302	1,740	820	325	2,620	1,000	1,160	552	700	200
12	395	240	280	1,500	820	305	3,490	855	1,160	420	420	152
13	325	240	260	1,420	760	285	4,280	720	1,000	2,240	370	138
14	302	260	280	1,900	640	285	5,840	660	925	3,010	280	165
15	348	370	200	1,000	610	388	6,180	660	855	1,660	260	325
16	1,070	580	165	880	610	480	4,580	660	1,000	1,280	152	1,000
17	610	552	165	760	640	455	4,140	1,330	1,510	1,000	200	580
18	525	445	2,510	640	700	432	4,580	1,870	855	1,140	182	420
19	498	525	3,680	525	525	410	3,490	1,330	1,000	760	152	348
20	552	880	3,010	552	420	388	2,820	1,160	1,160	580	138	302
21	552	880	2,060	640	498	365	2,620	1,080	1,080	498	138	240
22	498	880	1,660	2,810	610	345	2,820	1,000	1,000	420	115	200
23	420	760	1,740	5,370	580	325	3,490	2,230	785	420	165	2,510
24	370	760	1,420	2,610	580	325	2,920	1,870	660	325	200	880
25	348	700	1,280	2,330	640	365	2,820	1,510	720	280	260	640
26	325	640	4,950	2,610	4,000	555	2,720	1,240	855	420	165	498
27	370	640	4,680	3,450	2,500	1,000	2,820	1,080	720	1,660	182	445
28	420	610	3,450	4,950	1,870	3,030	2,820	1,330	855	1,140	498	370
29	348	580	2,810	4,420	1,600	5,520	2,520	1,160	720	880	760	420
30	325	610	2,060	2,710	.....	6,700	2,050	1,000	505	670	610	880
31	302	.....	1,660	2,610	.....	11,600	.....	1,000	.....	640	348	.....

NOTE.—Discharge Dec. 11–17, Jan. 16–21, Feb. 15–25, and Feb. 29–Mar. 27, estimated because of ice, from discharge measurements, weather records, and study of gage-height graph. New rating table used for period beginning Feb. 26.

Monthly discharge of West Branch of Delaware River at Hale Eddy, N. Y., for the year ending Sept. 30, 1916.

[Drainage area, 611 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,070	182	464	0.759	0.88
November	880	240	470	.769	.86
December	4,950	165	1,380	2.26	2.61
January	5,370	525	2,200	3.60	4.15
February	4,420	420	1,350	2.21	2.38
March	11,600	285	1,330	2.18	2.51
April	16,500	2,050	4,520	7.40	8.26
May	2,230	660	1,250	2.05	2.36
June	1,510	505	940	1.54	1.72
July	3,010	240	779	1.27	1.46
August	760	115	316	.517	.60
September	2,510	138	436	.714	.80
The year	16,500	115	1,280	2.10	28.59

SUSQUEHANNA RIVER BASIN.

SUSQUEHANNA RIVER AT CONKLIN, N. Y.

LOCATION.—At the steel highway bridge just below Conklin, Broome County, 5 miles below Big Snake Creek and 8 miles above Chenango River.

DRAINAGE AREA.—2,350 square miles.

RECORDS AVAILABLE.—November 13, 1912, to September 30, 1916. Records were obtained at Binghamton, 8 miles below, from July 31, 1901, to December 31, 1912.

GAGE.—Stevens water-stage recorder on left bank, just below the bridge, installed October 4, 1914. Prior to that date, staff in two sections, the lower section inclined; the upper vertical, attached to left abutment. Recorder inspected by Mrs. Cora Ames.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Coarse gravel and boulders; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 16.48 feet at 5.30 a. m. April 2 (discharge, 42,100 second-feet); minimum stage from water-stage recorder, 2.48 feet August 21, 23, 24, and 26 (discharge, 518 second-feet).

1901–1916: Maximum stage recorded, 19.74 feet at the former station in Binghamton at 7.40 a. m. March 2, 1902 (discharge, about 62,500 second-feet); minimum stage recorded, 1.32 feet at 8.20 a. m. and 4 p. m. September 16, 1913 (discharge, 106 second-feet).

ICE.—Stage-discharge relation affected by ice.

ACCURACY.—Stage-discharge relation practically permanent except as affected by ice for a large portion of the period from January to March. Rating curve well defined between 250 and 55,000 second-feet. Operation of the water-stage recorder fairly satisfactory throughout year. Daily discharge ascertained by applying mean daily gage heights to rating table. Gage heights determined by inspecting gage height graph or by averaging hourly gage heights. Results good except for periods when the stage-discharge relation was affected by ice; fair for other periods.

Discharge measurements of Susquehanna River at Conklin, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 14	E. D. Burchard	[a] 6.32	5,810	Mar. 22	C. C. Covert	[a] 4.41	1,850
19	do	[a] 4.76	2,400	Apr. 8	A. H. Davison	9.82	16,200
Feb. 15	O. W. Hartwell	4.24	2,320	10	do	8.34	11,400
26	E. D. Burchard	[a] 7.30	5,270	May 13	do	4.45	2,690
Mar. 14	do	[a] 4.77	2,070	Sept. 15	E. D. Burchard	2.77	733

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Susquehanna River at Conklin, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,350	2,000	2,360	6,170	11,300	3,330	35,000	5,720	2,750	1,570	1,170	635
2	1,570	1,940	2,210	8,760	11,300	2,830	41,800	4,950	2,280	1,350	1,050	558
3	2,210	1,880	2,070	12,600	8,520	2,510	40,300	4,430	2,750	1,400	898	544
4	2,510	1,810	2,000	11,000	6,400	2,360	31,500	4,430	3,680	1,350	842	530
5	2,510	1,750	1,940	9,240	5,060	2,280	21,100	4,530	3,420	1,750	818	530
6	4,230	1,880	1,880	12,800	5,280	2,210	17,700	3,950	2,910	1,570	712	530
7	4,140	2,070	1,690	15,200	5,060	2,280	17,100	3,590	2,830	1,400	726	530
8	3,240	1,880	1,570	11,000	4,330	2,510	15,200	3,950	3,420	1,250	677	530
9	2,670	.....	1,570	8,040	5,500	2,590	12,800	4,330	3,330	1,250	663	789
10	2,360	.....	1,400	6,630	2,910	2,510	11,300	4,430	3,420	1,390	670	740
11	2,140	.....	1,460	6,860	2,670	2,440	10,500	3,680	3,330	1,940	677	670
12	1,940	.....	1,400	6,400	2,440	2,210	11,800	3,160	3,500	4,120	782	659
13	1,940	1,520	1,270	5,720	2,360	2,070	14,300	2,590	3,160	6,000	747	659
14	1,750	1,570	1,230	5,810	2,280	2,000	17,100	2,360	2,670	5,790	677	706
15	1,880	1,940	1,260	4,640	2,280	1,940	18,400	2,210	2,280	5,500	621	796
16	6,170	2,670	1,300	3,500	2,510	1,940	16,400	2,070	2,910	4,710	565	970
17	5,060	2,830	1,520	2,910	2,510	1,880	13,700	3,330	3,500	3,180	565	1,460
18	3,590	.....	3,770	2,510	2,510	1,880	12,800	8,520	2,990	2,070	551	1,310
19	3,160	.....	8,280	2,400	2,440	1,810	12,300	7,800	2,990	2,070	537	922
20	3,680	.....	8,040	2,590	2,440	1,810	10,000	5,940	3,420	1,750	524	796
21	4,140	.....	6,860	3,240	2,440	1,810	8,760	4,840	3,500	1,350	518	712
22	3,500	.....	5,500	5,940	2,440	1,810	9,740	3,950	3,080	1,260	524	670
23	2,990	.....	4,640	13,700	2,360	1,810	11,800	4,530	2,670	1,200	518	1,400
24	2,670	.....	4,230	14,300	2,360	1,810	11,800	5,940	2,210	2,280	518	3,860
25	2,360	2,990	4,430	10,800	2,670	1,880	10,500	5,170	1,940	1,690	524	3,500
26	2,210	2,670	12,300	9,240	4,740	2,440	9,500	4,140	1,940	1,630	518	2,360
27	2,210	2,670	15,200	11,500	6,170	5,060	10,000	3,420	1,880	1,810	593	1,940
28	2,510	2,590	11,800	15,200	5,060	10,800	9,740	3,680	1,880	2,070	600	1,690
29	2,360	2,440	9,500	14,600	3,860	14,000	8,280	3,770	1,810	1,690	747	1,690
30	2,140	2,360	8,040	10,500	.....	19,700	6,860	3,160	1,810	1,400	719	2,440
31	2,070	.....	6,860	8,520	.....	31,900	.....	2,990	.....	1,300	677	.....

NOTE.—Discharge Jan. 14–20 and Feb. 10 to Mar. 25 estimated, because of ice, from discharge measurements, weather records, and study of gage-height graph. No gage-height record Nov. 3–5, 9–12, 14, 15, 18–24, Jan. 15, 16, Feb. 10–12, Feb. 28 to Mar. 21, except Mar. 4, 11, 14–18; no gage-height record July 9, 10, 12–14, 16, 17, and Sept. 12–14; discharge given estimated by comparison with records of flow, Chenango and Chemung rivers.

Monthly discharge of Susquehanna River at Conklin, N. Y., for the year ending Sept. 30, 1916.

[Drainage area, 2,350 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	6,170	1,350	2,810	1.20	1.38
November	.....	1,570	2,270	.966	1.08
December	15,200	1,230	4,440	1.89	2.18
January	15,200	2,400	8,460	3.60	4.15
February	11,300	2,280	4,210	1.79	1.93
March	31,900	1,810	4,460	1.90	2.19
April	41,800	6,860	15,900	6.76	7.54
May	7,800	2,070	4,240	1.80	2.08
June	3,680	1,810	2,810	1.19	1.33
July	6,000	1,200	2,230	.949	1.09
August	1,170	518	675	.287	.33
September	3,860	530	1,170	.497	.55
The year	41,800	518	4,470	1.90	25.83

NOTE.—Mean discharge Nov. 9–12 estimated 1,630 second-feet, Nov. 18–24, 2,860 second-feet.

CHENANGO RIVER NEAR CHENANGO FORKS, N. Y.

LOCATION.—About 1½ miles below Tioughnioga River, 2 miles by road below Chenango Forks post office, Broome County, and 11½ miles above Binghamton and the mouth.

DRAINAGE AREA.—1,380 square miles (revised). See "Diversions."

RECORDS AVAILABLE.—November 11, 1912, to September 30, 1916. Records were obtained at Binghamton July 31, 1901, to December 31, 1911.

GAGE.—Stevens water-stage recorder on the left bank on the farm of Erastus Ingraham. Prior to that date inclined staff on left bank. Water-stage recorder inspected by Erastus Ingraham.

DISCHARGE MEASUREMENTS.—Made from cable about 100 feet above the gage or by wading.

CHANNEL AND CONTROL.—Sand, gravel, and small cobblestones; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 12.18 feet from noon until 1 p. m. April 2 (discharge, 27,900 second-feet); minimum stage from water-stage recorder, 2.50 feet from 1 until 2 p. m. August 23 (discharge 210 second-feet).

1901–1916: Maximum stage recorded, 12.18 feet from noon until 1 p. m. April 2, 1916 (discharge, 27,900 second-feet); minimum stage recorded, 4.5 feet at the former station in Binghamton at 8 a. m. August 28, 1909 (discharge, 10 second-feet).

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—The run-off from 87.3 square miles at head of Chenango River and from 15.7 square miles from Tioughnioga River is stored in reservoirs and, except for discharge by spillways, is diverted out of the drainage area to the Erie Canal and is not included in the following tables. These two areas have been subtracted from the total drainage area, leaving net area of 1,380 square miles.

ACCURACY.—Stage-discharge relation practically permanent, except as affected by ice for a large part of the period from January to March inclusive. Rating curve well defined between 120 and 35,000 second-feet. Operation of the water-stage recorder fairly satisfactory throughout year. Daily discharge ascertained by applying to the rating table mean daily gage heights, determined by inspecting gage-height graph or for days of considerable fluctuation by averaging the hourly discharge.

