DEPARTMENT OF THE INTERIOR
JOHN BARTON PAYNE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

WATER-SUPPLY PAPER 451

SURFACE WATER SUPPLY OF THE UNITED STATES

1917

PART I. NORTH ATLANTIC SLOPE DRAINAGE BASINS

NATHAN C. GROVER, Chief Hydraulic Engineer
C. H. PIERCE, C. C. COVERT, 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 THE NORTH ATLANTIC SLOPE DRAINAGE BASINS, 1917.

AUTHORIZATION AND SCOPE OF WORK.

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

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

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

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

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

Annual appropriations for the fiscal years 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 11.

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

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

DEFINITION OF TERMS.

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

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

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

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

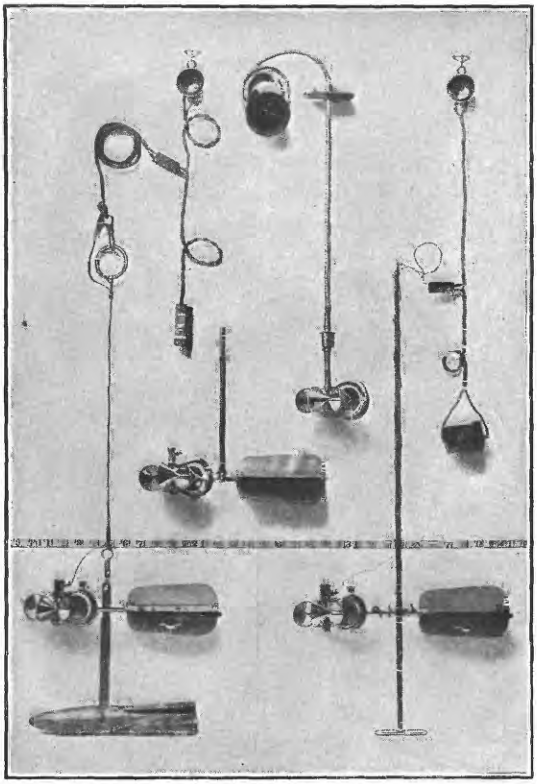
An "acre-foot," equivalent to 43,560 cubic feet, is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

The following terms not in common use are here defined:

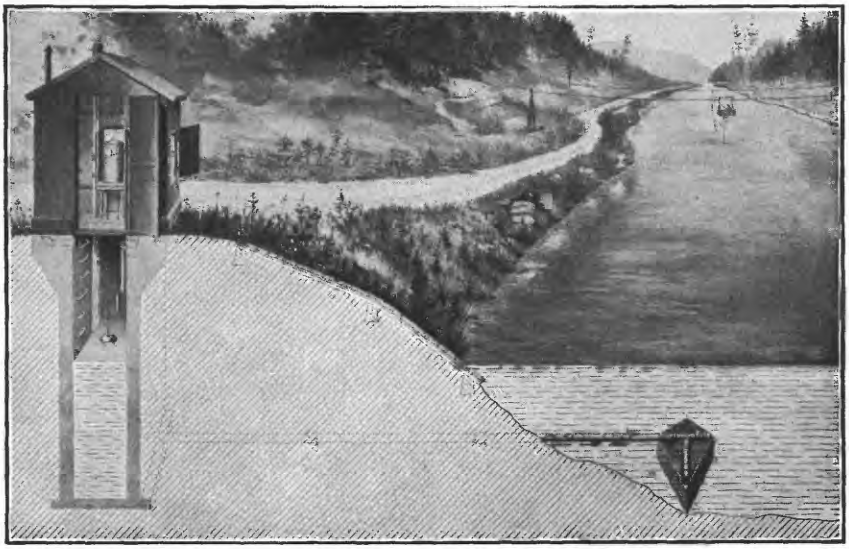
"Stage-discharge relation;" an abbreviation for the term "relation of gage height to discharge."

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

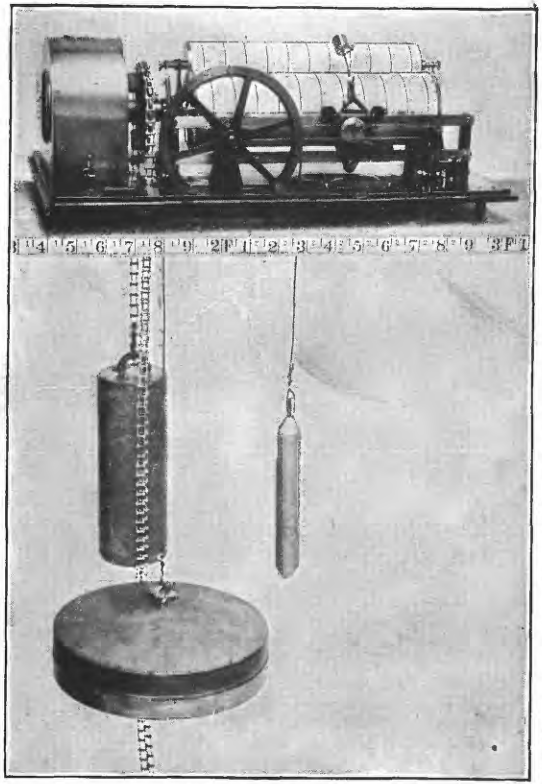
The "point of zero flow" for a gaging station is that point on the gage—the gage height—to which the surface of the river would fall if there were no flow.



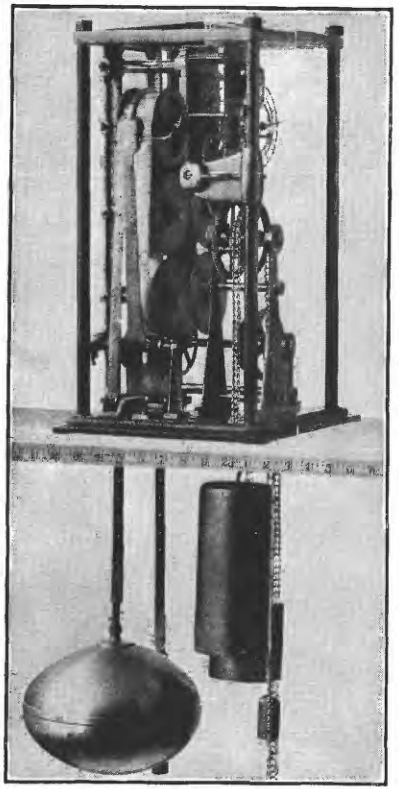
A. PRICE CURRENT METERS.



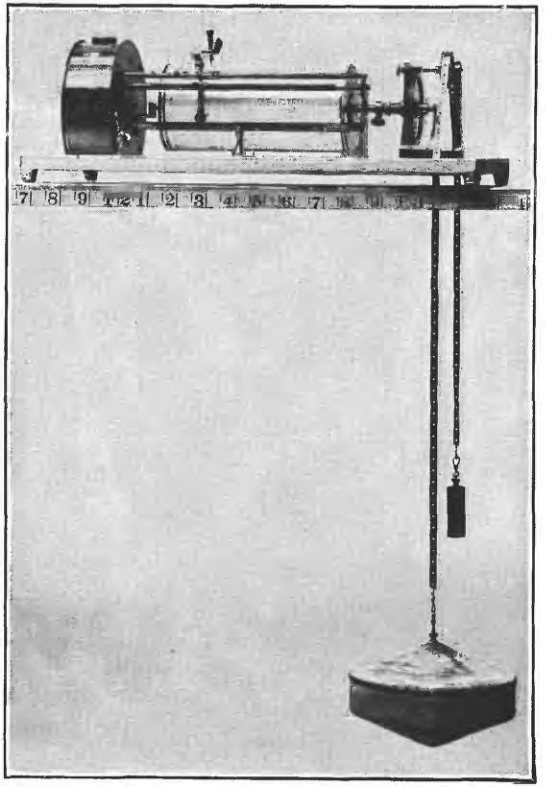
B. TYPICAL GAGING STATION.



A. STEVENS CONTINUOUS.



B. GURLEY PRINTING.



C. FRIEZ.

WATER-STAGE RECORDERS.

EXPLANATION OF DATA.

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

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

From the discharge measurements rating tables are prepared that give the discharge for any stage, and these rating tables, when applied to 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 fluctuations the discharge obtained from the rating table and the mean daily gage height may not be the true mean discharge for the day.

If such stations are equipped with water-stage recorders the mean daily discharge may be obtained by averaging discharge at regular intervals during the day or by using the discharge integrator, an instrument operating on the principle of the planimeter and containing as an essential element the rating curve of the station.

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

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

The accuracy of stream-flow data depends primarily (1) on the permanence of the 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 noncontributing districts in the measured drainage area, by lack of information concerning water diverted for irrigation or other use, or by inability to interpret the effect of artificial regulation of the flow of the river above the station. "Second-feet per square mile" and "Run-off (depth in inches)" are therefore not computed if such errors appear probable. The computations are also omitted for

[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.

stations on streams draining areas in which the annual rainfall is less than 20 inches. All figures representing "second-feet per square mile" and "run-off (depth in inches)" previously published by the Survey should be used with caution because of possible inherent sources of error not known to the Survey.

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

COOPERATION.

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 Horace F. Graham, governor, and Herbert M. McIntosh, State engineer.

The work in Massachusetts was carried on in cooperation with the Commonwealth, Samuel W. McCall, governor, and John N. Cole, chairman, commission on waterways and public lands.

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., and the W. H. McElwain Co.

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, Glens Falls, N. Y.

The station on Rappahannock River near Fredericksburg, Va., was maintained in cooperation with the Spottsylvania Power Co.

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 E. W. Conners and F. E. Pressey. The other assistants in New England were Hardin Thweatt, H. W. Fear, M. R. Stackpole, 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 Kinney.

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, B. L. Hopkins, M. I. Walters, and J. W. Moulton.

The manuscript was assembled and reviewed by W. E. Dickinson.