Discharge measurements of Chenango River at Chenango Forks, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 20	E. D. Burchard	[a] 4.05	1,660	May 15	A. H. Davison	3.56	1,220
Feb. 16	O. W. Hartwell	[a] 6.76	1,960	15	do	3.57	1,230
24	E. D. Burchard	[a] 5.40	1,380	20	do	5.19	3,990
Mar. 15	do	[a] 4.83	1,210	Sept. 14	E. D. Burchard	2.52	215
23	C. C. Covert	[a] 5.00	1,270	14	do	2.54	223
Apr. 6	A. H. Davison	8.34	13,100	30	do	4.54	2,540
7	do	7.91	11,200				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Chenango River at Chenango Forks, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,430	1,700	1,870	4,660	7,930	2,790	24,200	3,750	1,520	1,420	414	255
2	2,750	1,570	1,710	6,310	6,310	2,360	27,000	3,750	1,310	1,220	382	242
3	4,390	1,570	1,640	10,300	4,060	1,870	22,200	3,860	1,940	1,130	368	232
4	2,970	1,550	1,520	7,370	3,160	1,640	16,200	3,650	3,650	1,380	352	237
5	3,570	1,860	1,360	6,310	2,880	1,340	12,400	2,790	2,520	1,260	368	255
6	5,800	2,360	1,320	12,100	2,880	1,200	12,400	2,360	2,020	1,090	348	255
7	4,280	1,940	1,280	9,700	2,700	1,410	11,200	2,270	1,660	948	322	352
8	3,260	1,680	1,260	6,180	2,270	1,790	9,400	2,270	1,780	860	322	430
9	2,700	1,700	1,280	4,720	1,860	1,790	7,930	2,360	2,100	794	303	530
10	2,440	1,740	1,180	4,280	2,100	1,790	7,100	2,100	2,020	827	297	390
11	2,270	1,520	1,140	3,960	1,780	1,710	6,700	1,780	2,700	805	297	315
12	1,940	1,420	1,200	3,450	1,720	1,640	8,500	1,520	3,860	730	322	285
13	1,700	1,580	1,230	3,060	1,560	1,640	9,700	1,340	2,880	1,940	330	261
14	1,550	1,520	1,230	2,620	1,640	1,560	10,600	1,230	2,100	1,570	330	255
15	8,070	1,960	1,130	2,190	1,710	1,000	12,100	1,180	1,780	1,220	330	430
16	7,650	3,290	1,200	1,870	1,710	1,200	9,700	1,170	3,160	937	315	970
17	4,060	2,440	1,340	1,710	1,710	1,410	8,500	5,310	5,430	860	297	720
18	3,060	2,020	1,790	1,680	1,640	1,340	7,930	8,800	3,550	816	279	546
19	4,480	2,080	6,310	1,680	1,560	1,410	6,960	8,500	3,350	710	267	462
20	6,050	4,190	4,960	1,740	1,560	1,340	5,550	3,960	4,500	622	250	398
21	4,170	3,960	4,060	1,780	1,710	1,410	5,680	3,060	3,530	555	242	330
22	3,260	3,750	3,350	3,750	1,710	1,340	7,650	2,610	3,260	538	242	322
23	2,700	3,260	2,970	9,400	1,640	1,340	10,000	4,610	2,610	530	242	1,280
24	2,360	2,880	2,700	6,830	1,480	1,340	8,800	4,960	2,270	1,000	246	1,620
25	2,100	2,610	2,720	5,310	1,870	1,560	6,960	3,260	1,860	753	250	970
26	1,940	2,440	7,430	5,430	3,910	1,790	6,050	2,610	1,660	611	242	772
27	2,270	2,360	6,570	7,650	4,550	2,790	5,920	2,180	1,420	582	242	650
28	2,180	2,270	5,190	10,600	3,340	5,880	5,680	2,520	2,700	853	261	574
29	2,020	2,100	4,170	8,500	2,970	13,400	4,840	2,180	2,440	487	297	670
30	2,020	2,030	4,610	5,680	.....	15,800	4,060	1,860	1,680	446	291	784
31	2,020	.....	4,610	4,840	.....	20,600	.....	1,780	.....	422	267	.....

NOTE.—Discharge Jan. 13–20 and Feb. 14 to Mar. 30, estimated because of ice, from discharge measurements, weather records and study of gage-height graph. No gage-height record Nov. 30 to Dec. 4, Dec. 12, 16–18, July 24–28, and Sept. 30; discharge interpolated.

Monthly discharge of Chenango River near Chenango Forks, N. Y., for the year ending Sept. 30, 1916.

[Drainage area, 1,380 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	8,070	1,430	3,270	2.37	2.73
November	4,190	1,420	2,580	1.87	2.09
December	7,430	1,130	2,720	1.97	2.27
January	12,100	1,680	5,340	3.87	4.46
February	7,930	1,480	2,620	1.90	2.05
March	20,600	1,000	3,210	2.33	2.69
April	27,000	4,060	10,100	7.32	8.17
May	8,800	1,170	3,080	2.23	2.57
June	5,430	1,310	2,580	1.87	2.09
July	1,940	422	901	.653	.75
August	414	242	300	.217	.25
September	1,620	232	526	.381	.42
The year	27,000	232	3,070	2.22	30.54

NOTE.—See "Diversions" in station description.

CHEMUNG RIVER AT CHEMUNG, N. Y.

LOCATION.—At the highway bridge about midway between Chemung, Chemung County, N. Y., and Willawana, Pa., half a mile upstream from the State line and about 10 miles above the mouth.

DRAINAGE AREA.—2,440 square miles.

RECORDS AVAILABLE.—September 11, 1903, to September 30, 1916.

GAGE.—Tape gage at the upstream side of the right span of the bridge. Gage read by D. L. Orcutt.

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

CHANNEL AND CONTROL.—Sand and gravel; occasionally shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year, 17.46 feet at 5 a. m. June 18 (discharge, about 63,200 second-feet); minimum stage recorded, 1.83 feet at 5 p. m. September 3 (discharge, 222 second-feet).

1903–1916: Maximum stage recorded, 17.46 feet at 5 a. m. June 18, 1916 (discharge, about 63,200 second-feet); minimum stage recorded, 1.47 feet at 7 a. m. August 14, 1911 (discharge 49 second-feet).

ICE.—Stage-discharge relation affected by ice.

REGULATION.—Power is developed above the station, the largest plant being at Elmira, N. Y.

ACCURACY.—Stage-discharge relation subject to change; affected by ice for a large part of the period from December to March, inclusive. Rating curve well defined between 200 and 45,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good except for periods during which the stage discharge relation was affected by ice; fair for other periods.

Discharge measurements of Chemung River at Chemung, N. Y., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 20	C. C. Covert	[a] 4.15	2,270	Apr. 4	A. H. Davidson	8.72	15,300
Jan. 17	E. D. Burchard	[a] 2.93	833	5	do	7.65	11,400
Feb. 17	O. W. Hartwell	[a] 3.28	1,090	11	do	6.27	6,820
23	E. D. Burchard	[a] 3.05	811	29	E. D. Burchard	7.10	9,390
Mar. 14	do	[a] 3.56	921	May 10	do	3.92	2,160
Apr. 1	A. H. Davison	14.08	40,100	10	do	3.90	2,140
2	do	14.30	42,000	June 10	do	6.06	6,470
3	do	10.26	21,100	July 25	do	2.60	710
3	do	9.88	19,500	Sept. 13	do	1.93	260
3	do	9.28	17,200	13	do	1.92	271

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Chemung River at Chemung, N. Y., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	488	990	1,250	1,900	3,600	1,090	41,700	5,300	2,140	2,140	464	260
2	808	940	1,090	3,800	4,210	808	39,900	4,240	1,730	1,730	432	250
3	2,690	850	1,040	21,800	2,360	765	20,000	3,460	8,750	1,600	419	241
4	1,760	808	940	8,900	1,560	685	15,300	3,460	18,400	1,730	389	232
5	1,430	808	850	6,330	1,430	605	11,000	3,650	8,140	1,860	464	246
6	7,150	808	808	24,200	1,760	560	9,380	2,930	5,300	1,540	389	241
7	3,040	808	685	12,000	1,620	590	7,560	2,600	3,840	1,300	365	532
8	2,200	765	808	5,820	1,560	645	7,010	2,440	10,400	1,100	377	484
9	1,760	725	765	4,000	1,200	940	6,000	2,290	8,750	1,100	348	419
10	1,370	725	645	3,410	1,370	1,370	5,300	2,140	7,280	1,150	332	371
11	1,200	645	560	3,220	1,310	1,200	6,240	1,860	5,760	1,000	332	348
12	1,040	645	530	2,860	1,140	1,140	9,380	1,600	12,000	960	343	304
13	895	645	502	2,520	1,040	940	13,100	1,360	7,280	915	343	266
14	808	474	488	1,760	1,040	940	26,600	1,250	5,080	870	413	260
15	1,560	645	516	1,200	1,250	1,040	30,000	1,200	3,840	830	371	389
16	4,640	685	590	940	1,140	1,200	13,500	1,200	6,750	790	348	710
17	2,520	765	685	808	1,040	1,250	9,060	12,400	37,600	750	338	588
18	1,900	765	895	725	990	1,370	7,010	14,900	42,900	670	321	490
19	3,040	808	2,360	725	940	1,200	5,300	7,010	15,300	670	294	389
20	8,600	4,420	1,760	725	895	1,040	4,240	4,860	16,800	630	280	354
21	4,420	3,800	1,200	895	850	940	5,530	4,040	9,700	602	260	316
22	3,220	2,860	1,040	1,250	808	895	18,000	2,930	8,440	960	250	310
23	2,520	2,520	940	5,570	765	850	30,500	5,300	6,000	1,200	240	332
24	1,900	2,050	940	2,690	850	765	20,800	5,760	4,440	830	240	294
25	1,620	1,900	940	2,050	850	850	12,800	4,040	3,650	710	240	288
26	1,490	1,620	4,210	2,050	895	765	10,000	3,280	3,280	630	250	288
27	1,370	1,620	4,000	2,050	990	5,570	11,400	2,600	2,600	1,000	272	266
28	1,250	1,760	3,220	4,000	1,090	39,700	13,500	3,280	7,850	616	260	255
29	1,200	1,560	2,690	4,420	1,250	51,400	9,380	3,460	3,840	588	316	413
30	1,090	1,370	1,490	2,690	.....	42,900	6,750	2,930	2,600	560	288	870
31	1,040	.....	1,560	2,200	.....	49,400	.....	2,600	.....	518	282	.....

NOTE.—Discharge Dec. 12–25, Jan. 14–22, Feb. 13 to Mar. 27, estimated because of ice, from discharge measurements, weather records, and study of gage height graph. No gage-height record Aug. 20–25; discharge interpolated.

Monthly discharge of Chemung River at Chemung, N. Y., for the year ending Sept. 30, 1916.

[Drainage area, 2,440 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	8,600	488	2,260	0.926	1.07
November	4,420	474	1,330	.545	.61
December	4,210	488	1,290	.529	.61
January	24,200	725	4,440	1.82	2.10
February	4,210	765	1,370	.561	.60
March	51,400	560	6,880	2.82	3.25
April	41,700	5,300	14,200	5.82	6.49
May	14,900	1,200	4,190	1.72	1.98
June	42,900	1,730	9,350	3.83	4.27
July	2,140	518	1,020	.418	.48
August	464	240	331	.136	.16
September	870	232	367	.150	.17
The year	51,400	232	3,880	1.59	21.79

PATUXENT RIVER BASIN.

PATUXENT RIVER NEAR BURTONSVILLE, MD.

LOCATION.—At the Columbia turnpike bridge, 1½ miles northeast of Burtonsville, Montgomery County, and about 4 miles northwest of Laurel.

DRAINAGE AREA.—127 square miles.

RECORDS AVAILABLE.—July 21, 1911, to June 15, 1912 (records furnished by United States Engineer Office); July 21, 1913, to September 30, 1916.

GAGE.—Stevens water-stage recorder referred to a staff gage in three sections on left bank about 80 feet below highway bridge; prior to July 23, 1914, a vertical staff fastened to left side of bridge pier; datum of recorder is 1.29 feet below that of gage on pier. Recorder inspected by Columbus Brashears.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Banks are lined with trees and brush and are overflowed at stage of about 10 feet. Control is a flat gravel bar about 300 feet below bridge. Current is swift under bridge, but sluggish below bridge to control. Discharge measurements indicate that control remained practically permanent from 1911 to 1914, but shifted during the floods of January and February, 1915.

EXTREMES OF DISCHARGE.—Maximum stage during year, 8.75 feet at 6.30 p. m. July 25 (discharge, 2,260 second-feet); minimum stage, from water-stage recorder, 1.65 feet at 12.30 p. m. January 17 (discharge, 27 second-feet).

1911–1915: Maximum stage recorded, 14.6 feet at about 9 a. m. January 12, 1915 (discharge from poorly defined rating curve 5,100 second-feet); minimum stage, 0.18 foot August 25, 1911 (discharge, 6 second-feet).

ICE.—Discharge relation affected by ice during severe winters only.

ACCURACY.—Stage-discharge relation remained practically permanent during the year; affected by ice for a few days in January. Rating curve well defined between 50 and 2,000 second-feet. Operation of the water-stage recorder was satisfactory throughout the year except for short periods (see footnote to daily discharge table). Daily discharge ascertained by use of discharge integrator. Results excellent.

Discharge measurements of Patuxent River near Burtonsville, Md., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 6	M. I. Walters	1.95	62.4	July 26	Stevens and Walters	5.26	875
6	H. W. Fear	1.95	59.1	26	do	6.70	1,370
17	G. C. Stevens	4.42	592	Aug. 16	G. C. Stevens	2.06	77.6
17	do	3.95	467				

Daily discharge, in second-feet, of Patuxent River near Burtonsville, Md., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	301	50	54	143	140	107	149	97	68	70	117	56
2	153	50	54	157	158	103	135	93	68	70	108	56
3	78	49	56	148	149	118	131	89	67	70	101	55
4	70	48	59	126	113	104	136	89	66	70	99	54
5	82	51	60	117	116	106	131	148	65	70	105	54
6	100	53	61	107	129	106	123	113	62	70	105	50
7	70	54	61	102	188	99	116	97	100	70	.....	52
8	91	54	58	91	151	119	135	102	97	70	.....	53
9	88	58	61	78	129	127	246	92	171	74	.....	79
10	60	60	63	99	133	102	267	86	161	119	.....	55
11	61	62	59	120	127	93	155	83	149	183	.....	50
12	65	65	56	141	133	86	136	83	98	95	.....	45
13	72	65	51	143	292	87	119	80	84	81	.....	48
14	72	63	52	121	146	88	121	79	79	344	.....	44
15	74	93	63	90	136	134	112	80	76	285	.....	94
16	315	82	60	79	149	131	112	80	445	173	81	94
17	99	60	57	42	127	99	123	134	492	111	83	61
18	83	53	264	59	148	88	130	94	168	102	76	59
19	77	104	178	73	130	85	112	82	114	86	72	70
20	90	98	93	74	106	81	108	77	99	78	68	57
21	109	73	76	75	106	81	110	74	197	73	67	51
22	94	71	72	81	104	226	148	72	160	108	63	51
23	89	70	83	128	103	228	118	133	81	206	63	202
24	82	68	87	85	106	138	106	113	70	74	64	82
25	77	61	81	77	257	121	122	88	93	799	64	66
26	75	62	222	82	240	115	161	77	249	1,120	60	64
27	92	65	121	81	157	113	158	71	98	275	59	63
28	87	66	101	74	113	381	130	67	90	179	181	58
29	80	63	342	73	118	279	111	68	70	158	67	62
30	74	54	296	120	.....	210	105	78	64	133	61	70
31	66	.....	163	146	.....	168	.....	77	.....	124	61	.....

NOTE.—Discharge Jan. 15–21 estimated, because of ice, from study of weather records and gage-height graph. Probably slight ice effect Feb. 13–17 but no correction made therefor. No gage-height record obtained July 1–8 and Aug. 7–15; discharge estimated as in table for first period and as 85 second-feet for second. Discharge July 25–26 ascertained by averaging the hourly discharge.

Monthly discharge of Patuxent River near Burtonsville, Md., for the year ending Sept. 30, 1916.

[Drainage area 127 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	315	60	97.6	0.769	0.89
November	104	48	64.2	.506	.56
December	342	51	102	.803	.93
January	157	42	101	.795	.92
February	292	103	145	1.14	1.23
March	381	81	133	1.05	1.21
April	267	105	136	1.07	1.19
May	148	67	90.2	.710	.82
June	492	62	130	1.02	1.14
July	1,120	70	179	1.41	1.63
August	181	59	83.5	.657	.76
September	202	44	65.2	.513	.57
The year	1,120	42	110	.866	11.85

POTOMAC RIVER BASIN.

POTOMAC RIVER AT POINT OF ROCKS, MD.

LOCATION.—At the steel highway bridge at Point of Rocks, Frederick County, about one-third mile below Catoctin Creek and 6 miles above Monocacy River.

DRAINAGE AREA.—9,650 square miles.

RECORDS AVAILABLE.—February 17, 1895, to September 30, 1916.

GAGE.—Chain, attached to downstream side of left span of bridge, read once daily by G. H. Hickman. Datum constant since September 2, 1902; prior to this date datum was 0.45 foot higher than at present. Sea-level elevation of gage datum is 200.54 feet.

DISCHARGE MEASUREMENTS.—Made from the bridge.

CHANNEL AND CONTROL.—Practically permanent. The control is a ledge a few hundred feet below the station, the ledge extending completely across the river except for one relatively unimportant channel.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 18.3 feet at 3 p. m., March 29 (discharge 124,000 second-feet); minimum stage recorded, 0.65 foot at 5 p. m., September 13 (discharge 1,120 second-feet).

1895–1916: Maximum stage recorded, 39.0 feet on March 2, 1902 (discharge 219,000 second-feet); minimum stage, 0.38 foot on September 10, 1914 (discharge 540 second-feet).

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

DIVERSIONS.—The Chesapeake & Ohio Canal parallels the Potomac on the Maryland side. The average discharge of the canal is 75 to 100 second-feet. The discharge is not included in the following tables.

REGULATION.—Fluctuation at extremely low stages has been noted and is probably caused by the operation of power plants on the upper Potomac and tributaries.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice. Rating curve well defined except at extremely low water. Gage read to hundredths once daily; during high water read oftener. Daily discharge ascertained by applying daily gage heights to rating table. Results excellent except at extremely low stages, for which they are fair.

The following discharge measurement was made by James E. Stewart and H. W. Fear:

June 13, 1916: Gage height, 3.55 feet; discharge, 11,900 second-feet.

Daily discharge, in second-feet, of Potomac River at Point of Rocks, Md., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	6,520	1,990	3,240	26,800	19,800	8,620	36,300	16,300	5,020	6,520	5,380	2,380
2	6,520	1,740	2,800	14,600	17,400	9,530	26,800	14,100	4,840	5,750	4,500	2,250
3	34,200	1,310	2,640	19,100	15,200	10,500	22,900	12,000	4,500	5,750	4,170	1,460
4	20,400	2,250	2,520	23,600	14,100	9,530	17,400	11,000	3,860	5,380	5,750	2,660
5	14,100	2,120	2,380	17,400	13,000	8,620	19,800	11,500	3,700	8,620	5,750	2,520
6	9,530	2,250	2,800	13,000	12,000	9,070	18,600	12,500	4,010	9,530	4,670	2,520
7	9,070	3,090	2,800	12,000	12,500	8,620	16,800	11,500	5,750	6,520	5,020	2,250
8	8,620	4,010	2,660	10,500	15,200	8,180	16,300	10,500	6,130	4,670	4,840	2,520
9	7,330	2,250	2,520	9,070	17,400	9,530	16,300	9,070	6,520	4,010	3,700	2,520
10	6,520	2,120	2,520	7,330	15,700	12,500	19,800	8,180	7,750	4,670	3,700	2,660
11	5,750	3,090	2,380	7,330	13,500	13,000	23,600	7,750	15,700	4,170	3,540	2,800
12	4,500	2,940	2,380	7,750	1,000	12,500	23,600	7,330	15,200	3,090	3,540	1,360
13	3,860	2,640	2,590	26,800	16,800	8,620	22,300	6,920	12,000	2,380	4,100	1,120
14	4,330	2,940	2,660	26,100	43,000	9,070	22,300	6,130	12,800	2,660	4,670	1,460
15	4,670	4,010	3,090	25,500	30,100	9,530	21,100	6,130	13,500	3,090	4,840	1,510
16	4,170	2,640	2,800	18,600	21,100	24,200	18,000	6,130	22,900	2,660	4,170	1,740
17	3,860	2,800	2,660	9,530	18,000	31,500	21,700	5,750	49,200	4,010	3,090	2,800
18	3,090	3,240	5,380	8,620	15,700	16,300	13,000	6,340	49,200	3,860	2,940	1,990
19	2,800	5,750	11,000	7,750	14,100	12,500	12,000	6,920	30,100	3,240	2,660	1,860
20	4,010	3,860	14,600	8,180	13,000	11,500	10,000	6,520	19,800	2,800	2,380	1,460
21	5,750	4,010	14,100	8,620	11,500	10,500	10,500	6,520	22,300	2,520	2,250	3,240
22	5,750	5,380	13,500	9,070	10,500	10,000	11,000	6,920	18,000	2,380	2,120	3,090
23	4,840	7,330	5,020	9,530	9,530	64,700	11,500	6,520	15,200	2,380	2,520	2,800
24	4,330	6,130	4,840	9,070	9,070	54,000	14,600	5,750	12,000	5,750	2,800	2,940
25	4,010	5,380	3,240	8,620	9,530	34,200	13,000	5,750	10,000	11,000	2,250	2,660
26	3,860	5,020	5,750	7,750	12,000	27,500	21,700	5,380	10,000	33,500	2,380	2,380
27	3,860	4,670	7,750	7,330	14,600	24,200	38,500	5,380	8,180	26,800	2,380	2,520
28	3,390	4,840	9,070	6,520	14,100	43,700	31,500	5,020	12,500	16,300	2,800	2,660
29	3,240	4,170	9,530	6,130	11,500	21,000	24,200	5,380	11,000	11,500	3,240	2,800
30	3,090	3,700	9,530	6,130	.....	78,800	20,400	5,750	8,180	9,070	2,800	3,090
31	2,800	.....	47,600	8,180	.....	54,000	.....	5,380	.....	7,750	2,520	.....

Monthly discharge of Potomac River at Point of Rocks, Md., for the year ending Sept. 30, 1916.

[Drainage area, 9,650 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	34,200	2,800	6,730	0.697	0.80
November	7,330	1,310	3,590	.372	.42
December	47,600	2,380	6,650	.689	.79
January	26,800	6,130	12,500	1.30	1.50
February	43,000	9,070	15,600	1.62	1.75
March	121,000	8,180	24,700	2.56	2.95
April	38,500	10,000	19,800	2.05	2.29
May	16,300	5,020	7,950	.824	.95
June	49,200	3,700	14,000	1.45	1.62
July	33,500	2,380	7,170	.743	.86
August	5,750	2,120	3,600	.373	.43
September	3,240	1,120	2,330	.241	.27
The year	121,000	1,120	10,400	1.08	14.63

MONOCACY RIVER NEAR FREDERICK, MD.

LOCATION.—At county bridge on toll road leading from Frederick, Frederick County, to Mount Pleasant, about 3,000 feet below Tuscarora Creek (entering from the right) and about 2,000 feet above Israel Creek (entering from the left).

DRAINAGE AREA.—660 square miles.

RECORDS AVAILABLE.—August 4, 1896, to September 30, 1916.

GAGE.—Chain attached to downstream side of right span of bridge; read by Eugene L. Derr.

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

CHANNEL AND CONTROL.—Banks lined with trees and brush; overflow at high stages; bed composed of gravel and boulders and shifting during extreme floods. Control not well defined.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 22.7 feet at 6 p. m., June 16 (discharge, 14,900 second-feet); minimum stage recorded, 4.05 feet on several days in September (discharge 78 second-feet).

1896–1916: Maximum stage recorded, 27.2 feet at 11 a. m., January 13, 1915 (discharge, determined from rating curve used for 1916, 19,000 second-feet); minimum stage, 3.54 feet on several days in October, 1910 (discharge, 15 second-feet).

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

ACCURACY.—Stage-discharge relation remained practically permanent during the year and was not affected by ice. Rating curve well defined between 50 and 15,000 second-feet. Current-meter measurements made after September 30, 1916, were used to define the curve for high stages and indicate that previous curves gave results about 20 per cent too large at high stages. Gage read to half-tenths once daily and oftener during high water. Daily discharge ascertained by applying rating table to gage heights. Results good.

The following discharge measurement was made by James E. Stewart and H. W. Fear:

June 12, 1916: Gage height, 6.02 feet; discharge, 758 second-feet.

Daily discharge, in second-feet, of Monocacy River near Frederick, Md., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept
1	1,680	270	270	2,240	720	800	2,240	638	318	485	505	171
2	3,140	255	255	2,540	750	850	1,680	548	255	445	525	171
3	1,170	240	255	1,680	800	750	1,420	525	255	405	388	146
4	850	226	240	1,110	682	728	1,420	318	800	370	352	146
5	592	226	226	1,060	800	505	1,230	705	281	335	465	134
6	592	226	226	950	728	682	1,060	592	270	318	425	146
7	548	212	212	850	1,170	405	850	505	2,690	302	388	122
8	505	212	198	638	1,060	465	1,060	485	1,960	286	370	122
9	485	212	198	682	800	750	1,290	465	2,240	270	318	99
10	370	1,290	171	705	705	638	3,910	370	1,680	302	425	78
11	335	226	158	728	682	425	1,540	352	1,060	370	286	78
12	318	212	352	1,060	850	388	1,420	318	900	302	270	88
13	302	212	286	1,960	5,410	318	1,170	318	615	286	240	78
14	286	198	255	1,540	1,820	352	1,000	318	485	302	240	78
15	286	226	240	950	1,350	1,170	900	302	5,930	405	226	7,550
16	370	800	240	750	1,170	950	850	352	13,300	370	240	3,440
17	286	682	198	682	950	682	728	388	12,400	335	212	2,100
18	286	465	1,290	548	1,350	548	682	352	4,480	445	226	286
19	286	485	6,290	592	1,540	682	682	335	2,320	405	198	226
20	286	1,820	1,420	728	950	548	615	302	2,030	302	184	184
21	1,110	1,110	800	592	850	570	592	286	1,420	270	198	146
22	548	682	638	548	705	3,140	2,240	286	1,960	270	184	134
23	425	465	525	548	750	7,820	1,170	388	1,350	1,000	171	1,290
24	388	388	548	505	850	2,240	1,060	682	1,000	800	198	950
25	352	352	728	465	2,540	2,100	705	445	850	2,240	171	682
26	335	352	2,690	485	4,730	1,890	1,290	388	705	5,580	184	226
27	352	318	1,820	548	1,960	1,820	950	335	668	1,960	171	198
28	318	302	728	525	1,170	9,940	728	318	850	3,910	570	171
29	318	286	5,410	465	850	9,200	728	352	570	1,290	370	171
30	286	270	7,730	682	.....	4,730	660	405	505	660	302	171
31	286	.....	2,240	1,000	.....	3,140	.....	425	.....	525	212	.....

Monthly discharge of Monocacy River near Frederick, Md., for the year ending Sept. 30, 1916.

[Drainage area, 660 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	3,140	286	571	0.865	1.00
November	1,820	198	441	.668	.75
December	7,730	158	1,190	1.80	2.08
January	2,540	465	915	1.39	1.60
February	5,410	682	1,330	2.02	2.18
March	9,940	318	1,910	2.89	3.33
April	3,910	592	1,200	1.82	2.03
May	705	286	413	.626	.72
June	13,300	255	2,140	3.24	3.62
July	5,580	270	824	1.25	1.44
August	570	171	297	.450	.52
September	7,550	78	653	.989	1.10
The year	13,300	78	990	1.50	20.37

OCCOQUAN CREEK NEAR OCCOQUAN, VA.

LOCATION.—At Frank Davis's farm, about 1 mile above Beaverdam Creek, about 4½ miles upstream and northwest of Occoquan, on the line between Fairfax and Prince William counties.

DRAINAGE AREA.—546 square miles.

RECORDS AVAILABLE.—February 14, 1913, to May 3, 1916, when station was discontinued.

GAGE.—Friez water stage recorder on left bank installed April 27, 1913, referred to an inclined staff on left bank about 150 feet upstream. Observer, Miss Sadie Bradley. Previous to installation of recorder, a temporary vertical staff on opposite bank was used.