GAGING-STATION RECORDS.

ST. JOHN RIVER BASIN.

ST. JOHN RIVER AT VAN BUREN, MAINE.

LOCATION.—At 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, 1917.

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. From 1908 to 1911 stage was read on a vertical rod attached to pier of sawdust carrier of Hammond's mill, about 700 feet below international bridge, but as published, readings are reduced to datum of bridge gage. Gage read by W. H. Scott.

DISCHARGE MEASUREMENTS.—Made from international bridge.

CHANNEL AND CONTROL.—Control practically permanent. Banks high, rocky, cleared, and not subject to overflow except in very high freshets.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 22.8 feet at 7 a. m. June 20 (discharge, 92,700 second-feet); minimum stage recorded, 1.4 feet at 8 a. m. September 30 (discharge, 1,740 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 materially 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 mean daily-gage height to rating table. Records good.

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

No discharge measurements were made at this station during the year ending September 30, 1917.

Daily discharge, in second-feet, of St. John River at Van Buren, Maine, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,040	8,470	8,150	6,320	3,280	2,190	5,090	59,200	39,600	24,400	7,240	5,590
2	2,200	8,470	10,700	6,070	3,200	2,140	5,090	63,000	36,800	29,000	6,760	5,140
3	3,250	8,470	11,000	5,720	3,120	2,240	5,290	66,600	35,000	31,100	11,900	5,140
4	3,640	7,970	11,800	5,950	3,120	2,300	5,610	65,400	34,100	25,900	13,300	5,590
5	3,440	7,720	12,500	5,610	2,980	2,300	6,070	61,900	33,600	22,900	11,100	5,140
6	3,060	7,480	13,300	5,610	2,980	2,360	7,250	57,500	34,100	20,500	9,500	5,140
7	2,880	7,240	14,900	5,190	2,840	2,360	8,960	54,500	33,200	19,200	7,970	4,700
8	2,360	7,000	14,900	5,090	2,840	2,360	12,500	55,500	31,500	17,200	7,000	4,480
9	2,360	6,280	14,500	4,990	2,770	2,300	12,900	56,500	29,400	16,300	6,520	4,050
10	2,360	6,280	14,100	4,990	2,700	2,300	13,100	57,500	28,200	15,700	6,520	3,840
11	2,360	6,050	13,100	4,800	2,580	2,360	12,900	60,800	27,800	15,100	7,970	3,640
12	2,360	6,050	10,800	4,420	2,580	2,460	13,500	64,200	31,500	15,100	8,470	3,440
13	2,700	5,820	8,310	4,420	2,460	2,410	14,500	69,000	48,500	16,000	8,980	3,440
14	3,250	5,610	7,400	4,330	2,360	2,460	15,500	73,800	61,400	16,300	8,220	3,060
15	4,260	4,990	7,140	4,330	2,460	2,460	17,400	75,000	57,000	16,300	7,240	3,060
16	5,140	4,330	7,400	4,600	2,360	2,360	18,700	74,400	52,500	15,700	6,280	2,700
17	6,520	3,420	6,840	4,800	2,360	2,360	19,200	69,600	48,000	15,100	5,590	2,530
18	8,470	3,420	6,970	4,800	2,360	2,360	21,000	61,900	59,700	14,500	5,590	2,530
19	9,760	3,580	6,840	4,800	2,300	2,300	22,800	58,600	84,900	14,500	6,520	2,530
20	11,600	4,240	7,840	4,600	2,360	2,360	27,200	59,700	91,400	13,900	7,480	2,360
21	14,500	4,160	8,310	4,600	2,300	2,300	30,200	61,900	81,000	13,000	7,720	2,360
22	19,200	3,350	8,150	4,240	2,240	2,240	32,600	61,900	69,000	12,500	7,240	2,360
23	20,800	3,580	8,310	4,080	2,240	2,240	59,200	59,700	57,500	12,800	7,000	2,200
24	18,500	4,160	8,150	3,990	2,240	2,240	70,800	59,200	48,500	14,500	6,520	2,360
25	16,300	5,090	6,570	3,900	2,360	2,360	72,600	59,700	39,600	14,200	6,520	2,360
26	13,900	3,990	6,440	3,820	2,300	2,300	69,000	60,800	33,200	12,800	6,520	2,040
27	12,200	2,640	6,190	3,740	2,300	2,300	64,200	56,500	29,000	11,400	6,520	1,890
28	11,100	3,660	6,070	3,580	2,240	2,240	63,000	52,500	27,400	10,000	6,520	1,890
29	10,600	4,890	5,840	3,580	.....	2,190	60,800	47,500	25,500	8,980	6,520	1,740
30	9,500	3,660	5,720	3,420	.....	2,140	58,000	43,500	24,400	7,970	5,820	1,740
31	8,980	.....	6,320	3,280	.....	1,930	.....	41,500	.....	7,480	5,590	.....

NOTE.—Stage-discharge relation affected by ice Nov. 14 to Apr. 22; discharged determined by use of gage heights at Grand Falls.

Monthly discharge of St. John River at Van Buren, Maine, for the year ending Sept. 30, 1917.

[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	20,800	2,040	7,730	0.935	1.08
November	8,470	2,640	5,400	.653	.73
December	14,900	5,720	9,180	1.11	1.28
January	6,320	3,280	4,630	.560	.65
February	3,280	2,240	2,580	.312	.32
March	2,460	1,930	2,300	.278	.32
April	72,600	5,090	28,200	3.41	3.80
May	75,000	41,500	60,300	7.29	8.40
June	91,400	24,400	44,400	5.37	5.99
July	31,100	7,480	16,100	1.95	2.25
August	13,300	5,590	7,500	.907	1.05
September	5,590	1,740	3,300	.399	.46
The year	91,400	1,740	16,000	1.93	26.33

MACHIAS RIVER BASIN.

MACHIAS RIVER AT WHITNEYVILLE, MAINE.

LOCATION.—At a wooden highway bridge in 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, 1917.

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, 10.8 feet at 3.45 p. m. June 18 (discharge by extension of rating curve, 6,800 second-feet); minimum stage recorded during year, 3.4 feet several times in November (discharge, 221 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 fairly 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 height. Records fair.

Discharge measurements of Machias River at Whitneyville, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 19	E. W. Conners	[a] 4.80	542
May 4	F. E. Pressey	7.02	2,720
31	....do	7.00	2,850

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Machias River at Whitneyville, Maine, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	412	544	800	1,380	860	860	3,750	2,210	2,950	1,540	711	800
2	412	517	1,780	1,240	860	800	2,950	2,390	2,950	1,540	740	800
3	464	464	1,640	1,100	860	740	2,480	2,570	2,850	1,380	740	770
4	464	464	1,360	1,040	860	626	2,750	2,750	2,750	1,100	740	740
5	464	464	1,710	1,100	860	626	3,350	2,570	2,570	980	682	682
6	412	412	1,040	1,380	860	626	4,050	2,210	2,480	860	626	626
7	412	362	1,040	1,540	920	626	4,800	1,780	2,120	682	571	571
8	412	314	1,100	1,540	920	682	5,020	1,700	1,860	626	517	571
9	412	267	981	1,460	682	740	4,580	1,780	1,620	571	464	626
10	412	267	860	1,460	682	800	3,350	2,210	1,860	517	517	654
11	412	267	800	1,460	682	740	2,950	2,750	2,390	517	2,210	682
12	464	267	682	1,540	682	711	2,660	3,350	4,800	682	2,030	682
13	464	267	626	1,540	626	682	2,660	2,950	6,450	860	1,620	517
14	517	244	517	1,540	626	682	2,750	2,480	4,910	920	1,240	464
15	517	221	626	3,150	571	626	2,850	2,210	4,250	980	1,040	412
16	517	221	740	3,050	544	626	2,950	1,860	2,750	980	860	362
17	517	221	800	2,950	544	626	3,050	1,540	3,750	920	626	362
18	517	221	860	2,480	544	626	3,150	1,170	6,780	860	517	338
19	626	221	800	2,210	544	626	3,350	1,310	6,670	740	626	314
20	1,100	221	740	1,700	517	626	3,450	1,240	5,130	682	860	290
21	1,860	221	682	1,620	517	626	3,550	1,240	4,250	682	920	267
22	1,460	221	626	1,540	517	626	3,550	1,240	3,050	682	1,040	267
23	626	221	1,460	1,460	517	626	3,550	1,310	2,750	682	980	314
24	571	1,040	2,750	1,380	517	740	3,450	1,460	2,570	654	860	314
25	571	1,860	2,480	1,310	517	920	3,350	1,620	2,480	626	800	338
26	571	1,380	1,940	1,310	517	1,700	3,050	1,780	2,480	626	800	362
27	626	800	1,700	1,310	800	1,940	2,660	1,860	1,940	626	860	387
28	626	740	1,620	1,240	860	2,570	2,480	1,940	1,620	626	920	412
29	626	682	1,620	1,100	.....	3,750	2,390	2,030	1,620	682	800	412
30	571	682	1,620	980	.....	4,150	2,210	2,210	1,540	682	740	412
31	571	.....	1,540	860	.....	4,580	.....	2,850	.....	682	740	.....

NOTE.—Stage-discharge relation affected by ice from Jan. 29 to Mar. 31; discharge estimated from gage heights, 1 discharge measurement, observer's notes, and weather records.

Monthly discharge of Machias River at Whitneyville, Maine, for the year ending Sept. 30, 1917.

[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	1,860	412	600	1.29	1.49
November	1,860	221	476	1.02	1.14
December	2,750	517	1,220	2.62	3.02
January	3,150	860	1,580	3.40	3.92
February	920	517	679	1.46	1.52
March	4,580	626	1,160	2.49	2.87
April	5,020	2,210	3,240	6.97	7.78
May	3,350	1,170	2,020	4.34	5.00
June	6,780	1,540	3,210	6.90	7.70
July	1,540	517	812	1.75	2.02
August	2,210	464	884	1.90	2.19
September	800	267	492	1.06	1.18
The year	6,780	221	1,360	2.92	39.83

UNION RIVER BASIN.