DISCHARGE MEASUREMENTS.—Made from cable about 75 feet below the recorder, or by wading.

CHANNEL AND CONTROL.—Gravel and large rocks; control is practically permanent. Stage of zero flow at foot gage height, 0.4.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 15.5 feet at 4 p. m., March 28 (discharge, 11,900 second-feet); minimum stage from water stage recorder, 2.10 feet at 5 p. m., December 11 (discharge 50 second-feet).

1913–1916: Maximum stage 21.2 feet on afternoon of January 13, 1915, determined from flood marks on recorder shelter (discharge determined from extension of rating curve, 20,900 second-feet); minimum stage recorded, 1.39 feet, September 13–18, 1913, discharge, 9.7 second-feet.

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

ACCURACY.—Discharge relation has remained practically permanent and was affected by ice for only a few days during the winter. Gage-height record satisfactory. Rating curve well defined between 15 and 10,000 second-feet. Daily discharge obtained by discharge integrator except for March 28–29 and April 25–26, which are averages of two-hourly values. Because of ice effect, estimated corrections were applied to gage height graph January 8–10, 16–21, and February 14–18 before integrating. Records excellent except at extremely high and low stages and periods of ice effect.

Discharge measurements of Occoquan Creek near Occoquan, Va., during the year ending Sept. 30, 1916.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 4	Walters and Stewart...	2.21	63.6	Aug. 14	Peterson and Walters..	2.57	115

Daily discharge, in second-feet, of Occoquan Creek near Occoquan, Va., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.
1	642	72	68	607	715	344	769	454
2	2,010	68	68	612	2,100	318	603	378
3	500	64	67	513	2,600	378	499	320
4	275	63	63	357	1,010	405	582	.....
5	200	60	63	277	780	297	485	.....
6	232	60	58	261	1,140	286	419	.....
7	257	60	57	246	1,520	260	377	.....
8	235	60	58	190	841	245	340	.....
9	259	58	60	140	534	249	1,210	.....
10	165	59	60	170	856	208	1,630	.....
11	130	60	56	720	697	186	739	.....
12	120	63	57	1,060	578	166	535	.....
13	114	62	57	902	680	158	438	.....
14	98	61	61	645	470	160	380	.....
15	90	66	85	355	340	200	330	.....
16	86	64	55	230	380	346	270	.....
17	82	64	60	230	520	238	241	.....
18	78	75	81	190	1,150	186	223	.....
19	78	92	523	170	740	158	210	.....
20	108	373	315	150	425	149	190	.....
21	189	232	194	150	380	145	176	.....
22	191	146	152	190	337	408	200	.....
23	137	116	129	377	286	1,460	325	.....
24	107	100	114	331	289	615	220	.....
25	95	88	111	219	2,260	436	1,170	.....
26	81	82	283	193	1,420	366	4,680	.....
27	83	76	603	180	695	320	2,050	.....
28	82	77	350	168	445	7,140	1,200	.....
29	100	74	1,090	162	372	3,850	767	.....
30	95	68	1,900	592	.....	1,790	570	.....
31	82	.....	861	935	.....	1,080	.....	.....

Monthly discharge of Occoquan Creek near Occoquan, Va., for the year ending Sept. 30, 1916.

[Drainage area, 546 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,010	78	226	0.414	0.48
November	373	58	88.8	.163	.18
December	1,900	55	250	.458	.53
January	1,060	140	372	.681	.79
February	2,600	286	847	1.55	1.67
March	7,140	145	727	1.33	1.53
April	4,680	176	728	1.33	1.48

RAPPAHANNOCK RIVER BASIN.

RAPPAHANNOCK RIVER NEAR FREDERICKSBURG, VA.

LOCATION.—At the rear of the McWhirt farm, about 1½ miles above the dam of the Spottsylvania Power Co., and about 3½ miles above Fredericksburg, Spottsylvania County.

DRAINAGE AREA.—1,590 square miles.

RECORDS AVAILABLE.—September 19, 1907, to September 30, 1916.

GAGE.—Vertical staff on right bank installed November 4, 1913, to replace chain gage destroyed October 31, 1913. Original gage was a vertical staff, which was destroyed February 14, 1908, and replaced February 20, 1908, by a chain gage under the cable. All gages referred to the same datum and at practically same site. Gage read by J. W. Franklin and Charles Perry.

DISCHARGE MEASUREMENTS.—Made from cable at the gage. At extreme low water measurements can be made by wading or from a bridge over the power canal below the dam.

CHANNEL AND CONTROL.—Both banks wooded; right bank subject to overflow at stage about 15 feet, left bank at about 12 feet. One channel, bed composed of boulders and somewhat rough. Current sluggish at extreme low water. Control is a rocky section a few hundred feet below the gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.5 feet at 9 a. m. June 17 (discharge, determined from extension of rating curve, 33,600 second-feet); minimum stage recorded, 0.88 foot September 23 (discharge, 260 second-feet).

1907–1916: Maximum stage recorded, 11.0 feet January 13, 1915, determined by leveling from flood marks (discharge determined from extension of rating curve, 36,300 second-feet); minimum stage recorded, 0.30 foot at 3 p. m. August 21, 1914 (discharge 72 second-feet).

ICE.—Ice forms near gage but seldom in sufficient quantity at control section to affect stage-discharge relation.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice during the year. Rating curve well defined except at extremely high and low stages. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good.

No discharge measurements made during the year.

Daily discharge, in second-feet, of Rappahannock River near Fredericksburg, Va., for the year ending Sept. 30, 1916.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,770	750	750	2,740	1,560	1,770	3,100	1,700	1,620	2,080	.....	588
2	20,600	860	698	2,240	2,240	1,620	2,920	1,560	1,280	1,920	.....	578
3	4,140	805	698	2,080	5,360	2,000	2,400	1,480	1,040	1,770	.....	502
4	2,570	750	698	1,620	2,920	1,920	2,400	1,420	1,100	1,620	.....	418
5	1,840	718	687	1,480	2,400	1,770	2,240	1,560	805	1,220	.....	526
6	1,280	740	656	1,420	2,400	1,560	2,240	2,740	860	1,160	.....	510
7	1,040	750	656	1,560	2,400	1,420	2,240	2,000	1,620	1,040	.....	462
8	1,560	740	616	1,420	2,080	1,350	2,240	1,700	2,400	975	.....	425
9	1,560	750	607	1,350	2,000	1,350	3,490	1,560	4,850	975	.....	918
10	1,480	740	656	1,100	2,080	1,280	3,100	1,350	5,630	1,040	.....	860
11	1,280	718	560	2,400	2,080	1,160	2,570	1,350	6,770	1,840	.....	598
12	1,160	740	569	2,920	2,240	1,100	2,240	1,220	3,490	1,480	.....	462
13	1,100	698	636	2,570	2,080	1,040	2,080	1,160	2,570	1,160	.....	288
14	1,100	740	698	2,400	1,700	1,040	2,000	1,100	1,770	1,040	.....	598
15	1,040	750	656	1,840	1,480	1,220	1,920	918	2,400	975	.....	645
16	1,040	805	645	1,700	1,350	1,280	1,700	975	25,100	975	.....	975
17	1,040	805	676	1,560	1,840	1,040	1,560	1,620	30,900	1,160	.....	708
18	1,040	718	805	1,350	2,400	918	1,480	1,620	8,010	11,300	.....	569
19	1,040	750	2,570	1,160	1,920	918	1,350	1,220	4,850	3,100	.....	478
20	1,040	2,920	1,560	1,160	1,700	918	1,350	1,040	3,920	2,240	.....	323
21	1,620	1,840	1,280	1,350	1,480	918	1,280	975	3,490	1,350	.....	288
22	1,420	1,220	975	1,420	1,350	1,040	1,480	918	4,140	1,160	.....	288
23	1,160	1,040	750	1,420	1,350	2,000	1,560	1,040	3,490	1,700	.....	260
24	1,040	918	698	1,280	1,350	1,840	1,480	1,420	3,490	2,570	2,240	349
25	918	918	740	1,100	4,140	1,420	1,700	1,220	8,680	9,390	1,700	518
26	918	860	1,040	1,040	3,490	1,350	5,360	975	5,100	15,000	1,200	349
27	975	805	918	1,040	2,740	1,350	2,920	860	3,100	7,380	676	349
28	1,040	805	718	1,040	2,080	12,000	2,570	805	6,770	5,100	687	288
29	975	750	1,560	1,040	1,840	10,100	2,240	2,570	4,140	3,490	698	336
30	860	805	8,010	1,280	.....	5,910	2,080	8,680	2,740	2,400	578	288
31	805	.....	3,700	1,420	.....	3,700	.....	2,920	.....	1,800	510	.....

NOTE.—Gage not read July 30 to Aug. 23 and Aug. 25–26; discharge July 30–31 and Aug. 25–26 estimated as in table; mean discharge Aug. 1–23 estimated 1,400 second-feet by comparison with records of flow of adjacent streams.

Monthly discharge of Rappahannock River near Fredericksburg, Va., for the year ending Sept. 30, 1916.

[Drainage area, 1,590 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	20,600	805	1,950	1.23	1.42
November	2,920	698	907	.570	.64
December	8,010	560	1,180	.742	.86
January	2,920	1,040	1,600	1.01	1.16
February	5,360	1,350	2,210	1.39	1.50
March	12,000	918	2,200	1.38	1.59
April	5,360	1,280	2,240	1.41	1.57
May	8,680	805	1,670	1.05	1.21
June	30,900	805	5,200	3.27	3.65
July	15,000	975	2,920	1.84	2.12
August	.....	510	1,310	.824	.95
September	975	260	491	.309	.34
The year	30,900	260	1,990	1.25	17.01

INDEX.

STREAM-GAGING STATIONS

AND

PUBLICATIONS RELATING TO WATER RESOURCES

PART I. NORTH ATLANTIC SLOPE BASINS

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STREAM-GAGING STATIONS AND PUBLICATIONS RELATING TO WATER RESOURCES.

PART I. NORTH ATLANTIC SLOPE BASINS.

INTRODUCTION.

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

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

PART I. North Atlantic slope basins.
II. South Atlantic slope and eastern Gulf of Mexico basins.
III. Ohio River basin.
IV. St. Lawrence River basin.
V. Upper Mississippi River and Hudson Bay basins.
VI. Missouri River basin.
VII. Lower Mississippi River basin.
VIII. Western Gulf of Mexico basins.
IX. Colorado River basin.
X. Great Basin.
XI. Pacific slope basins in California.
XII. North Pacific slope basins (in three volumes).

This appendix contains, in addition to the list of gaging stations and the annotated list of publications relating specifically to the section, a similar list of reports that are of general interest in many sections and cover a wide range of hydrologic subjects; also brief references to reports published by State and other organizations (p. XXIII).

HOW GOVERNMENT REPORTS MAY BE OBTAINED OR CONSULTED.

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

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

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

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

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

Boston, Mass., 2500 Customhouse.
Albany, N. Y., Room 18, Federal Building.
Atlanta, Ga., Post Office Building.
Madison, Wis., c/o Railroad Commission of Wisconsin.
Topeka, Kans., 25 Federal Building.
Austin, Tex., Old Post Office Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 403 New Post Office Building.
Phoenix, Ariz., 417 Fleming Building.
Salt Lake City, Utah, 421 Federal Building.
Boise, Idaho, 615 Idaho Building.
Tacoma, Wash., 406 Federal Building.
Portland, Oreg., 416 Couch Building.
San Francisco, Cal., 328 Customhouse.
Los Angeles, Cal., 619 Federal Building.
Honolulu, Hawaii, Kapiolani Building.

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

STREAM-FLOW REPORTS.

Stream-flow records have been obtained at more than 4,100 points in the United States, and the data obtained have been published in the reports indicated in the following table:

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

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

Report.	Character of data.	Year.
10th A, pt. 2	Descriptive information only	
11th A, pt. 2	Monthly discharge and descriptive information	1884 to Sept., 1890.
12th A, pt. 2	do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
W 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.

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

Report.	Character of data.	Year.
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.

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

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

The following table gives, by years and drainage basin, the numbers of papers on surface-water supply published from 1899 to 1914. The data for any particular station will be found in the reports covering the years during which the station was maintained. For example, data for 1902 to 1916 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, and 433, which contain records for the Ohio River basin for those years.

Numbers of water-supply papers containing results of stream measurements, 1899-1916.

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 and Great Lakes basins.	V Hudson Bay and upper Mississippi River basin.	VI Missouri River basin.	VII Lower Mississippi River basin.	VIII Western Gulf of Mexico basins.	IX Colorado River basin.	X Great Basin.	XI Pacific slope basins in California.	XII North Pacific slope basins.		
												Pacific slope basins in Washington and upper Columbia River.	Snake River basin.	Lower Columbia River 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] 169,173	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	332A	332B	332C
1913	351	352	353	354	355	356	357	358	359	360	361	362A	362B	362C
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

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39. Estimates for 1899 in Twenty-first Annual Report, Part IV.
[b] James River only.
[c] Gallatin River.
[d] Green and Gunnison rivers and Grand River above junction with Gunnison.
[e] Mohave River only.
[f] Kings and Kern rivers and south Pacific slope basins.
[g] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52. Estimates 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 of St. Lawrence River.
[m] Hudson Bay only.
[n] New England Rivers only.
[o] Hudson River to Delaware River, inclusive.
[p] Susquehanna River to Yadkin River, inclusive.
[q] Platte and Kansas rivers.
[r] Great Basin in California except Truckee and Carson river basins.
[s] Below junction with Gila.
[t] Rogue, Umpqua, and Siletz rivers only.

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

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

PRINCIPAL STREAMS.

The principal streams flowing into the Atlantic Ocean between St. John River, Maine-New Brunswick, and York River, Virginia, are the St. Croix, Machias, Union, Penobscot, Kennebec, Androscoggin, Saco, Merrimack, Mystic, Blackstone, Connecticut, Hudson, Delaware, Susquehanna, Potomac, and Rappahannock. The streams drain wholly or in part the States of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Jersey, New Hampshire, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia.

GAGING STATIONS.[1]

NOTE.—Dash after date indicates that station was being maintained September 30, 1916. Period after a date indicates discontinuance.

ST. JOHN RIVER BASIN.

St. John River near Dickey, Maine, 1910–11.
St. John River at Fort Kent, Maine, 1905–1915.
St. John River at Van Buren, Maine, 1908–
Allagash River near Allagash, Maine, 1910–11.
St. Francis River at St. Francis, Maine, 1910–11.
Fish River at Wallagrass, Maine, 1903–1908; 1911.
Madawaska River at St. Rose du Degele, Quebec, 1910–11.
Aroostook River at Fort Fairfield, Maine, 1903–1910.

ST. CROIX RIVER BASIN.

St. Croix River near Woodland (Sprague Falls), Maine, 1902–1911.
St. Croix River at Baring, Maine, 1914.
West Branch of St. Croix River at Baileyville, Maine, 1910–1912.

MACHIAS RIVER BASIN.

Machias River at Whitneyville, Maine, 1903–

[1] St. John River to York River, inclusive.

UNION RIVER BASIN.

Union River, West Branch (head of Union River), at Amherst, Maine, 1909–
Union River, West Branch, near Mariaville, Maine, 1909.
Union River at Ellsworth, Maine, 1909.
East Branch of Union River near Waltham, Maine, 1909.
Webb Brook at Waltham, Maine, 1909.
Green Lake (head of Reeds Brook) at Green Lake, Maine, 1909–1912.
Reeds Brook [Green Lake Stream] at Lakewood, Maine, 1909–1913.
Branch Lake (head of Branch Lake Stream) near Ellsworth, Maine, 1909–1915.
Branch Lake Stream near Ellsworth, Maine, 1909–1914.

PENOBSCOT RIVER BASIN.

Penobscot River, West Branch (head of Penobscot River), at Millinocket, Maine, 1901–
Penobscot River, West Branch, near Medway, Maine, 1916–
Penobscot River at West Enfield, Maine, 1901–
Penobscot River at Sunkhaze rips, near Costigan, Maine, 1899–1900.
East Branch of Penobscot River at Grand Lake dam, Maine, 1912.
East Branch of Penobscot River at Grindstone, Maine, 1902–
Mattawamkeag River at Mattawamkeag, Maine, 1902–
Piscataquis River near Foxcroft, Maine, 1902–
Passadumkeag River at Lowell, Maine, 1915–
Cold Stream Pond (head of Cold Stream), Maine, 1900–1911 (record of opening and closing of pond).
Cold Stream at Enfield, Maine, 1904–1906.
Kenduskeag Stream near Bangor, Maine, 1908–
Orland River:
Phillips Lake outlet near East Holden, Maine, 1904–1908.

ST. GEORGE RIVER BASIN.

St. George River at Union, Maine, 1913–14.

KENNEBEC RIVER BASIN.

Moose River (head of Kennebec River) near Rockwood, Maine, 1902–1908; 1910–1912.
Moosehead Lake (on Kennebec River) at Greenville, Maine, 1903–1906 (stage only).
Moosehead Lake at east outlet, Maine (stage only), 1895–
Kennebec River at The Forks, Maine, 1901–
Kennebec River at Bingham, Maine, 1907–1910.
Kennebec River at North Anson, Maine, 1901–1907.
Kennebee River at Waterville, Maine, 1892–
Kennebec River at Gardiner, Maine, 1785–1910 (record of opening and closing of navigation).
Roach River at Roach River, Maine, 1901–1908.
Dead River near The Foks, Maine, 1901–1907; 1910–
Carrabassett River at North Anson, Maine, 1901–1907.
Sandy River near Farmington, Maine, 1910–1915.
Sandy River near Madison, Maine, 1904–1908.
Sebasticook River at Pittsfield, Maine, 1908–
Messalonskee Stream at Waterville, Maine, 1903–1905.
Cobbosseecontee Lake (on Cobbosseecontee Stream), Maine, 1839–1911 (dates of opening and closing).
Cobbosseecontee Stream at Gardiner, Maine, 1890–1915.

ANDROSCOGGIN RIVER BASIN.

Rangeley Lake (head of Androscoggin River), Maine, 1879–1911 (dates of opening and closing).
Androscoggin River at Errol dam, N. H., 1905–
Androscoggin River at Berlin, N. H., 1913–
Androscoggin River at Gorham, N. H., 1903 (fragmentary).
Androscoggin River at Shelburne, N. H., 1903–1907; 1910.
Androscoggin River at Rumford Falls, Maine, 1892–1903; 1905–
Androscoggin River at Dixfield, Maine, 1902–1908.
Magalloway River at Aziscohos dam, Maine, 1912–
Auburn Lake, Maine, 1890–1911 (date of opening).
Little Androscoggin River at Bisco Falls, near South Paris, Maine, 1913–

PRESUMPSCOT RIVER BASIN.

Presumpscot River at outlet of Sebago Lake, Maine, 1887–

SACO RIVER BASIN.

Saco River near Center Conway, N. H., 1903–1912.
Saco River at Cornish, Maine, 1916–
Saco River at West Buxton, Maine, 1907–
Ossipee River at Cornish, Maine, 1916–

MERRIMACK RIVER BASIN.

Pemigewasset River (head of Merrimack River) at Plymouth, N. H., 1886–1913.
Merrimack River at Franklin Junction, N. H., 1903–
Merrimack River at Garvins Falls, N. H., 1904–1915.
Merrimack River at Lowell, Mass., 1848–1861; 1866–
Merrimack River at Lawrence, Mass., 1880–
Middle Branch of Pemigewasset River at North Woodstock, N. H., 1911–12.
Lake Winnepesaukee at Lakeport, N. H., 1860–1911. (Stage only.)
Contoocook River at West Hopkinton, N. H., 1903–1907.
Suncook River at East Pembroke, N. H., 1904–5.
Souhegan River at Merrimack, N. H., 1909–
Nashua River:
South Branch of Nashua River, Clinton, Mass., 1896–
Concord River at Lowell, Mass., 1901–
Sudbury River at Framingham, Mass., 1875–
Lake Cochituate at Cochituate, Mass., 1863–

MYSTIC RIVER BASIN.

Mystic Lake (on Mystic River) near Boston, Mass., 1878–1897.

CHARLES RIVER BASIN.

Charles River at Waltham, Mass., 1903–1909.

TAUNTON RIVER BASIN.

Matfield River (head of Taunton River) at Elmwood, Mass., 1909–10.
Satucket River near Elmwood, Mass., 1909–10.

PROVIDENCE RIVER BASIN.

Providence River:
Seekonk River:
Tenmile River near Rumford, R. I., 1909.
Blackstone River at Woonsocket, R. I., 1904–5.
Blackstone River at Albion, R. I., 1914–
Blackstone River at Berkeley, R. I., 1901–2.
Branch River at Branch Village, R. I., 1909–10; 1912–13.
Woonasquatucket River at Olneyville, R. I., 1910.

PAWTUXET RIVER BASIN.

Pawtuxet River at Harris, R. I., 1909.

PAWCATUCK RIVER BASIN.

Pawcatuck River:
Wood River at Hope Valley, R. I., 1909–10.

THAMES RIVER BASIN.

Thames River:
Quinebaug River:
Shetucket River at Willimantic, Conn., 1904–5.

CONNECTICUT RIVER BASIN.

Connecticut River at Orford, N. H., 1900–
Connecticut River at Sunderland, Mass., 1904–
Connecticut River at Holyoke, Mass., 1880–1899.
Connecticut River at Hartford, Conn., 1896–1908.
Israel River above South Branch, near Jefferson Highlands, N. H., 1903–1906.
Israel River below South Branch, at Jefferson Highlands, N. H., 1903–1907.
Passumpsic River at Pierce's Mills, near St. Johnsbury, Vt., 1909–
Passumpsic River at St. Johnsbury Center, Vt., 1903.
Ammonoosuc River at Bretton Woods, N. H., 1903–1907.
Zealand River near Twin Mountain, N. H., 1903–1907.
Little River at Twin Mountain, N. H., 1904–5.
White River at Sharon, Vt., 1903–1904; 1909–1913.
White River at West Hartford, Vt., 1915–
Ashuelot River at Winchester, N. H., 1903–1904.
Ashuelot River at Hinsdale, N. H., 1907–1909; 1914–
Millers River at Wendell, Mass., 1909–1913.
Millers River near Winchenden, Mass., 1916–
Millers River at Erving, Mass., 1914–
Sip Pond Brook near Winchenden, Mass., 1916–
Priest Brook near Winchenden, Mass., 1916–
Otter River near Gardner, Mass., 1916–
East Branch Tully River near Athol, Mass., 1916–
Moss Brook at Wendell, Mass., 1909–10; 1916–
Deerfield River at Hoosac Tunnel, Mass., 1909–1913.
Deerfield River at Charlemont, Mass., 1913–
Deerfield River at Shelburne Falls, Mass., 1907–1913.
Deerfield River at Deerfield, Mass., 1904–5.
Ware River (head of Chicopee River) at Waro, Mass., 1904–1911.
Ware River at Gibbs Crossing, Mass., 1912–
Burnshirt River near Templeton, Mass., 1909.
Swift River at West Ware, Mass., 1910–
Quaboag River at West Warren, Mass., 1903–1907.
Quaboag River at West Brimfield, Mass., 1909–

Connecticut River tributaries—Continued.
Westfield River at Knightville, Mass., 1909–
Westfield River at Russell, Mass., 1904–5.
Westfield River near Westfield, Mass., 1914–
Middle Branch of Westfield River at Goss Heights, Mass., 1910–
West Branch of Westfield River at Chester, Mass., 1915.
Westfield Little River near Westfield, Mass., 1905–
Borden Brook near Westfield, Mass., 1910–
Farmington River near New Boston, Mass., 1913–
Salmon River at Leesville, Conn., 1905–6.

HOUSATONIC RIVER BASIN.

Housatonic River near Great Barrington, Mass., 1913–
Housatonic River at Falls Village, Conn., 1912–
Housatonic River at Gaylordsville, Conn., 1900–1914.
Tenmile River at Dover Plains, N. Y., 1901–1903.
Pomperaug River at Bennetts Bridge, Conn., 1913–

MIANUS RIVER BASIN.

Mianus River at Bedford, N. Y., 1903.
Mianus River near Stamford, Conn., 1903.

BYRAM RIVER BASIN.

Byram River, West Branch (head of Byram River), near Port Chester, N. Y., 1903.
Byram River at Pemberwick, Conn., 1903.
East Branch of Byram River near Greenwich, Conn., 1903.
Middle Branch of Byram River near Riverville, Conn., 1903.

HUDSON RIVER BASIN.

Hudson River near Indian Lake, N. Y., 1916–
Hudson River at North Creek, N. Y., 1907–
Hudson River at Thurman, N. Y., 1907–
Hudson River at Corinth, N. Y., 1904–1912.
Hudson River at Spier Falls, N. Y., 1912–
Hudson River at Fort Edward, N. Y., 1899–1908.
Hudson River at Mechanicville, N. Y., 1890–
Cedar River near Indian Lake, N. Y., 1911–
Indian Lake reservoir near Indian Lake, N. Y., 1900–
Indian River near Indian Lake, N. Y., 1912–1914; 1915–
Schroon Lake (on Schroon River) at Pottersville, N. Y., 1908–1911.
Schroon River at Riverbank, N. Y., 1907–
Schroon River at Warrensburg, N. Y., 1895–1902.
Sacandaga River at Wells, N. Y., 1907–1911.
Sacandaga River near Hope, N. Y., 1911–
Sacandaga River at Northville, N. Y., 1907–1910.
Sacandaga River near Hadley, N. Y., 1907–1910.
Sacandaga River (at cable) at Hadley, N. Y., 1911–
Sacandaga River at Union Bag & Paper Co.'s mill at Hadley, N. Y., 1909–1911.
West Branch of Sacandaga River at Whitehouse, N. Y., 1910.
West Branch of Sacandaga River at Blackbridge, near Wells, N. Y., 1911–
Batten Kill at Battenville, N. Y., 1908.
Fish Creek at Burgoyne, N. Y., 1905; 1908.
Hoosic River near Eagle Bridge, N. Y., 1910–
Hoosic River at Buskirk, N. Y., 1903–1908.
Mohawk River at Ridge Mills, near Rome, N. Y., 1898–1900.
Mohawk River at Utica, N. Y., 1901–1903.

PASSAIC RIVER BASIN.

Passaic River at Millington, N. J., 1903–1906.
Passaic River near Chatham, N. J., 1902–1911.
Passaic River at Two Bridges (Mountain View), N. J., 1901–1903.
Rockaway River at Boonton, N. J., 1903–4.
Pompton River at Pompton Plains, N. J., 1903–4.
Pompton River at Two Bridges (Mountain View), N. J., 1901–1903.
Ramapo River near Mahwah, N. J., 1903–1906; 1908.
Wanaque River at Wanaque, N. J., 1903–1905.

RARITAN RIVER BASIN.

Raritan River, South Branch (head of Raritan River), at Stanton, N. J., 1903–1906.
Raritan River at Finderne, N. J., 1903–1907.
Raritan River at Boundbrook, N. J., 1903–1909.
North Branch of Raritan River at Pluckemin, N. J., 1903–1906.
Millstone River at Millstone, N. J., 1903–4.