WEST BRANCH OF UNION RIVER AT AMHERST, MAINE.

LOCATION.—At highway bridge three-quarters 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, 1917.

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, 12.25 feet at 8 a. m. April 7 (discharge, 1,940 second-feet); a stage of 13.5 feet was recorded March 29, but the stage-discharge relation was affected by ice at the time; minimum stage recorded during year, 5.6 feet several times in October, August, and September (discharge, 55 second-feet).

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 3 to April 4, when it was read twice daily three days a week. Daily discharge ascertained by applying rating table to mean daily gage height. Records fair.

Discharge measurements of West Branch of Union River at Amherst, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Dec. 30	E. W. Conners	[a] 10.10	247
Feb. 21	....do	[a] 8.10	95
June 26	G. C. Danforth	8.48	593

[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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	83	125	392	140	190	125	1,220	798	438	438	208	83
2	72	103	580	140	182	132	1,370	768	415	392	304	83
3	72	110	532	140	173	140	1,560	738	393	392	254	83
4	63	110	532	156	173	132	1,720	738	392	347	226	132
5	55	110	605	173	173	125	966	682	370	347	226	245
6	55	103	630	190	140	118	1,370	682	370	254	190	140
7	55	96	605	190	110	110	1,880	682	370	217	156	72
8	55	83	556	182	110	118	1,800	630	370	190	118	63
9	72	83	556	173	110	125	1,640	556	347	173	110	55
10	68	83	532	173	110	140	1,520	738	369	156	284	63
11	55	83	461	173	103	140	1,440	896	605	156	369	63
12	55	78	461	103	96	125	1,330	896	930	190	304	63
13	55	78	438	110	96	125	1,250	830	1,000	199	304	72
14	72	72	392	245	96	125	1,220	798	930	190	190	63
15	72	68	380	369	103	132	1,220	798	862	173	110	63
16	63	68	358	325	110	132	1,220	738	830	173	63	63
17	55	68	347	284	110	140	1,180	656	966	148	55	63
18	55	68	336	264	103	156	1,180	580	1,800	140	63	63
19	190	68	314	245	96	173	1,250	484	1,370	125	83	63
20	347	68	304	226	96	164	1,330	461	1,250	118	90	68
21	347	68	304	208	96	156	1,370	438	1,180	110	110	72
22	325	78	347	199	90	182	1,560	415	1,040	103	96	72
23	284	72	532	190	90	199	1,520	415	862	110	83	63
24	96	78	532	190	83	226	1,480	415	798	118	96	63
25	236	325	461	190	110	347	1,440	392	682	110	118	63
26	208	438	415	182	132	580	1,400	369	580	96	103	72
27	190	347	392	173	156	710	1,250	347	484	96	83	59
28	173	245	347	190	140	830	1,150	325	438	96	72	55
29	140	226	325	208	.....	930	1,040	347	415	96	72	55
30	125	245	284	199	.....	1,000	930	438	438	304	90	55
31	125	.....	284	190	.....	1,070	.....	461	.....	236	90	.....

NOTE.—Stage-discharge relation affected by ice Dec. 15 to Apr. 3; discharge ascertained from gage heights, two discharge measurements, observer's notes, and weather records; affected by log jams Apr. 20–25, and discharge determined by comparison with near-by streams. Discharge estimated June 5–7 when gage was removed for repairs to bridge.

Monthly discharge of West Branch of Union River at Amherst, Maine, for the year ending Sept. 30, 1917.

[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	347	55	126	0.900	1.04
November	438	68	128	.914	1.02
December	630	284	437	3.12	3.60
January	369	103	197	1.41	1.63
February	190	83	121	.864	.90
March	1,070	110	287	2.05	2.36
April	1,880	930	1,360	9.71	10.83
May	896	325	597	4.26	4.91
June	1,800	347	710	5.07	5.66
July	438	96	193	1.38	1.59
August	369	55	152	1.09	1.26
September	245	55	76.4	.546	.61
The year	1,880	55	365	2.61	35.41

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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, 1917.

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 second-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. Records 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, 1917.

[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	2,240	1,790	0.952	1.10
November	2,250	1,820	.968	1.08
December	2,220	3,560	1.89	2.18
January	2,380	1,660	.883	1.02
February	2,230	828	.440	.46
March	2,590	1,640	.872	1.00
April	2,950	7,250	3.86	4.31
May	7,650	10,600	5.64	6.50
June	12,800	13,300	7.04	7.86
July	4,720	4,230	2.25	2.59
August	5,950	5,920	3.15	3.63
September	2,810	2,300	1.22	1.36
The year	4,250	4,570	2.43	33.09

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 town of Medway, Penobscot County, and 2 miles below East Millinocket.

DRAINAGE AREA.—2,100 square miles.

RECORDS AVAILABLE.—February 20, 1916, to September 30, 1917.

GAGE.—Chain gage on left bank used February 20 to August 4, 1916; read by A. T. Read; Gurley 7-day water-stage recorder on left bank used since August 4, 1916.

DISCHARGE MEASUREMENTS.—Made from cable.

CHANNEL AND CONTROL.—Bed 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 Rapids; shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum stage for period of records, from water-stage recorder, 9.88 feet at 1 p. m., June 16, 1917 (discharge, from extension of rating curve, about 20,000 second-feet); minimum stage recorded, 1.45 feet at 9.45 a. m., January 7, 1917 (discharge, 585 second-feet).

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

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

ACCURACY.—Stage-discharge relation changed occasionally during high water when débris was removed from right side on control. Rating curve used February 20, 1916, to June 20, 1917, fairly well defined below 7,000 second-feet; curve used June 21 to September 30, 1917, fairly well defined between 2,000 and 7,000 second-feet. Chain gage read to tenths once daily to August 4, 1916; water-stage recorder used since that date. Daily discharge ascertained by applying daily gage height to rating table until August 4, 1916; August 5 to December 23, 1916, May 15–19, 1917, and June 12–28, 1917, by applying to rating table the mean of 12 bihourly gage heights, and for rest of year by discharge integrator. Records fair.

COOPERATION.—Several discharge measurements made by T. W. Clark, hydraulic engineer, Oldtown, Maine.

Discharge measurements of West Branch of Penobscot River near Medway, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 11	E. W. Conners	3.26	2,170	Jan. 7	E. W. Conners	a4.22	3,280
15	do	2.24	1,160	June 8	F. E. Pressey	5.21	5,650
Nov. 11	T. W. Clark	2.60	1,420	30	H. A. Lancaster	5.22	5,960
Jan. 7	E. W. Conners	1.55	630				

a Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of West Branch of Penobscot River near Medway, Maine, for the years ending Sept. 30, 1916 and 1917.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916.							
1	2,630	3,810	3,810	3,250	3,420	3,250	2,930
2	2,930	2,930	3,610	3,420	1,800	3,250	3,010
3	2,630	3,090	3,810	3,250	2,780	3,090	2,780
4	2,360	2,490	4,020	2,780	2,930	3,420	2,360
5	2,000	2,490	3,610	3,610	4,950	3,170	2,630
6	2,490	4,020	3,810	3,250	4,700	2,860	2,860
7	2,490	4,020	2,110	4,240	3,610	2,860	2,930
8	2,780	4,240	4,020	3,250	4,020	3,810	3,010
9	2,630	4,020	3,810	3,420	3,420	5,340	3,010
10	2,780	3,810	3,810	3,250	3,090	5,080	2,630
11	2,780	4,020	3,810	1,500	3,420	4,820	2,630
12	1,800	4,020	3,420	3,610	2,490	4,700	2,630
13	2,780	3,810	4,240	3,810	4,240	4,240	2,420
14	2,780	3,810	1,700	3,610	4,240	3,610	2,560
15	2,780	4,240	3,090	3,250	4,240	4,020	2,560
16	2,600	2,630	2,930	3,250	3,810	4,240	2,700
17	2,490	4,020	3,090	3,250	4,020	4,240	2,420
18	2,630	4,470	3,090	2,360	4,240	4,240	2,360
19	2,000	4,470	3,090	3,810	3,090	3,610	2,630
20	2,780	4,240	3,250	4,020	3,250	3,170	2,630
21	2,490	4,240	2,630	5,470	3,250	2,700	2,560
22	2,780	4,470	3,420	4,020	2,930	2,930	2,560
23	2,630	2,780	4,020	4,020	2,930	2,930	2,560
24	2,780	3,810	4,020	3,250	2,930	3,090	2,360
25	2,780	3,610	4,020	2,110	3,420	3,170	2,420
26	2,930	3,610	3,810	3,250	3,420	3,010	2,560
27	3,610	3,610	3,810	3,090	3,420	2,630	2,360
28	2,930	3,610	1,800	2,930	3,250	2,930	2,360
29	3,250	3,610	2,930	2,930	3,420	2,930	2,360
30	3,610	2,930	2,230	3,090	3,420	3,010	2,360
31	4,020	.....	3,610	.....	3,250	3,010	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916-17.												
1	2,230	2,300	3,340	3,050	3,250	2,800	3,500	3,900	8,000	8,350	5,510	2,930
2	2,230	2,420	3,810	2,950	3,250	2,850	3,800	3,750	7,600	8,350	5,200	2,840
3	2,300	2,420	2,560	3,050	3,100	2,800	4,150	3,900	5,700	8,500	6,360	2,680
4	2,300	2,630	3,090	3,000	2,650	2,500	4,050	3,650	5,150	8,100	7,550	2,680
5	2,300	2,170	2,930	2,950	2,800	2,400	3,850	3,800	5,250	7,490	7,570	2,570
6	2,230	2,300	2,930	3,000	2,800	2,600	3,950	3,450	6,500	7,270	8,300	2,990
7	2,230	2,420	2,930	2,850	2,600	2,800	4,450	4,000	6,050	6,460	7,660	3,470
8	2,110	2,700	3,090	3,150	2,600	2,800	4,550	4,050	5,700	4,450	7,160	3,470
9	2,230	2,860	3,010	3,650	2,650	2,750	4,400	4,150	5,000	5,390	7,080	2,990
10	2,060	2,860	2,630	3,900	2,650	2,850	4,300	4,000	3,550	5,200	7,430	3,220
11	2,170	2,780	3,090	4,250	2,350	2,600	4,250	4,400	7,250	3,310	8,200	2,880
12	2,170	2,300	2,930	4,200	2,500	2,800	4,100	4,150	11,800	3,420	8,150	2,840
13	2,170	2,560	3,090	3,200	2,500	3,000	3,650	4,850	13,000	7,020	8,200	2,780
14	2,300	2,860	2,930	2,800	2,500	3,050	3,900	8,250	12,400	6,280	7,490	2,780
15	2,000	2,780	2,930	3,100	2,350	3,200	3,450	12,600	13,600	5,100	6,510	3,910
16	2,060	2,860	2,560	3,350	2,350	3,100	3,700	13,300	14,300	4,650	6,330	2,430
17	2,300	2,930	2,560	3,300	2,250	3,100	3,800	13,300	15,800	4,520	5,940	2,930
18	2,300	2,780	2,930	3,200	1,960	2,650	3,900	13,000	18,600	4,360	6,640	2,570
19	2,300	2,490	3,010	3,250	2,500	3,100	3,950	13,000	19,200	4,110	6,620	2,630
20	2,360	2,700	2,930	3,650	2,650	3,100	4,050	11,800	19,800	4,650	7,160	2,570
21	2,420	3,010	2,930	3,500	2,650	3,100	4,300	11,800	19,500	4,110	6,780	2,730
22	2,420	2,930	2,930	4,200	2,800	3,100	4,400	10,000	18,800	3,580	6,620	2,930
23	2,420	2,420	3,090	4,200	2,800	3,100	4,750	10,600	18,000	4,320	5,890	2,460
24	2,490	2,560	2,850	3,800	2,800	3,050	4,650	10,600	17,200	4,320	3,830	2,520
25	2,360	2,420	2,800	3,800	2,600	2,750	4,350	9,150	16,100	3,630	2,840	2,780
26	2,420	2,060	2,800	3,700	2,700	2,950	4,050	10,200	15,800	3,090	3,260	2,780
27	2,490	2,300	2,900	3,350	2,900	3,350	3,800	11,000	14,600	2,780	4,450	2,880
28	2,300	2,490	2,950	3,050	2,800	4,000	4,250	11,000	11,200	3,190	4,520	2,680
29	2,060	2,560	3,100	3,250	.....	4,350	3,150	9,350	8,450	3,970	3,910	2,930
30	2,170	2,780	3,250	3,400	.....	4,250	3,800	8,200	6,570	4,030	3,220	2,520
31	2,360	.....	3,100	3,250	.....	4,150	.....	8,300	.....	3,910	3,630	.....

NOTE.—Stage-discharge relation not seriously affected by ice. Discharge estimated Jan. 29–30, Feb. 1–4, 10–17, 19–24, Mar. 17–23 and May 20–22, when water-stage recorder was not in operation.

Monthly discharge of West Branch of Penobscot River near Medway, Maine, for the years ending Sept. 30, 1916 and 1917.

[Drainage area, 2,100 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1916.					
March	4,020	1,800	2,740	1.30	1.50
April	4,470	2,490	3,700	1.76	1.96
May	4,240	1,700	3,370	1.60	1.84
June	5,470	1,500	3,340	1.59	1.77
July	4,950	1,800	3,460	1.65	1.90
August	5,340	2,630	3,530	1.68	1.94
September	3,010	2,360	2,600	1.24	1.38
1916-17.					
October	2,490	2,000	2,270	1.08	1.24
November	3,010	2,060	2,590	1.23	1.37
December	3,810	2,560	2,970	1.41	1.63
January	4,250	2,800	3,400	1.62	1.87
February	3,250	1,960	2,650	1.26	1.31
March	4,350	2,400	3,060	1.46	1.68
April	4,750	3,150	4,040	1.92	2.14
May	13,300	3,450	7,980	3.80	4.38
June	19,800	3,550	11,700	5.57	6.21
July	8,500	2,780	5,090	2.42	2.79
August	8,300	2,840	6,130	2.92	3.37
September	3,910	2,430	2,850	1.36	1.52
The year	19,800	1,960	4,570	2.18	29.51

PENOBSCOT RIVER AT WEST ENFIELD, MAINE.

LOCATION.—At steel highway bridge 1,000 feet below 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, 1917.

GAGES.—Friez water-stage recorder on left bank, downstream side on 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, 17.7 feet at 4 to 8 a. m. June 19 (discharge, from extension of rating curve, about 87,900 second-feet); minimum stage during year, from water-stage recorder, 1.98 feet at 11 a. m. October 8 (discharge, 3,190 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 discharge of 12 two-hour periods. Records good.

COOPERATION.—Gage height record furnished and discharge computed by T. W. Clark, hydraulic engineer, Oldtown, Maine. Several discharge measurements also made by students of University of Maine, under direction of Prof. A. C. Lyon.

Discharge measurements of Penobscot River at West Enfield, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 6	University of Maine students	2.53	4,230	Oct. 21	University of Maine students	5.18	12,100
6	....do	2.53	4,080	Nov. 11	....do	3.16	5,890
7	....do	2.40	3,980	22	T. W. Clark	[a] 2.79	4,460
7	....do	2.40	4,170	Jan. 10	H. A. Lancaster	[a] 5.52	10,200
15	H. A. Lancaster	3.03	5,660	Apr. 17	T. W. Clark	[a] 9.96	32,100
20	E. N. Wilbur	3.39	6,280	26	....do	11.93	44,300
20	University of Maine students	3.40	6,450	June 14	H. A. Lancaster	12.24	47,100
				19	....do	17.63	87,300

[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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4,170	6,010	25,600	8,970	7,300	5,530	27,300	31,900	24,700	20,800	18,600	10,000
2	4,840	6,140	34,700	8,830	7,170	5,530	25,700	30,100	22,700	22,500	16,600	9,120
3	4,960	6,140	25,500	8,680	6,780	5,530	24,700	29,300	21,300	21,800	17,400	8,400
4	4,730	6,010	20,600	8,260	6,390	5,530	23,700	29,300	19,300	20,800	19,700	8,120
5	4,500	6,140	18,400	8,120	6,390	5,300	24,400	28,200	18,800	19,300	18,400	7,710
6	4,280	5,770	18,400	8,260	6,910	4,960	26,000	26,800	18,600	18,000	17,800	7,300
7	4,060	5,300	18,800	8,400	6,780	5,190	31,900	25,200	18,000	17,200	17,600	7,570
8	3,730	5,300	18,800	8,680	6,390	5,300	39,000	23,900	16,600	15,200	15,200	7,840
9	3,840	5,530	17,800	8,830	6,650	5,300	41,400	21,800	16,400	13,000	13,000	7,440
10	3,950	5,650	17,000	9,570	6,520	5,300	38,700	22,700	15,400	13,700	13,900	6,910
11	3,840	5,530	15,600	9,120	6,260	5,300	34,100	25,200	19,300	12,300	17,800	7,170
12	3,730	5,300	13,900	8,400	5,770	5,300	32,500	27,100	42,700	10,500	19,500	7,040
13	3,950	4,960	11,100	7,570	5,770	4,960	30,400	26,800	55,200	12,000	17,600	7,170
14	3,950	4,960	8,680	7,980	6,010	5,070	31,000	29,000	48,900	13,700	16,200	6,910
15	5,650	5,070	7,710	8,970	6,140	5,300	33,800	31,600	43,800	13,200	14,100	6,650
16	6,140	4,960	7,300	10,700	6,010	5,300	33,500	35,100	42,700	13,000	12,500	7,440
17	5,890	4,960	7,170	12,500	5,890	5,530	32,800	33,500	46,100	12,100	12,000	5,300
18	5,650	5,070	8,540	12,800	5,650	5,530	35,100	31,600	73,700	11,800	11,300	5,650
19	5,650	5,300	9,420	12,800	5,530	5,530	38,000	29,800	86,400	11,600	12,000	5,420
20	7,570	4,840	10,000	12,100	5,070	5,070	42,700	27,300	78,600	12,800	12,100	5,190
21	12,300	4,730	9,570	11,300	5,530	5,650	46,100	26,300	71,200	13,500	12,300	5,300
22	13,000	4,390	9,420	10,300	5,530	5,770	49,200	26,300	64,400	12,500	12,300	5,420
23	11,800	4,960	10,000	10,200	5,300	5,770	53,400	23,900	58,000	11,300	12,100	5,070
24	10,500	5,770	12,300	9,570	5,530	6,010	55,600	25,700	51,000	12,800	11,000	4,730
25	9,570	8,400	13,500	8,970	5,530	6,390	52,000	26,000	45,100	14,600	11,100	5,070
26	8,680	7,840	14,400	8,680	5,530	6,780	46,500	25,700	39,700	13,700	13,300	5,190
27	8,260	6,910	14,100	8,120	5,070	8,260	42,700	26,300	35,100	12,300	11,600	4,960
28	7,840	7,170	13,000	7,300	5,530	13,200	40,400	24,400	26,300	10,500	11,300	4,960
29	7,040	7,570	12,000	6,520	.....	21,500	36,100	23,400	21,100	9,870	10,700	4,730
30	6,140	7,980	11,100	6,910	.....	27,600	32,800	22,500	18,600	9,570	9,570	4,730
31	6,010	.....	10,300	7,440	.....	27,900	.....	25,000	.....	12,800	9,570	.....