DELAWARE RIVER BASIN.

Delaware River, East Branch (head of Delaware River), at Fish's Eddy, N. Y., 1912–
Delaware River, East Branch, at Hancock, N. Y., 1902–1912.
Delaware River at Port Jervis, N. Y., 1904–
Delaware River at Riegelsville, N. J., 1906–
Delaware River at Lambertville, N. J., 1897–1908.
Beaver Kill at Cooks Falls, N. Y., 1913–
West Branch of Delaware River at Hale Eddy, N. Y., 1912–
West Branch of Delaware River at Hancock, N. Y., 1902–1912.
Mongaup River near Rio, N. Y., 1909–1913.
Neversink River at Godeffroy, N. Y., 1903; 1909–10; 1911–1914.
Neversink River at Port Jervis, N. Y., 1902–3.
Paulins Kill at Columbia, N. J., 1908–9.
Lehigh River at South Bethlehem, Pa., 1902–1905; 1909–1913.
Lehigh River at Easton, Pa., 1909.
Musconetcong River at Asbury, N. J., 1903.
Musconetcong River near Bloomsbury, N. J., 1903–1907.
Tohickon Creek at Point Pleasant, Pa., 1883–1889; 1901–1913.
Neshaminy Creek below Forks, Pa., 1884–1913.
Schuylkill River near Philadelphia, Pa., 1898–1912.
Perkiomen Creek near Frederick, Pa., 1884–1913.
Wissahickon Creek near Philadelphia, Pa., 1897–1902; 1905–6.

SUSQUEHANNA RIVER BASIN.

Susquehanna River at Colliersville, N. Y., 1907–8.
Susquehanna River at Conklin, N. Y., 1912–
Susquehanna River at Binghamton, N. Y., 1901–1912.
Susquehanna River at Wysox, Pa., 1908–9.
Susquehanna River at Wilkes-Barre, Pa., 1899–1913.
Susquehanna River at Danville, Pa., 1899–1913.
Susquehanna River at Harrisburg, Pa., 1891–1913.
Susquehanna River at McCall Ferry, Pa., 1902–1909.
Chenango River at South Oxford, N. Y., 1903.
Chenango River near Greene, N. Y., 1908.
Chenango River near Chenango Forks, N. Y., 1912–

Susquehanna River tributaries—Continued.
Chenango River at Binghamton, N. Y., 1901–1912.
Eaton Brook, Madison County, N. Y., 1835.
Madison Brook, Madison County, N. Y., 1835.
Tioughnioga River at Chenango Forks, N. Y., 1903.
Cayuta Creek at Waverly, N. Y., 1898–1902. (Data in Water-Supply Paper 109 only.)
Chemung River at Chemung, N. Y., 1903– (Data for period prior to 1905 published in Water-Supply Paper 109.)
West Branch of Susquehanna River at Williamsport, Pa., 1895–1913.
West Branch of Susquehanna River at Allenwood, Pa., 1899–1902.
Juniata River at Newport, Pa., 1899–1913.
Broad Creek at Mill Green, Md., 1905–1909.
Octoraro Creek at Rowlandsville, Md., 1896–1899.
Deer Creek near Churchville, Md., 1905–1909.

GUNPOWDER RIVER BASIN.

Gunpowder Falls at Glencoe, Md., 1905–1909.
Little Gunpowder Falls near Belair, Md., 1905–1909.

PATAPSCO RIVER BASIN.

Patapsco River at Woodstock, Md., 1896–1909.

PATUXENT RIVER BASIN.

Patuxent River near Burtonsville, Md., 1911–12; 1913–
Patuxent River at Laurel, Md., 1896–1898.

POTOMAC RIVER BASIN.

Potomac River, North Branch (head of Potomac River), at Piedmont, W. Va., 1899–1906.
Potomac River, North Branch, at Cumberland, Md., 1894–1897.
Potomac River at Great Cacapon, W. Va., 1895.
Potomac River at Point of Rocks, Md., 1895–
Potomac River at Great Falls, Md., 1886–1891.
Potomac River at Chain Bridge, near Washington, D. C., 1892–1895.
Savage River at Bloomington, Md., 1905–6.
Georges Creek at Westernport, Md., 1905–6.
Wills Creek near Cumberland, Md., 1905–6.
South Branch of Potomac River near Springfield, W. Va., 1894–1896; 1899–1906.
Opequan Creek near Martinsburg, W. Va., 1905–6.
Tuscarora Creek at Martinsburg, W. Va., 1905.
Antietam Creek near Sharpsburg, Md., 1897–1905.
North River (head of South Fork of Shenandoah River, which is continuation of main stream) at Port Republic, Va., 1895–1899.
South Fork of Shenandoah River near Front Royal, Va., 1899–1906.
Shenandoah River at Millville, W. Va., 1895–1909.
Cooks Creek at Mount Crawford, Va., 1905–6.
Middle River:
Lewis Creek near Staunton, Va., 1905–6.
South River at Basic City, Va., 1905–6.
South River at Port Republic, Va., 1895–1899.
Elk Run at Elkton, Va., 1905–6.
Hawksbill Creek near Luray, Va., 1905–6.

REPORTS ON WATER RESOURCES OF NORTH ATLANTIC COAST.[1]

PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY

WATER-SUPPLY PAPERS.

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

*24. Water resources of the State of New York, Part I, by G. W. Rafter. 1899. 99 pp., 13 pls. 15c.

Describes the principal rivers of New York and their more important tributaries, and gives data on temperature, precipitation, evaporation, and stream flow.

*25. Water resources of the State of New York, Part II, by G. W. Rafter. 1899. 100 pp., 12 pls. 15c.

Contains discussion of water storage projects on Genesee and Hudson rivers, power development at Niagara Falls, descriptions and early history of State canals, and a chapter on the use and value of the water power of the streams and canals; also brief discussion of the water yields of sand areas of Long Island.

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

Gives elevations and distances along rivers of the United States, also brief descriptions of many of the streams, including St. Croix, Penobscot, Kennebec, Androscoggin, Saco, Merrimack, Connecticut, Housatonic, Hudson, Mohawk, Delaware, Lehigh, Schuylkill, Susquehanna, Juniata, Potomac, and James rivers.

*57. Preliminary list of deep borings in the United States, Part I (Alabama-Montana), by N. H. Darton. 1902. 60 pp. (See No. 149.) 5c.

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

Nos. 57 and 61 contain information as to depth, diameter, yield, and head of water in borings more than 400 feet deep; under head "Remarks" give information concerning temperature, quality of water, purposes of boring, etc. The lists are arranged by States, and the States are arranged alphabetically. Revised edition published in 1905 as Water-Supply Paper 149 (q. v.).

*69. Water powers of the State of Maine, by H. A. Pressey. 1902. 124 pp., 14 pls. 20c.

Discusses briefly the geology and forests of Maine and in somewhat greater detail the drainage areas, lake storage, and water powers of the St. Croix, Penobscot, Kennebec, Androscoggin, Presumpscot, Saco, and St. John rivers, and the minor coastal streams; mentions also developed tidal powers.

72. Sewage pollution in the metropolitan area near New York City and its effect on inland water resources, by M. O. Leighton. 1902. 75 pp., 8 pls. 10c.

Defines "normal" and "polluted" waters and discusses the water of Raritan, Passaic, and Hudson rivers and their tributaries and the damage resulting from pollution.

76. Observations on the flow of rivers in the vicinity of New York City, by H. A. Pressey. 1903. 108 pp., 13 pls. 15c.

Describes methods of measuring stream flow in open channels and under ice, and the quality of the river water as determined by tests of turbidity, color, alkalinity, and permanent hardness. The streams considered are Catskill, Esopus, Rondout, and Fishkill creeks, and Wallkill, Tenmile, and Housatonic rivers.

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[1] For stream-measurement reports see tables on pages IV–V and VI.

79. Normal and polluted waters in northeastern United States, by M. O. Leighton. 1903. 192 pp. 10c.

Defines essential qualities of water for various uses, the impurities in rain, surface, and underground waters, the meaning and importance of sanitary analyses, and the principal sources of pollution; chiefly "a review of the more readily available records" of examination of water supplies derived from streams in the Merrimack, Connecticut, Housatonic, Delaware, and Ohio River basins; contains many analyses.

88. The Passaic flood of 1902, by G. B. Hollister and M. O. Leighton. 1903. 56 pp., 15 pls. 15c.

Describes the topography of the area drained by the Passaic and its principal tributaries; discusses flood flow and losses caused by the floods, and makes comparison with previous floods; suggests construction of dam at Mountain View to control flood flow. See also No. 92.

92. The Passaic flood of 1903, by M. O. Leighton. 1904. 48 pp., 7 pls. 5c.

Discusses flood damages and preventive measures. See No. 88.

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

Contains brief reports on the wells and springs of the New England States and New York. The reports comprise tabulated well records giving information as to location, owner, depth, yield, head, etc., supplemented by notes as to elevation above sea, material penetrated, temperature, use, and quality; many miscellaneous analyses.

106. Water resources of the Philadelphia district, by Florence Bascom. 1904. 75 pp., 4 pls. 5c.

Describes the physiography, stratigraphic geology, rainfall, streams, ponds, springs, deep and artesian wells, and public water supplies of the area mapped on the Germantown, Norristown, Philadelphia, and Chester atlas sheets of the United States Geological Survey; compares quality of Delaware and Schuylkill River waters.

108. Quality of water in the Susquehanna River drainage basin, by M. O. Leighton, with an introductory chapter on physiographic features, by G. B. Hollister. 1904. 76 pp., 4 pls. 15c.

109. Hydrography of the Susquehanna River drainage basin, by J. C. Hoyt and R. H. Anderson. 1905. 215 pp., 29 pls. 25c.

The scope of No. 108 is sufficiently indicated by its title. No. 109 describes the physical features of the area drained by the Susquehanna and its tributaries, contains the results of measurements of flow at the gaging stations, and discusses precipitation, floods, low water, and water power.

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

Contains brief reports on water resources, surface and underground, of districts in the North Atlantic slope drainage basins, as shown by the following list:

Drilled wells of the Triassic area of the Connecticut Valley, by W. H. C. Pynchon.

Triassic rocks of the Connecticut Valley as a source of water supply, by M. L. Fuller. Scope indicated by title.

Water resources of the Taconic quadrangle, New York, Massachusetts, and Vermont, by F. B. Taylor. Discusses rainfall, drainage, water powers, lakes and ponds, underground waters, and mineral springs; also quality of spring water as indicated by chemical and sanitary analyses of Sand Spring, near Williamstown.

Water resources of the Watkins Glen quadrangle, New York, by Ralph S. Tarr. Discusses the use of the surface and underground waters for municipal supplies and their quality as indicated by examination of Sixmile and Fall creeks, and sanitary analyses of well water at Ithaca.

Water resources of the central and southwestern highlands of New Jersey, by Laurence La Forge. Treats of population, industries, climate, and soils, lakes, ponds, swamps and rivers, mineral springs (with analyses), water power, and the Morris Canal; present and prospective sources and quality of municipal supplies.

Water resources of the Chambersburg and Mercersburg quadrangles, Pennsylvania, by George W. Stose. Describes streams and springs.

Water resources of the Curwensville, Patton, Ebensburg, and Barnesboro quadrangles, Pennsylvania, by F. G. Clapp. Treats briefly of surface and underground waters and their use for municipal supplies; gives analyses of waters at Cresson Springs.

Water resources of the Accident and Grantsville quadrangles, Maryland, by G. C. Martin.

Water resources of the Frostburg and Flintstone quadrangels, Maryland and West Virginia, by G. C. Martin.

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

Contains brief reports on water supplies of the North Atlantic States as follows:
Maine, by W. S. Bayley.
New Hampshire, by M. L. Fuller.
Vermont, by G. H. Perkins.
Massachusetts and Rhode Island, by W. O. Crosby.
Connecticut, by H. E. Gregory.
New York, by F. B. Weeks.
New Jersey, by G. N. Knapp.
Pennsylvania, by M. L. Fuller.
Delaware, by N. H. Darton.
Maryland, by N. H. Darton and M. L. Fuller.
District of Columbia, by N. H. Darton and M. L. Fuller.
Virginia, by N. H. Darton and M. L. Fuller.

Each of these reports discusses the resources of the public and private water supplies and related subjects, and gives list of pertinent publications; mineral springs are listed and sales of mineral water are reported.

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

Contains chapter on measurement of rate of underflow on Long Island, N. Y.

144. The normal distribution of chlorine in the natural waters of New York and New England, by D. D. Jackson. 1905. 31 pp., 5 pls. 10c.

Discusses common salt in coast and inland waters, salt as an index to pollution of streams and wells, the solutions and methods used in chlorine determinations, and the use of the normal chlorine map; gives charts and tables for chlorine in the New England States and New York.

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

Contains several brief reports relating chiefly to areas in the North Atlantic coast drainage basins, as follows:

Water resources of the Portsmouth-York region, New Hampshire and Maine, by George Otis Smith. Gives results of investigations made for the War Department to determine water supplies available for forts at mouth of harbor.

Water supply from glacial gravels near Augusta, Maine, by George Otis Smith. Describes the Silver Lake system of ponds near Augusta and the series of springs at the head of Spring Brook.

Water resources of the Pawpaw and Hancock quadrangles, West Virginia, Maryland, and Pennsylvania, by George W. Stose and George C. Martin. Describes rocks, springs, and streams in the area at the northernmost bend of the Potomac; discusses history of development, character of water (with analysis), flow, and origin of Berkeley Springs.

Water of a gravel-filled valley near Tully, N. Y., by George B. Hollister. Describes character of the sands and gravels, the volume of the springs issuing from them, deposits of tufa, the waters of the lakes, and the composition of the spring and lake waters; analyses.

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

Describes floods on Susquehanna and Mohawk rivers and near Johnstown, Pa.

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

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

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

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

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

Contains accounts of floods in North Atlantic slope drainage basins as follows: Flood on Poquonnock River, Connecticut, by T. W. Norcross; flood on the Unadilla and Chenango rivers, New York, by R. E. Horton and C. C. Covert; also estimates of flood discharge and frequency on Kennebec, Androscoggin, Merrimack, Connecticut, Hudson, Passaic, Raritan, Delaware, Susquehanna, and Potomac rivers; gives index to literature on floods on American streams.

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

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

*192. The Potomac River basin (Geographic history; Rainfall and stream flow; Pollution, typhoid fever, and character of water; Relation of soils and forest cover to quality and quantity of surface water; Effect of industrial wastes on fishes), by H. N. Parker, Bailey Willis, R. H. Bolster, W. W. Ashe, and M. C. Marsh. 1907. 364 pp., 10 pls. 60c.

Scope indicated by title.

*198. Water resources of the Kennebec River basin, Maine, by H. K. Barrows, with a section on the quality of Kennebec River water, by G. C. Whipple. 1907. 235 pp., 7 pls. 30c.

Describes physical characteristics and geology of the basin, the flow of the streams, evaporation, floods, developed and undeveloped water powers, water storage, log driving, and lumbering; under quality of water discusses effect of tides, pollution, and the epidemic of typhoid fever in 1902–3; contains gazetteer of rivers, lakes, and ponds.

*223. Underground waters of southern Maine, by F. G. Clapp, with records of deep-wells, by W. S. Bayley. 1909. 268 pp., 24 pls. 55c.

Describes physiography, rivers, water-bearing rocks, amount, source, and temperature of the ground waters, recovery of waters by springs, collecting galleries and tunnels, and wells; discusses well-drilling methods, municipal water supplies, and the chemical composition of the ground waters; gives details for each county.

232. Underground-water resources of Connecticut, by H. E. Gregory, with a study of the occurrence of water in crystalline rocks, by E. E. Ellis. 1909. 200 pp., 5 pls. 20c.

Describes physiographic features, drainage, forests, climate, population and industries, and rocks; circulation, amount, temperature, and contamination of ground water; discusses the ground waters of the crystalline rocks, the Triassic sandstones and traps, and the glacial drift; the quality of the ground waters (with analyses); well construction; temperature, volume, character, uses, and production of spring waters.

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

Describes collection of samples, method of examination, preparation of solutions, accuracy of estimates, and expression of analytical results; gives results of analyses of waters of Androscoggin, Hudson, Raritan, Delaware, Susquehanna, Lehigh, Potomac, and Shenandoah rivers.

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

Contains four brief reports pertaining especially to districts in the North Atlantic coast drainage area:

Occurrence and composition of well waters in the slates of Maine, by F. G. Clapp. Analyses.

Occurrence and composition of well waters in the granites of New England, by F. G. Clapp. Discusses proportion of successful wells and water supply and depth. Analyses.

Composition of mineral springs in Maine, by F. G. Clapp.

Saline artesian waters of the Atlantic Coastal Plain, by Samuel Sanford.

Underground waters near Manassas, Va., by F. G. Clapp.

279. Water resources of the Penobscot River basin, Maine, by H. K. Barrows and C. C. Babb. 1912. 285 pp., 19 pls. 65c.

Describes the topography, drainage, geology, forests, population, industries, transportation lines, and precipitation in the basin; gives results of investigations of stream flow at gaging stations; discusses relation of run-off to precipitation, evaporation, floods, low water, developed, and undeveloped water powers, storage, log driving, and lumbering; contains gazetteer of rivers lakes, and ponds.

374. Ground water in the Hartford, Stamford, Salisbury, Willimantic, and Saybrook areas, Connecticut, by H. E. Gregory and A. J. Ellis. 1916. 150 pp., 13 pls. 30c.

Describes occurrence of ground water, methods of developing, and requirements for municipal use. Gives, by towns, a description of the surface and ground water and of the public water supply, and records of wells and springs.

397. Ground water in the Waterbury area, Connecticut, by A. J. Ellis, under direction of H. E. Gregory. 1916. 73 pp., 4 pls. 15c.

Describes the geology of the area, the occurrence of ground water, its use for private and municipal supply, and methods of developing. Discusses under towns the population and industries, topography, water-bearing formations, surface and ground water, and public supplies, and gives records of wells and springs.

415. Surface waters of Massachusetts, by C. H. Pierce and H. J. Dean. 1916. 433 pp., 12 pls. 45c.

A compilation of available stream-flow data, including the classic records collected on the Merrimack at Lowell and Lawrence, on the Connecticut at Holyoke, and on the Cochituate at Sudbury by the Metropolitan Water and Sewerage Board, as well as records covering shorter periods; prepared in cooperation with the Commonwealth of Massachusetts. Contains a gazetteer of streams, lakes, and ponds.

424. Surface waters of Vermont, by C. H. Pierce. 1917. 218 pp., 14 pls.

A compilation of available stream-flow data; prepared in cooperation with the Commonwealth of Vermont. Contains a gazetteer of streams, lakes, and ponds.

ANNUAL REPORTS.

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

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

*Sixth Annual Report of the United States Geological Survey, 1884–85, J. W. Powell, Director. 1885. xxix, 570 pp., 65 pls. Cloth $2.00. Contains:

* Seacost swamps of the eastern United States, by N. S. Shaler. pp. 353-398. Describes the coast swamps of New England; discusses economic problems connected with marine swamps; gives a detailed account of selected areas of salt marsh lands, and a list of the principal areas of salt marshes between the Hudson River and Portland, Maine.

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

* General account of the fresh-water morasses of the United States, with a description of the Dismal Swamp district of Virginia and North Carolina, by N. S. Shaler, pp. 255-339, Pls. 6 to 19. Scope indicated by title.

Fourteenth Annual Report of the United States Geological Survey, 1892–93, J. W. Powell, Director. 1983. (Pt. II, 1894.) 2 parts. *Pt. II.—Accompanying papers, xx, 597 pp., 73 pls. Cloth $2.10. Contains:

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

PROFESSIONAL PAPERS.

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

*44. Underground-water resources of Long Island, N. Y., by A. C. Veatch, C. S. Slichter, Isaiah Bowman, W. O. Crosby, and R. E. Horton. 1906. 394 pp., 34 pls. $1.25.

Describes the geologic formations, the source of the ground waters, and requisite conditions for flowing wells; the springs, streams, ponds, and lakes; artesian and deep wells; fluctuation of ground-water table; blowing wells; waterworks; discusses measurements of velocity of underflow, the results of sizing and filtration tests, and the utilization of stream waters; gives well records and notes (with chemical analyses) concerning representative wells.

BULLETINS.

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

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

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

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

Discusses the importance of accurate well records to the driller, to owners of oil, gas, and water wells, and to the geologist; describes the general methods of work; gives tabulated records of wells in Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Virginia, and detailed records of wells at Pleasantville and Atlantic Highlands, N. J., and Tully, N. Y. These wells were selected because they give definite stratigraphic information.

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

Gives an account of progress in the collection of well records and samples; contains tabulated records of wells in Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia, and detailed records of wells in Newcastle County, Del.; Cumberland County, Maine; Anne Arundel, St. Mary, and Talbot counties, Md.; Hampshire County, Mass.; Monmouth County, N. J., Saratoga County, N. Y.; and Lycoming and Somerset counties, Pa. The wells of which detailed sections are given were selected because they afford valuable stratigraphic information.

GEOLOGIC FOLIOS.

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

A folio is designated by the name of the principal town or of a prominent natural feature within the quadrangle. Each folio includes maps showing the topography, geology, underground structure, and mineral deposits of the area mapped and several pages of descriptive text. The text explains the maps and describes the topographic and geologic features of the country and its mineral products. The topographic map shows roads, railroads, waterways, and, by contour lines, the shapes of the hills and valleys and the height above sea level of all points in the quadrangle. The areal-geology map shows the distribution of the various rocks at the surface. The structural-

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

geology map shows the relations of the rocks to one another underground. The economic-geology map indicates the location of mineral deposits that are commercially valuable. The artesian-water maps show the depth to underground-water horizons. Economic-geology and artesian-water maps are included in folios if the conditions in the areas mapped warrant their publication. The folios are of special interest to students of geography and geology and are valuable as guides in the development and utilization of mineral resources.

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

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

An asterisk (*) indicates that the stock of the folio is exhausted.

*13. Fredericksburg, Virginia-Maryland. 1894. 5c.

23. Nomini, Maryland-Virginia. 1896. 5c.

*70. Washington, District of Columbia-Maryland-Virginia. 1901.

*83. New York City (Paterson, Harlem, Staten Island, and Brooklyn quadrangles), New York-New Jersey. 1902.
Discusses the present and future water supply of New York City.

136. St. Marys, Maryland-Virginia. 1906. 5c.
Discusses artesian wells.

137. Dover, Delaware-Maryland-New Jersey. 1906. 5c.
Describes the shallow and deep wells used as sources of water supply; gives section of well at Middletown, Del.

*149. Penobscot Bay, Maine. 1907. 5c.
Describes the wells and springs; gives analysis of spring water from North Bluehill.

152. Patuxent, Maryland-District of Columbia. 1907. 5c.
Discusses the springs, shallow wells, and artesian wells.

*157. Passaic, New Jersey-New York. 1908.
Discusses the underground water of the quadrangle, including the cities of Newark, Hoboken, Jersey City, Paterson, Elizabeth, Passaic, Plainfield, Rahway, and Perth Amboy, and a portion of the city of New York; gives a list of the deep borings in the New Jersey portion of the quadrangle, and notes concerning wells on Staten Island, Long Island, Hoffman Island, and Governors Island.

158. Rockland, Maine. 1908. 5c.
Describes the water supply in Knox County, Maine, of which Rockland is the principal city; discusses the water obtained from wells drilled in limestone and granite, and the city water supply of Camden, Rockport, Rockland, and Thomaston.

160. Accident-Grantsville, Maryland-Pennsylvania-West Virginia. 1908. 5c.
Under "Mineral Resources" the folio describes Youghiogheny and Castleman rivers, Savage River, and Georges Creek, and the spring waters; notes possibility of obtaining artesian water.

*161. Franklin Furnace, New Jersey. 1908.
Describes the streams, water powers, and ground waters of a district in northwestern New Jersey, mainly in Sussex County but including also a small part of Morris County; gives tabulated list of water powers and of bored wells.

*162. Philadelphia (Norristown, Germantown, Chester, and Philadelphia quadrangles), Pennsylvania-New Jersey-Delaware. 1909.
Describes the underground waters of the Piedmont Plateau and the Coastal Plain and gives a tabulated list of wells; discusses the water supply of Philadelphia and Camden, also suburban towns; gives analysis of filtered water of Pickering Creek.

*167. Trenton, New Jersey-Pennsylvania.[1] 1909. 5c.
Describes streams tributary to Raritan and Delaware rivers (including estimates of capacity with and without storage) and the springs and wells; discusses also the public water supply of Trenton and suburban towns.

169. Watkins Glen-Catatonk, New York. 1909. 5c.
Describes the rivers, which include tributaties of the Susquehanna and the St. Lawrence, the lakes and swamps, and, under "Economic geology," springs and shallow and deep wells; discusses also water supply at Ithaca.

170. Mercersburg-Chambersburg, Pennsylvania.[2] 1909. 5c.
Describes the underground waters, including limestone springs, sandstone springs, and wells, and mentions briefly the sources of the water supplies of the principal towns.

182. Choptank, Maryland. 1912.[2] 5c.
The Choptank quadrangle includes the entire width of Chesapeake Bay and portions of many large estuaries.

189. Barnesboro-Patton, Pennsylvania. 1913. 25c.
Discusses the water supply of various towns in the quadrangle.

191. Raritan, New Jersey.[3] 1914.
Discusses briefly the surface and ground waters of the quadrangle, the quality, and the utilization of streams for power; gives analysis of water from Raritan River and from Schooley Mountain Spring near Hackettstown.

192. Eastport, Maine. 1914. 25c.
Includes brief account of the water supply of the quadrangle and of the utilization of streams for power.

204. Tolchester, Maryland. 1917. 25c.
Discusses shallow and artesian wells.

MISCELLANEOUS REPORTS.

Other Federal bureaus and State and other organizations have from time to time published reports relating to the water resources of various sections of the country. Notable among those pertaining to the North Atlantic States are the reports of the Maine State Water Storage Commission (Augusta), the New Hampshire Forestry Commission (Concord), the Metropolitan Water and Sewerage Board (Boston, Mass.), the New York State Water-Supply Commission (Albany), the New York State Conservation Commission (Albany), the New York State engineer and surveyor (Albany), the various commissions on water supply of New York City, the Geological Survey of New Jersey (Trenton), State boards of health, and the Tenth Census (vol. 16).

The following reports deserve special mention:

Water power of Maine, by Walter Wells, Augusta, 1869.

Hydrology of the State of New York, by G. W. Rafter: New York State Museum Bull. 85, 1905.

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

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[1] Octavo edition only.

[2] Issued in two editions—library (18 by 22 inches) and octavo (6 by 9 inches). Specify edition desired.

[3] Issued in two editions—library (18 by 22 inches), 25c., and octavo (6 by 9 inches), 50c. Specify edition desired.

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

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

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

GEOLOGICAL SURVEY HYDROLOGIC REPORTS OF GENERAL INTEREST.

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

WATER-SUPPLY PAPERS.