NOTE.—Stage-discharge relation affected by ice Nov. 16–18, 22, 23, and Dec. 12 to Apr. 17, and by log jams Aug. 4–11; discharge ascertained by comparison with records at Sunkhaze Rips, using a reduction factor obtained by comparing records obtained under normal conditions.

Monthly discharge of Penobscot River at West Enfield, Maine, for the year ending Sept. 30, 1917.

[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	13,000	3,730	6,330	0.959	1.10
November	8,400	4,390	5,820	.882	.98
December	34,700	7,170	14,300	2.17	2.50
January	12,800	6,520	9,190	1.39	1.60
February	7,300	5,070	6,030	.914	.95
March	27,900	4,960	7,780	1.18	1.36
April	55,600	23,700	36,700	5.56	6.20
May	35,100	21,800	27,200	4.12	4.75
June	86,400	15,400	38,700	5.86	6.54
July	22,500	9,570	14,200	2.15	2.48
August	19,700	9,570	14,100	2.14	2.47
September	10,000	4,730	6,480	.982	1.10
The year	86,400	3,730	15,600	2.36	32.04

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 basin.

RECORDS AVAILABLE.—October 23, 1902, to September 30, 1917.

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, 12.6 feet at 4.20 p. m. June 19 (discharge, 17,000 second-feet); minimum stage recorded during year, 4.1 feet October 11 to 13 (discharge, 210 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 tributary to 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 logs jams at station and at Grindstone Falls immediately below, and by ice during winter. Rating curve well defined below 9,000 second-feet. Gage read to tenths twice daily except during the winter when it was read three times a week. Daily discharge ascertained by applying rating table to mean daily gage height. Record good, except for winter months for which they are fair.

Discharge measurements of East Branch of Penobscot River at Grindstone, Maine, during the year ending Sept. 30, 1917.

[Made by E. W. Conners.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Jan. 7	a 6.45	1,050
Feb. 1	a 6.10	777
27	a 5.65	513

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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	560	590	5,770	2,120	790	533	3,320	6,210	4,290	a 3,140	2,450	1,960
2	533	560	5,120	1,880	790	533	3,140	6,210	4,290	3,890	2,450	a 1,810
3	405	560	3,700	1,740	750	505	2,960	5,990	4,490	4,090	2,280	1,660
4	505	560	2,620	1,520	750	505	2,960	5,990	4,090	3,700	2,120	1,520
5	505	620	2,620	1,320	715	505	2,790	5,770	4,290	3,510	a 2,120	1,380
6	455	680	2,620	1,130	715	505	3,320	a 5,330	4,490	4,090	2,120	1,250
7	360	620	2,960	1,080	715	505	3,700	4,910	4,490	4,490	1,960	1,130
8	360	620	2,790	1,020	715	505	7,350	4,290	4,700	a 4,490	1,660	1,130
9	360	620	2,620	970	715	505	6,660	4,290	4,700	4,290	1,660	a 1,130
10	295	680	2,620	875	715	505	4,490	4,910	a 4,090	4,490	2,620	1,020
11	225	620	1,960	830	715	505	3,890	5,330	3,510	4,910	3,320	1,020
12	210	620	1,380	830	715	505	3,890	5,770	5,990	4,910	a 2,790	920
13	210	620	1,380	830	680	505	3,890	a 5,770	8,050	4,910	2,280	920
14	338	505	1,380	1,020	650	505	4,090	5,550	7,120	4,490	1,960	830
15	560	405	1,380	1,250	620	505	4,090	6,660	7,580	a 4,090	1,660	830
16	650	405	1,190	1,450	590	505	4,090	6,660	6,660	3,700	1,810	a 830
17	533	430	830	1,740	590	505	4,290	6,210	a 7,000	3,700	1,810	750
18	455	455	920	1,960	590	505	5,770	6,210	13,100	4,290	1,810	750
19	455	430	1,020	1,740	560	505	6,210	6,210	16,700	4,490	a 1,810	680
20	1,130	405	1,190	1,520	560	505	7,810	a 5,770	15,300	4,490	1,810	680
21	2,200	405	1,380	1,250	560	505	8,050	5,330	11,800	4,090	1,960	680
22	1,810	382	1,380	1,250	533	505	8,530	5,330	9,010	a 4,090	2,120	680
23	1,320	360	1,810	1,190	533	590	9,750	5,330	7,580	4,290	1,810	a 680
24	970	a 405	2,280	1,130	533	680	10,000	5,770	a 6,200	5,330	1,960	620
25	830	455	2,960	1,130	533	790	8,770	5,550	4,910	5,000	2,620	620
26	750	a 505	3,510	1,020	533	920	7,350	5,550	4,490	4,290	a 2,280	620
27	680	560	2,960	920	505	1,320	7,120	a 5,550	3,140	2,960	1,810	620
28	620	a 620	2,620	875	505	3,600	7,120	5,330	2,620	2,790	1,960	620
29	620	a 680	2,360	830	.....	4,290	a 6,780	4,910	1,810	a 2,620	1,960	560
30	620	750	2,120	830	.....	3,510	6,430	4,490	2,280	2,450	1,810	a 560
31	620	.....	2,120	790	.....	3,320	.....	4,490	.....	2,620	1,960	.....

a Discharge estimated on account of no gage height.

NOTE.—Stage-discharge relation affected by ice Nov. 16–22, and Dec. 9 to Apr. 17; discharge ascertained rom gage heights, three discharge measurements, observer's notes, and weather records.

Monthly discharge of East Branch of Penobscot River at Grindstone, Maine, for the year ending Sept. 30, 1917.

[Drainage area, 1,100 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,200	210	650	0.591	0.68
November	750	360	538	.489	.55
December	5,770	830	2,310	2.10	2.42
January	2,120	790	1,230	1.12	1.29
February	790	505	638	.580	.60
March	4,290	505	974	.885	1.02
April	10,000	2,790	5,620	5.11	5.70
May	6,660	4,290	5,540	5.04	5.81
June	16,700	1,810	6,290	5.72	6.38
July	5,330	2,450	4,020	3.65	4.21
August	3,320	1,660	2,090	1.90	2.19
September	1,960	560	949	.863	.96
The year	16,700	210	2,580	2.35	31.81

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, 1917.

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 stage recorded during year, 13.3 feet at 7 a. m. and 5 p. m. June 20 (discharge, 23,300 second-feet); minimum stage recorded, 3.6 feet several times in October (discharge, 390 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 fairly well defined between 500 and 15,000 second-feet. Gage read to tenths twice daily except from December 13 to April 7, when it was read twice a week. Daily discharge ascertained by applying mean daily gage height to rating table. Open-water records good; winter records fair.

COOPERATION.—Several discharge measurements furnished by T. W. Clark, hydraulic engineer, Oldtown, Maine.

Records for 1916, revised by means of data obtained in 1917, are republished herewith and supersede those published in Water-Supply Paper 431.

Discharge measurements of Mattawamkeag River at Mattawamkeag, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 12	T. W. Clark	3.91	560	Mar. 10	H. A. Lancaster	*a* 7.10	710
Nov. 29	do	5.18	1,750	30	do	*a* 10.45	5,110
Jan. 9	E. W. Conners	*a* 9.46	1,930	Apr. 19	F. E. Pressey	9.84	13,800
Feb. 7	do	*a* 7.85	1,370	Aug. 26	H. A. Lancaster	4.95	1,470

a Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Mattawamkeag River at Mattawamkeag, Maine, for the years ending Sept. 30, 1916 and 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915–16.												
1	1,470	1,470	2,040	6,140	995	1,240	2,680	5,020	2,090	1,690	1,280	445
2	1,240	1,350	2,170	6,140	950	1,300	3,620	5,020	2,380	1,690	1,130	445
3	1,190	1,350	2,380	6,140	860	1,350	4,680	5,020	2,090	1,750	1,030	445
4	1,140	1,240	2,380	6,360	860	1,300	7,480	5,020	1,950	2,160	940	445
5	1,040	1,140	2,530	6,360	780	1,240	9,290	5,020	1,820	5,240	850	390
6	1,140	1,040	2,310	6,720	780	1,300	10,100	5,020	1,690	5,460	850	390
7	1,040	950	2,100	7,220	740	1,300	9,290	5,020	1,690	5,460	770	445
8	950	860	1,970	7,730	740	1,350	7,990	5,800	1,690	5,240	900	445
9	860	860	1,840	7,100	740	1,350	6,980	4,920	1,690	4,700	1,130	500
10	780	860	1,710	6,480	740	1,350	6,490	4,300	1,750	3,700	1,130	500
11	780	860	1,710	5,810	740	1,350	6,370	4,000	1,950	2,780	1,130	500
12	780	860	1,710	5,280	740	1,350	6,370	3,700	2,230	2,300	1,130	445
13	780	860	1,710	4,090	740	1,350	6,370	3,140	3,230	3,700	1,030	445
14	780	860	1,840	3,000	700	1,300	6,610	2,620	3,040	1,750	940	445
15	700	905	2,100	2,100	700	1,240	6,850	2,090	2,950	1,570	770	390
16	700	1,090	2,310	1,900	700	1,240	7,100	1,820	2,530	1,340	770	472
17	700	1,410	2,680	1,840	665	1,190	7,100	1,820	2,380	1,080	690	620
18	700	1,470	2,840	1,780	665	1,190	7,730	1,880	2,230	1,450	620	690
19	700	1,530	2,840	1,650	665	1,140	8,380	2,380	2,380	1,450	620	690
20	630	1,710	3,000	1,590	630	1,090	8,640	2,700	2,700	1,450	560	770
21	630	1,710	3,170	1,530	630	1,090	8,900	2,530	2,620	1,230	560	690
22	630	1,900	3,340	1,410	598	1,040	9,160	2,300	2,300	1,130	560	620
23	630	2,310	3,340	1,350	598	950	8,900	2,300	1,880	1,030	500	620
24	700	2,240	3,620	1,350	665	905	8,250	2,780	1,630	1,130	560	560
25	700	1,970	3,900	1,300	740	860	7,860	2,870	1,400	1,130	620	560
26	700	1,840	4,090	1,300	820	780	7,350	2,620	1,280	1,230	560	560
27	995	1,710	4,480	1,240	905	780	6,730	3,040	1,630	1,750	500	500
28	1,140	1,710	4,980	1,240	995	780	6,030	2,620	1,880	2,090	500	500
29	1,240	1,710	5,280	1,190	1,140	780	5,350	2,160	2,020	2,090	500	445
30	1,350	1,840	5,600	1,140	.....	1,240	5,020	2,020	1,250	1,880	445	445
31	1,470	.....	5,920	1,090	.....	1,900	.....	2,380	.....	1,510	445	.....
1916–17.												
1	445	1,340	2,700	3,420	1,400	895	7,100	11,300	6,370	5,460	1,280	1,340
2	500	1,450	4,600	3,230	1,400	895	7,600	9,960	6,140	5,460	1,820	1,340
3	500	1,340	6,140	2,700	1,400	850	8,380	9,160	5,020	5,460	2,090	1,450
4	560	1,340	6,370	2,230	1,340	850	8,900	8,900	4,810	5,240	2,230	1,570
5	500	1,230	6,370	2,090	1,340	810	9,420	8,500	4,400	4,810	2,380	1,400
6	500	1,130	6,850	1,820	1,340	730	10,500	8,100	4,400	4,600	2,700	1,230
7	500	1,030	6,370	2,090	1,340	690	11,000	7,600	4,200	4,200	2,380	1,230
8	445	1,030	6,610	1,570	1,280	690	12,200	7,200	4,000	3,610	1,950	1,230
9	390	940	6,610	1,820	1,230	690	12,700	7,200	3,800	3,040	1,400	1,130
10	390	850	6,370	1,690	1,180	690	12,400	8,000	3,420	2,380	1,280	1,130
11	390	850	5,460	1,450	1,130	770	12,200	8,900	3,610	2,090	1,820	1,130
12	500	770	4,600	1,340	1,130	770	11,000	9,420	5,240	1,950	2,530	1,030
13	500	770	3,610	1,820	1,130	770	10,800	10,200	8,640	1,950	2,700	1,030
14	530	770	3,230	2,530	1,130	770	10,500	9,960	9,960	1,820	2,090	985
15	810	770	2,870	2,870	1,080	770	10,800	9,960	10,500	2,230	1,690	850
16	1,030	770	2,380	3,230	1,030	770	11,000	10,200	10,800	2,380	1,230	730
17	1,130	770	1,820	3,420	985	770	11,600	10,200	10,800	2,230	1,130	620
18	1,130	770	1,820	3,420	940	770	11,900	8,640	16,400	2,230	1,030	590
19	1,130	690	2,090	3,420	895	770	12,400	7,350	21,600	2,380	940	500
20	1,510	690	2,230	3,230	810	770	13,900	6,370	23,300	2,700	940	560
21	2,530	730	2,380	3,040	770	770	14,500	5,910	22,000	2,700	1,030	560
22	3,420	940	2,380	2,700	770	770	15,800	5,910	20,300	2,700	1,230	655
23	3,420	850	3,040	2,380	730	770	17,000	5,910	17,700	2,530	1,340	770
24	3,230	850	5,680	2,090	690	770	17,400	5,020	13,600	3,040	1,400	690
25	3,040	1,400	5,910	1,820	690	770	17,700	4,810	12,700	3,610	1,690	620
26	2,700	1,950	5,910	1,690	770	1,570	17,000	5,240	10,800	3,800	1,690	620
27	2,380	2,700	5,460	1,570	850	2,700	15,800	5,240	8,640	3,420	1,570	690
28	2,090	2,530	5,910	1,400	940	4,000	15,100	5,020	6,140	2,530	1,400	620
29	1,820	1,820	5,020	1,400	.....	4,400	13,300	4,810	5,460	1,950	1,180	620
30	1,450	1,820	4,200	1,400	.....	5,020	12,200	5,020	5,020	1,340	1,030	620
31	1,340	.....	3,610	1,400	.....	5,910	.....	5,910	.....	1,080	1,180	.....

NOTE.—Stage-discharge relation affected by ice Jan. 6 to Apr. 5, 1916, and Dec. 14, 1916, to Apr. 7, 1917; discharge determined from gage heights corrected for effect of ice by means of discharge measurements, observer's notes, weather records, and comparison with records of East Branch of Penobscot River at Grindstone. Discharge May 5–10 estimated by comparison with records of flow of near-by streams.

Monthly discharge of Mattawamkeag River at Mattawamkeag, Maine, for the years ending Sept. 30, 1916–17.

[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.	
1915–16.					
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	7,120	4.75	5.30
May	5,800	1,820	3,350	2.23	2.57
June	3,230	1,280	2,100	1.40	1.56
July	5,460	1,030	2,330	1.55	1.79
August	1,280	445	775	.517	.60
September	770	390	514	.343	.38
The year	10,100	390	2,250	1.50	20.37
1916–17.					
October	3,420	390	1,320	.880	1.01
November	2,700	690	1,160	.773	.86
December	6,850	1,820	4,470	2.98	3.44
January	3,420	1,340	2,270	1.51	1.74
February	1,400	690	1,060	.707	.74
March	5,910	690	1,390	.927	1.07
April	17,700	7,100	12,400	8.27	9.23
May	11,300	4,810	7,610	5.07	5.84
June	23,300	3,420	9,660	6.44	7.18
July	5,460	1,080	3,060	2.04	2.35
August	2,700	940	1,620	1.08	1.24
September	1,570	500	918	.612	.68
The year	23,300	390	3,910	2.61	35.38

PISCATAQUIS RIVER NEAR FOXCROFT, MAINE.

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

DRAINAGE AREA.—286 square miles.

RECORDS AVAILABLE.—August 17, 1902, to September 30, 1917.

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, 13.5 feet at 7 a. m., June 18 (discharge, from extension of rating curve, about 19,800 second-feet); minimum stage recorded, 1.7 feet from 5 p. m., September 15, to 7 a. m., Sepber 17 (discharge, 31 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 fairly well defined between 20 and 4,000 second-feet. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Some uncertainty exists in regard to accuracy of gage heights and the effect of diurnal fluctuation. Records fair.

Discharge measurements of Piscataquis River near Foxcroft, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 2	E. W. Conners	[a] 3.46	379	Apr. 27	F. E. Pressey	5.06	2,680
Feb. 5	do	[a] 4.00	427	May 14	do	3.68	910
Apr. 9	F. E. Pressey	[a] 6.25	2,680				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Piscataquis River near Foxcroft, Maine, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	292	100	6,820	502	374	112	3,970	2,640	709	638	2,780	604
2	292	244	3,100	374	374	164	1,960	2,490	502	638	1,840	374
3	148	148	1,720	406	374	180	1,620	2,350	437	604	2,080	406
4	112	148	1,400	502	318	148	1,110	2,220	502	569	1,400	502
5	112	123	1,110	267	437	136	1,160	1,840	502	536	1,110	470
6	112	112	1,110	267	318	81	1,670	1,620	406	470	782	406
7	112	112	1,210	200	267	81	9,040	1,620	346	374	638	318
8	112	220	1,110	100	318	100	8,940	1,840	346	220	638	220
9	136	318	782	220	244	31	6,040	1,840	318	244	604	180
10	112	318	782	220	200	28	3,260	1,210	318	220	898	244
11	112	148	782	220	180	46	2,350	1,210	2,080	164	1,840	180
12	112	64	674	292	148	58	1,840	1,300	7,010	200	1,210	180
13	112	112	604	374	374	100	1,840	1,110	3,970	267	1,020	148
14	180	112	604	292	374	64	1,840	898	1,840	318	709	123
15	318	180	604	858	292	100	1,840	782	2,080	374	709	51
16	220	136	638	1,400	292	100	1,840	782	2,490	292	638	31
17	136	100	604	1,210	292	81	1,620	782	4,340	220	604	46
18	112	100	569	898	220	81	2,350	782	17,500	220	674	81
19	100	100	569	674	220	81	2,350	709	8,220	220	638	90
20	709	136	569	502	220	81	2,220	638	3,260	180	638	112
21	1,110	180	437	267	220	81	3,970	709	2,350	180	638	112
22	898	244	569	437	180	81	4,700	858	1,840	220	604	100
23	569	148	1,020	374	200	90	6,620	980	1,400	180	604	81
24	502	244	1,620	374	200	100	5,840	1,960	1,200	180	858	164
25	406	1,160	1,510	318	200	267	4,150	1,400	1,160	180	1,620	244
26	406	1,110	1,160	318	200	638	3,260	1,160	858	180	1,070	164
27	318	437	638	244	180	709	3,100	746	536	81	638	148
28	346	374	502	100	180	2,640	2,080	638	502	81	638	136
29	267	374	502	220	.....	7,210	2,080	536	569	64	709	112
30	100	782	502	220	.....	4,980	2,350	938	820	437	746	90
31	100	.....	638	220	.....	4,150	.....	980	.....	7,810	604	.....

NOTE.—Stage-discharge relation affected by ice Dec. 13 to Apr. 9; discharge ascertained from gage heights, three discharge measurements, observer's notes, weather records, and comparisons with other streams.

Monthly discharge of Piscataquis River near Foxcroft, Maine, for the year ending Sept. 30, 1917.

[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	1,110	100	280	0.979	1.13
November	1,160	64	269	.941	1.05
December	6,820	437	1,110	3.88	4.47
January	1,400	100	415	1.45	1.67
February	437	148	264	.923	.96
March	7,210	28	735	2.57	2.96
April	9,040	1,110	3,230	11.30	12.61
May	2,640	536	1,280	4.48	5.16
June	17,500	318	2,280	7.98	8.90
July	7,810	64	534	1.87	2.16
August	2,780	604	974	3.40	3.92
September	604	31	204	.713	.80
The year	17,500	28	965	3.37	45.79

PASSADUMKEAG RIVER AT LOWELL, MAINE.