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

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

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

*14. New tests of certain pumps and water lifts used in irrigation, by O. P. Hood. 1898. 91 pp., 1 pl. 10c.
Discusses efficiency of pumps and water lifts of various types.

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

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

*41. The windmill: Its efficiency and economic use, Part I, by E. C. Murphy. 1901. 72 pp., 14 pls.

*42. The windmill: Its efficiency and economic use, Part II, by E. C. Murphy. 1901. 75 pp., 2 pls. 10c.
Nos. 41 and 42 give details of results of experimental tests with windmills of various types.

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

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

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

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

Discusses origin, depth, and amount of underground waters; permeability of rocks and porosity of soils; causes, rates, and laws of motions of underground water; surface and deep zones of flow, and recovery of waters by open wells and artesian and deep wells; treats of the shape and position of the water table; gives simple methods of measuring yield of flowing wells; describes artesian wells at Savannah, Ga.

*80. The relation of rainfall to run-off, by G. W. Rafter. 1903. 104 pp. 10c.

Treats of measurements of rainfall and laws and measurements of stream flow; gives rainfall, run-off, and evaporation formulas; discusses effect of forests on rainfall and run-off.

87. Irrigation in India (second edition), by H. M. Wilson. 1903. 238 pp., 27 pls. 25c.

First edition was published in Part II of the Twelfth Annual Report.

*94. Hydrographic manual of the United States Geological Survey, prepared by E. C. Murphy, J. C. Hoyt, and G. B. Hollister. 1904. 76 pp., 3 pls. 10c.

Gives instruction for field and office work relating to measurements of stream flow by current meters. See also No. 95.

*95. Accuracy of stream measurements (second enlarged edition), by E. C. Murphy. 1904. 169 pp., 6 pls.

Describes methods of measuring and computing stream flow and compares results derived from different instruments and methods. See also No. 94.

*103. A review of the laws forbidding pollution of inland waters in the United States, by E. B. Goodell. 1904. 120 pp. (See No. 152.)

Explains the legal principles under which antipollution statutes become operative, quotes court decisions to show authority for various deductions, and classifies according to scope the statutes enacted in the different States.

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

Contains the following reports of general interest. The scope of each paper is indicated by its title.

Description of underflow meter used in measuring the velocity and direction of underground water, by Charles S. Slichter.

The California or "stovepipe" method of well construction, by Charles S. Slichter.

Approximate methods of measuring the yield of flowing wells, by Charles S. Slichter.

Corrections necessary in accurate determinations of flow from vertical well casings, from notes furnished by A. N. Talbot.

Experiments relating to problems of well contamination at Quitman, Ga., by S. W. McCallie.

113. The disposal of strawboard and oil-well wastes, by R. L. Sackett and Isaiah Bowman. 1905. 52 pp., 4 pls. 5c.

The first paper discusses the pollution of streams by sewage and by trade wastes, describes the manufacture of strawboard, and gives results of various experiments in disposing of the waste. The second paper describes briefly the topography, drainage, and geology of the region about Marion, Ind., and the contamination of rock wells and of streams by waste oil and brine.

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

Contains report on "Occurrence to underground waters," by M. L. Fuller, discussing sources, amount, and temperature of waters, permeability and storage capacity of rocks, water-bearing formations, recovery of water by springs, wells, and pumps, essential condition of artesian flows and general conditions affecting underground waters in eastern United States.

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

Contains results of surveys made to determine location of undeveloped power sites.

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

Scope indicated by title.

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

*122. Relation of the law to underground waters, by D. W. Johnson. 1905. 55 pp. 5c.
Defines and classifies underground waters, gives common-law rules relating to their use, and cites State legislative acts affecting them.

140. Field measurements of the rate of movement of underground waters, by C. S. Slichter. 1905. 122 pp., 15 pls. 15c.
Discusses the capacity of sand to transmit water, describes measurements of underflow in Rio Hondo, San Gabriel, and Mohave River valleys, Cal., and on Long Island, N. Y.; gives results of tests of wells and pumping plants, and describes stovepipe method of well construction.

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

145. Contributions to the hydrology of eastern United States, 1905; M. L. Fuller, geologist in charge. 1905. 220 pp., 6 pls. 10c.
Contains brief reports of general interest as follows:
Drainage of ponds into drilled wells, by Robert E. Horton. Discusses efficiency, cost, and capacity of drainage wells, and gives statistics of such wells in southern Michigan.
Construction of so-called fountain and geyser springs, by Myron L. Fuller.
A convenient gage for determining low artesian heads, by Myron L. Fuller.

146. Proceedings of second conference of engineers of the Reclamation Service, with accompanying papers, compiled by F. H. Newall, chief engineer. 1905. 267 pp. 15c.
Contains brief account of the organization of the hydrographic [water-resources] branch and the Reclamation Service, reports of conferences and committees, circulars of instruction, and many brief reports on subjects closely related to reclamation, and a bibliography of technical papers by members of the service. Of the papers read at the conference those listed below (scope indicated by title) are of more or less general interest:
Proposed State code of water laws, by Morris Bien.
Power engineering applied to irrigation problems, by O. H. Ensign.
Estimates on tunneling in irrigation projects, by A. L. Fellows.
Collection of stream-gaging data, by N. C. Grover.
Diamond-drill methods, by G. A. Hammond.
Mean-velocity and area curves, by F. W. Hanna.
Importance of general hydrographic data concerning basins of streams gaged, by R. E. Horton.
Effect of aquatic vegetation on stream flow, by R. E. Horton.
Sanitary regulations governing construction camps, by M. O. Leighton.
Necessity of draining irrigated land, by Thos. H. Means.
Alkali soils, by Thos. H. Means.
Cost of stream-gaging work, by E. C. Murphy.
Equipment of a cable gaging station, by E. C. Murphy.
Silting of reservoirs, by W. M. Reed.
Farm-unit classification, by D. W. Ross.
Cost of power for pumping irrigating water, by H. A. Storrs.
Records of flow at current-meter gaging stations during the frozen senson, by F. H. Tillinghast.

147. Destructive floods in United States in 1904, by E. C. Murphy and others. 206 pp., 18 pls. 15c.
Contains a brief account of "A method of computing cross-section area of waterways," including formulas for maximum discharge and area of cross section.

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

*151. Field assay of water, by M. O. Leighton. 1905. 77 pp., 4 pls. 10c.
Discusses methods, instruments, and reagents used in determining turbidity, color, iron, chlorides, and hardness, in connection with studies of the quality of water in various parts of the United States.

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

*160. Underground-water papers, 1906; M. L. Fuller, geologist in charge. 1906. 104 pp., 1 pl.
Gives account of work in 1905, lists of publications relating to underground waters, and contains the following brief reports of general interest:
Significance of the term "artesian," by Myron L. Fuller.
Representation of wells and springs on maps, by Myron L. Fuller.
Total amount of free water in the earth's crust, by Myron L. Fuller.
Use of fluorescein in the study of underground waters, by R. B. Dole.
Problems of water contamination, by Isaiah Bowman.
Instances of improvement of water in wells, by Myron L. Fuller.

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

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

*179. Prevention of stream pollution by distillery refuse, based on investigations at Lynchburg, Ohio, by Herman Stabler. 1906. 34 pp., 1 pl. 10c.
Describes grain distillation, treatment of slop, sources, character, and effects of effluents on streams; discusses filtration, precipitation, fermentation, and evaporation methods of disposal of wastes without pollution.

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

*186. Stream pollution by acid-iron wastes, a report based on investigations made at Shelby, Ohio, by Herman Stabler. 1906. 36 pp., 1 pl.
Gives history of pollution by acid-iron wastes at Shelby, Ohio, and resulting litigation; discusses effect of acid-iron liquors on sewage purification processes, recovery of copperas from acid-iron wastes, and other processes for disposal of pickling liquor.

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

*189. The prevention of stream pollution by strawboard waste, by E. B. Phelps. 1906. 29 pp., 2 pls. 5c.
Describes manufacture of strawboard, present and proposed methods of disposal of waste liquors, laboratory investigations of precipitation and sedimentation, and field studies of amounts and character of water used, raw material and finished product, and mechanical filtration.

*194. Pollution of Illinois and Mississippi rivers by Chicago sewage (a digest of the testimony taken in the case of the State of Missouri *v.* the State of Illinois and the Sanitary district of Chicago), by M. O. Leighton. 1907. 369 pp., 2 pls. 40c.
Scope indicated by amplification of title.

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

*226. The pollution of streams by sulphite pulp waste, a study of possible remedies, by E. B. Phelps. 1909. 37 pp., 1pl. 10c

Describes manufacture of sulphite pulp, the waste liquors, and the experimental work leading to suggestions as to methods of preventing stream pollution.

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

Scope indicated by title.

*234. Papers on the conservation of water resources. 1909. 96 pp., 2 pls. 15c.

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

*235. The purification of some textile and other factory wastes, by Herman Stabler and G. H. Pratt. 1909. 76 pp. 10c.

Discusses waste waters from wool scouring, bleaching and dyeing cotton yarn, bleaching cotton piece goods, and manufacture of oleomargarine, fertilizer, and glue.

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

Describes collection of samples, method of examination, preparation of solutions, accuracy of estimates, and expression of analytical results.

238. The public utility of water powers and their governmental regulation, by René Tavernier and M. O. Leighton. 1910. 161 pp. 15c.

Discusses hydraulic power and irrigation, French, Italian, and Swiss legislation relative to the development of water powers, and laws proposed in the French parliament; reviews work of bureau of hydraulics and agricultural improvement of the French department of agriculture, and gives résumé of Federal and State water-power legislation in the United States.

*255. Underground waters for farm use, by M. L. Fuller. 1910. 58 pp., 17 pls. 15c.

Discusses rocks as sources of water supply and the relative safety of supplies from different materials; springs, and their protection; open or dug and deep wells, their location, yield, relative cost, protection, and safety; advantages and disadvantages of cisterns and combination wells and cisterns.

*257. Well-drilling methods, by Isaiah Bowman. 1911. 139 pp., 4 pls. 15c.

Discusses amount, distribution, and disposal of rainfall, water-bearing rocks, amount of underground water and artesian conditions, and oil and gas bearing formations; gives history of well drilling in Asia, Europe, and the United States; describes in detail the various methods and the machinery used; discusses loss of tools and geologic difficulties; contamination of well waters and methods of prevention; tests of capacity and measurement of depth; and costs of sinking wells.

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

Contains the following papers (scope indicated by titles) of general interest:
Drainage by wells, by M. L. Fuller.
Freezing of wells and related phenomena, by M. L. Fuller.
Pollution of underground waters in limestone, by G. C. Matson.
Protection of shallow wells in sandy deposits, by M. L. Fuller.
Magnetic wells, by M. L. Fuller.

259. The underground waters of southwestern Ohio, by M. L. Fuller and F. G. Clapp, with a discussion of the chemical character of the waters, by R. B Dole. 1912. 228 pp., 9 pls. 35c.

Describes the topography, climate, and geology of the region, the water-bearing formations, the source, mode of occurrence, and head of the waters, and municipal supplies; gives details by counties; discusses in supplement, under chemical character, method of analysis and expression of results, mineral constituents, effect of the constituents on waters for domestic, industrial, or medicinal uses, methods of purification, and chemical composition; many analyses and field assays. The matter in the supplement was also published in Water-Supply Paper 254 (The underground waters of north-central Indiana).

274. Some stream waters of the western United States, with chapters on sediment carried by the Rio Grande and the industrial application of water analyses, by Herman Stabler. 1911. 188 pp. 15c.

Describes collection of samples, plan of analytical work, and methods of analyses; discusses soap-consuming power of waters, water softening, boiler waters, and water for irrigation.

280. Gaging stations maintained by the United States Geological Survey, 1888—1910, and Survey publications relating to water resources, compiled by B. D. Wood. 1912. 102 pp. 10c.

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

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

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

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

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

Discusses methods of measuring the winter flow of streams.

*345. Contributions to the hydrology of the United States, 1914. N. C. Grover, chief hydraulic engineer. 1915. 225 pp., 17 pls. 30c. Contains:

*(e) A method of determining the daily discharge of rivers of variable slope, by M. R. Hall, W. E. Hall, and C. H. Pierce, pp. 53–65. 5c. Scope indicated by title.

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

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

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

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

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

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

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

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

400. Contributions to the hydrology of the United States, 1916. N. C. Grover, chief hydraulic engineer. Contains:

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

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

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

416. The divining rod, a history of water witching, with a bibliography, by Arthur J. Ellis. 1917. 39 pp. 10c.

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

PROFESSIONAL PAPERS.

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

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

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

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

A highly technical report.

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

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

BULLETINS.

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

Defines mineral waters, lists the springs by States, and gives tables of analyses so far as available

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

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

Bulletins 264 and 298 discuss the importance of accurate well records to the driller, to owners of oil, gas, and water wells, and to the geologist; describes the general methods of work; gives tabulated records of wells by States, and detailed records selected as affording valuable stratigraphic information.

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

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

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

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

ANNUAL REPORTS.

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

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

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

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

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

*American irrigation engineering, by H. M. Wilson, C. E., pp. 191–349, Pls. 111 to 146. Discusses the economic aspects of irrigation, alkaline drainage, silt, and sedimentation; gives brief history and legislation; describes canals; discusses water storage at reservoirs of the California and other projects, subsurface sources of supply, pumping, and subirrigation.

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

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

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

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

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

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

INDEX BY AREAS AND SUBJECTS.

[A=Annual Reports; M=Monograph; B=Bulletin; P=Professional Paper; W=Water-Supply Paper; GF=Geologic folio. For titles see preceding pages.]

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

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

INDEX OF STREAMS.