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

DRAINAGE AREA.—301 square miles.

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

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, 5.8 feet at 9.30 a. m. April 26 (discharge 2,460 second-feet); minimum open-water stage recorded during year, 1.3 feet at 9 a. m. November 13 (discharge 134 second-feet); minimum discharge, 120 second-feet, November 18–23 (stage-discharge relation affected by ice).

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 and mill one-half mile above gage causes fluctuations in stage for a short time each day when mill is in operation.

ACCURACY.—Stage-discharge relation practically permanent, except when affected by backwater due to logs on control or to ice. Rating curve well defined between 70 and 2,600 second-feet. Gage read to tenths once daily until April 18, and to half tenths thereafter. Daily discharge ascertained by applying daily gage height to rating table. Records fair.

COOPERATION.—Discharge measurements made and discharge computed by T. W. Clark, hydraulic engineer, Oldtown, Me.

Discharge measurements of Passadumkeag River at Lowell, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 5	H. A. Lancaster	1.61	200	Mar. 28	H. A. Lancaster	2.99	704
Nov. 17	do	[a] 1.39	119	29	do	[a] 3.62	963
Dec. 22	do	[a] 2.28	274	Apr. 7	do	4.16	1,310
22	do	[a] 2.17	281	19	do	4.89	1,780
Jan. 8	E. W. Conners	[a] 2.59	357	25	do	5.70	2,370
8	do	[a] 2.60	367	May 21	do	4.02	1,250
Feb. 13	H. A. Lancaster	[a] 4.70	237	June 19	do	4.97	1,800
14	do	[a] 4.60	237	Aug. 6	do	2.58	486
				29	do	1.83	263

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Passadumkeag River at Lowell, Maine, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	226	340	480	320	270	240	1,000	1,500	1,110	1,170	652	281
2	253	281	606	320	270	240	1,000	1,740	1,230	1,230	584	240
3	226	253	700	320	270	240	1,000	1,560	1,290	1,170	606	253
4	226	310	700	320	240	240	1,050	1,530	1,290	1,350	584	253
5	253	253	700	320	240	240	1,110	1,410	1,290	1,350	562	226
6	226	226	900	320	240	210	1,170	1,440	1,230	1,230	520	267
7	200	200	900	360	240	210	1,350	1,410	1,200	1,110	480	270
8	200	176	850	360	240	210	1,530	1,410	1,170	1,230	442	267
9	226	176	800	390	240	240	1,530	1,320	1,140	1,140	406	226
10	200	154	750	390	240	240	1,470	1,380	1,050	1,110	406	253
11	176	154	700	360	240	240	1,410	1,470	1,080	1,080	424	253
12	176	154	606	360	240	240	1,290	1,530	1,260	1,140	442	240
13	226	134	520	360	240	240	1,350	1,560	1,380	1,170	442	226
14	226	134	440	390	240	240	1,530	1,560	1,380	1,050	461	253
15	226	134	410	420	210	240	1,470	1,530	1,290	1,080	442	281
16	226	134	340	460	210	240	1,470	1,530	1,140	1,020	406	280
17	253	130	310	500	210	240	1,530	1,470	1,170	1,000	356	281
18	253	120	310	500	210	240	1,650	1,260	1,710	950	340	281
19	253	120	310	460	210	240	1,780	1,200	1,820	900	310	253
20	310	120	280	420	210	240	1,920	1,170	1,850	900	310	226
21	340	120	280	390	210	240	2,140	1,260	1,880	850	356	226
22	406	120	280	360	210	240	2,300	1,230	1,820	800	356	253
23	442	120	320	320	210	240	2,380	1,050	1,680	780	310	240
24	406	154	390	320	210	260	2,420	1,000	1,500	800	267	253
25	406	226	460	320	210	300	2,380	1,170	1,440	700	253	240
26	406	281	460	320	210	320	2,460	1,080	1,440	652	253	200
27	340	310	460	290	210	360	2,220	1,050	1,260	629	267	200
28	406	310	460	290	240	700	2,020	1,050	1,170	606	267	180
29	406	281	420	290	.....	950	1,920	1,110	1,110	584	267	180
30	406	310	390	290	.....	1,050	1,650	1,110	1,170	541	296	176
31	406	.....	360	290	.....	1,050	.....	1,170	.....	520	296	.....

NOTE.—Stage-discharge relation affected by ice Nov. 17–23, and Dec. 13 to Mar. 30; discharge determined from gage-height records and discharge measurements. Daily discharge on May 18, 28, July 25, Aug. 23, and Sept. 11, corrected for opening of gates in dam. Discharge estimated Oct. 10, Apr. 1, and Sept. 7, 16, and 26–29.

Monthly discharge of Passadumkeag River at Lowell, Maine, for the year ending Sept. 30, 1917.

[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	406	176	288	0.957	1.10
November	340	120	198	.658	.73
December	900	280	513	1.70	1.96
January	500	290	359	1.19	1.37
February	270	210	229	.761	.79
March	1,050	210	336	1.12	1.29
April	2,460	1,000	1,650	5.48	6.11
May	1,740	1,000	1,330	4.42	5.10
June	1,880	1,050	1,350	4.49	5.01
July	1,350	520	963	3.20	3.69
August	652	253	399	1.33	1.53
September	281	176	242	.804	.90
The year	2,460	120	656	2.18	29.58

KENDUSKEAG STREAM NEAR BANGOR, MAINE.

LOCATION.—At highway bridge at Sixmile Falls, 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, 1917.

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.

EXTREMES OF DISCHARGE.—Maximum open-water stage recorded during year, 9.5 feet at 7 a. m. and 4 p. m. April 8 (discharge from extension of rating curve, 4,950 second-feet); maximum stage of 11.2 feet occurred Mar. 29 when stage-discharge relation was affected by ice; minimum stage recorded, 2.0 feet at 7.20 a. m. and 2.00 p. m. September 30 (discharge 52 second-feet).

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

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 water flows through the artificial cut into the Kenduskeag. Black Stream probably sends its water only to the Kenduskeag.

ACCURACY.—Stage-discharge relation fairly permanent except as affected by ice; shifts slightly at infrequent intervals. Rating curve well defined below 2,600 second-feet and fairly well defined between 2,600 and 4,000 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 table to mean daily gage height. Records good for ordinary stages; for winter records, fair.

Discharge measurements of Kenduskeag Stream near Bangor, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec-ft.*
Dec. 27	E. W. Conners	[a] 6.08	514	May 16	F. E. Pressey	3.08	290
Jan. 30	do	[a] 3.48	137	June 6	do	2.78	201
Feb. 17	do	[a] 3.16	89	June 13	G. C. Danforth	7.96	3,570
Apr. 4	G. C. Danforth	5.92	1,680				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Kenduskeag Stream near Bangor, Maine, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	107	181	1,480	262	156	128	3,930	376	538	790	2,370	327
2	99	206	3,160	211	146	137	2,650	500	427	538	2,210	376
3	115	181	2,050	177	146	137	1,970	576	359	463	1,890	327
4	107	150	1,120	156	137	119	1,750	740	312	359	1,610	250
5	99	132	890	156	137	119	1,970	655	234	250	1,060	181
6	68	132	1,000	156	137	119	2,460	576	220	194	576	150
7	76	115	890	156	137	119	4,040	576	181	250	265	181
8	68	123	890	177	137	128	5,140	500	206	194	194	140
9	68	140	890	188	146	146	3,270	427	392	159	220	140
10	68	115	890	223	146	156	2,650	500	695	206	181	123
11	91	107	1,000	249	156	156	1,890	615	1,180	234	280	115
12	107	91	1,000	276	146	146	1,240	655	2,750	206	427	107
13	107	84	890	305	146	137	1,540	538	3,490	181	327	123
14	99	132	890	335	137	128	2,130	427	2,850	312	265	107
15	91	132	790	538	119	119	2,050	376	2,050	410	220	123
16	99	140	695	538	102	146	1,750	250	1,360	427	181	99
17	107	150	615	576	86	166	1,610	265	2,050	359	220	91
18	99	107	615	465	71	223	1,750	280	3,710	312	265	107
19	84	84	538	398	71	166	1,680	194	3,600	220	250	123
20	123	68	501	320	71	146	1,540	170	2,370	220	220	123
21	576	91	431	249	78	137	1,750	150	2,050	159	265	107
22	655	84	465	249	86	166	1,540	150	1,680	150	234	107
23	500	115	950	236	86	211	1,420	170	1,240	123	296	132
24	392	265	1,240	223	94	249	1,240	376	890	170	427	132
25	312	538	895	223	102	366	890	343	695	170	695	115
26	250	740	700	211	110	795	740	250	615	132	1,000	115
27	220	538	514	199	119	1,060	576	170	538	115	1,000	99
28	234	327	465	199	119	3,680	500	159	427	115	790	84
29	194	427	398	177	.....	4,950	427	265	327	99	576	84
30	150	576	366	137	.....	4,650	392	500	463	695	392	61
31	159	.....	305	146	.....	4,480	.....	655	.....	1,480	296	.....

NOTE.—Stage-discharge relation affected by ice Dec. 19 to Mar. 30; discharge determined from gage heights, three discharge measurements, observer's notes, and weather records.

Monthly discharge of Kenduskeag Stream near Bangor, Maine, for the year ending Sept. 30, 1917.

[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	655	68	178	0.932	1.07
November	740	68	209	1.09	1.22
December	3,160	305	888	4.65	5.36
January	576	137	262	1.37	1.58
February	156	71	119	.623	.65
March	4,950	119	761	3.98	4.59
April	5,140	392	1,880	9.84	10.98
May	655	150	399	2.09	2.41
June	3,600	181	1,260	6.60	7.36
July	1,480	99	313	1.64	1.89
August	2,370	181	619	3.24	3.74
September	376	61	145	.759	.85
The year	5,140	61	587	3.07	41.70

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, 1917.

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 39 gates; the sills of the gates being at elevations varying from 8.0 feet to 11.4 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 at east outlet, Maine, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	15.1	.....	15.55	.....	.....	.....	.....	17.4	.....	16.4	.....
2	15.45	.....	14.7	.....	.....	13.55	.....	16.5	.....	17.4	.....	.....
3	.....	15.1	.....	15.55	14.95	.....	.....	.....	.....	.....	16.9	17.35
4	15.45	.....	14.9	.....	.....	.....	12.5	16.2	17.4	.....	17.1	.....
5	.....	.....	.....	15.5	14.85	.....	.....	.....	.....	.....	17.25	.....
6	15.35	15.1	14.95	.....	.....	13.45	.....	.....	17.45	17.3	17.3	17.35
7	.....	.....	.....	.....	14.7	.....	12.7	16.4	.....	.....	17.4	17.2
8	.....	15.05	.....	15.45	.....	13.3	.....	.....	17.4	.....	17.4	.....
9	15.4	.....	15.3	.....	14.65	.....	12.9	16.55	.....	17.15	17.35	.....
10	.....	14.9	.....	15.45	.....	.....	.....	.....	.....	.....	17.45	.....
11	.....	.....	.....	.....	.....	.....	.....	16.7	.....	17.0	17.45	.....
12	15.1	.....	15.4	15.4	14.4	.....	13.1	.....	17.55	.....	.....	16.8
13	15.0	14.9	.....	.....	.....	.....	13.2	.....	17.55	.....	.....	.....
14	.....	.....	15.4	.....	.....	12.0	.....	17.1	.....	16.8	17.35	16.7
15	.....	14.8	15.5	15.4	14.3	.....	.....	.....	17.5	.....	17.4	.....
16	14.95	14.8	.....	.....	14.25	12.95	13.5	17.4	.....	.....	.....	.....
17	.....	.....	.....	15.4	.....	.....	.....	.....	.....	16.4	17.4	16.6
18	14.9	.....	15.6	.....	.....	.....	13.6	17.5	17.7	16.3	.....	.....
19	.....	.....	15.5	.....	14.15	.....	.....	.....	.....	.....	.....	.....
20	14.95	14.7	.....	15.4	.....	.....	13.9	.....	17.8	16.2	17.4	16.3
21	.....	.....	.....	.....	13.95	12.6	.....	17.45	.....	.....	.....	16.2
22	.....	14.6	15.6	15.4	.....	.....	14.2	.....	17.6	.....	.....	.....
23	15.05	.....	.....	.....	.....	.....	.....	17.5	.....	16.1	17.45	.....
24	.....	14.55	.....	15.4	13.8	.....	.....	.....	.....	.....	.....	16.0
25	15.0	.....	15.5	.....	.....	.....	14.8	17.45	17.3	16.2	17.5	.....
26	.....	.....	.....	15.4	.....	.....	.....	.....	.....	.....	.....	15.9
27	15.1	14.5	15.5	.....	13.7	.....	15.3	.....	17.4	16.1	17.45	.....
28	.....	.....	.....	.....	13.65	12.3	.....	17.35	.....	.....	.....	15.7
29	.....	14.55	.....	15.4	.....	.....	.....	.....	17.4	.....	17.4	.....
30	15.0	.....	15.5	.....	.....	.....	15.75	17.4	.....	16.0	.....	.....
31	.....	.....	.....	15.2	.....	.....	.....	.....	.....	.....	17.7	.....

KENNEBEC RIVER AT THE FORKS, MAINE.

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

DRAINAGE AREA.—1,570 square miles.

RECORDS AVAILABLE.—September 28, 1901, to September 30, 1917.

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.—Channel at bridge is subject to slight changes; control is occasionally affected by backwater from Dead River.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.1 feet, from 4 to 12 p. m. June 18 (discharge, by extension of rating curve, 23,700 second-feet); minimum stage recorded during year, 1.2 feet on October 24 (discharge, 700 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 occasionally affected by backwater from Dead River and by ice during the winter. Rating curve fairly 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 14 and April 26 to September 30; chain gage read to half-tenths once daily November 15 to April 25. Daily discharge for period when water-stage recorder was in operation determined by use of discharge integrator; for period when water-stage recorder was not in operation, discharge ascertained by applying rating table to mean daily gage height. Records fair.

Discharge measurements of Kennebec River at The Forks, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 16	E. W. Conners	[a] 2.84	822	Apr. 16	F. E. Pressey	[b] 1.89	1,120
Feb. 13	do	[a] 5.10	2,620	May 23	do	5.61	7,600

[a] Stage-discharge relation affected by ice. [b] Stage-discharge relation affected by log jam.

Daily discharge, in second-feet, of Kennebec River at The Forks, Maine, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,320	1,700	1,740	2,100	3,000	1,950	1,160	4,500	5,000	9,200	7,400	3,900
2	1,200	1,720	1,740	2,100	3,000	2,200	990	4,700	4,700	8,800	3,100	3,800
3	1,180	1,620	1,530	2,100	3,200	2,100	915	5,400	4,500	7,700	2,600	3,750
4	1,280	1,560	1,240	2,300	3,200	2,100	915	5,200	4,550	6,300	3,300	3,750
5	1,160	1,380	1,070	2,200	3,200	2,100	840	5,500	4,700	6,000	2,600	3,400
6	1,220	1,400	990	1,950	3,000	2,200	915	4,100	6,000	7,300	2,100	3,200
7	2,100	1,440	990	1,950	3,000	2,500	1,330	4,100	5,200	6,900	3,050	3,850
8	2,350	1,540	990	1,850	3,000	2,600	1,630	4,600	3,600	6,800	6,100	3,850
9	2,300	1,540	990	1,850	2,900	2,700	1,740	4,050	5,900	6,800	6,000	4,400
10	1,980	1,380	990	1,950	2,800	2,600	1,740	4,850	8,300	6,600	7,400	4,200
11	1,920	1,680	920	1,850	2,700	2,600	1,740	5,200	10,600	6,300	9,800	4,600
12	1,900	1,740	920	1,850	2,600	2,600	1,330	3,800	14,700	6,200	9,200	4,300
13	1,920	1,660	840	1,850	2,600	2,700	1,330	3,200	14,200	6,200	7,300	4,100
14	1,940	1,700	1,350	1,950	2,600	2,600	1,240	3,850	13,300	5,800	5,500	4,150
15	1,740	1,740	1,450	1,850	2,700	2,500	1,150	3,000	12,600	6,200	4,650	4,350
16	1,700	1,850	1,750	820	2,600	2,600	1,100	2,400	12,300	6,000	4,550	4,300
17	1,680	1,960	1,950	920	2,600	2,500	1,240	5,000	13,100	5,900	4,850	4,200
18	1,760	1,850	2,100	1,650	2,500	2,500	1,740	7,700	17,600	5,800	3,900	5,200
19	1,900	1,740	2,200	1,850	2,500	2,500	1,960	7,500	18,000	5,900	3,750	4,300
20	2,100	1,740	2,200	1,850	2,500	2,460	2,460	7,500	17,000	5,900	4,300	3,900
21	1,500	1,740	2,200	1,850	2,500	2,600	2,880	5,300	16,600	5,700	4,300	3,450
22	1,000	1,850	2,100	1,850	2,500	2,740	3,810	5,800	16,000	5,600	4,200	3,300
23	740	1,740	2,100	1,850	2,300	2,600	4,880	6,800	15,400	4,400	3,950	3,300
24	710	1,850	2,100	2,100	2,100	2,450	5,460	7,500	15,000	4,100	4,000	3,300
25	850	1,960	1,950	2,300	2,100	2,600	3,640	7,400	13,000	3,700	4,350	3,250
26	920	1,960	1,850	2,600	2,100	2,600	3,320	7,200	8,300	3,750	4,350	3,200
27	920	1,740	1,850	2,700	2,100	2,600	3,260	6,800	6,500	3,700	4,100	3,150
28	1,120	1,530	1,850	2,900	1,950	2,880	2,850	5,000	7,200	4,000	4,100	3,050
29	1,400	1,430	1,950	2,900	.....	2,080	2,700	4,200	8,000	3,400	4,000	3,000
30	1,500	1,330	2,100	3,000	.....	1,960	3,200	5,000	9,400	4,100	4,150	3,000
31	1,540	.....	2,100	3,000	.....	1,850	.....	5,300	.....	11,000	4,000	.....

NOTE.—Stage-discharge relation affected by ice Dec. 10 to Mar. 19; discharge ascertained from gage heights, two discharge measurements, observer's notes, and weather records; affected by logs Apr. 15–16.

Monthly discharge of Kennebec River at The Forks, Maine, for the year ending Sept. 30, 1917.

[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	1,510	1,030	0.656	0.76
November	1,700	1,210	.771	.86
December	1,620	2,690	1.71	1.97
January	2,060	1,700	1.08	1.24
February	2,640	610	.389	.42
March	2,440	970	.618	.71
April	2,120	6,220	3.96	4.42
May	5,240	7,220	4.60	5.30
June	10,400	10,400	6.62	7.39
July	6,000	4,560	2.90	3.34
August	4,740	6,540	4.17	4.81
September	3,780	1,240	.790	.88
The year	3,680	3,700	2.36	32.10

DEAD RIVER AT THE FORKS, MAINE.

LOCATION.—One-eighth mile above farm house 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, 1917.

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 during year, about 7.9 feet on morning of June 21 (discharge about 22,600 second-feet); minimum open-water stage recorded during year, 0.6 foot, several times in October and November (discharge, from extension of rating curve, 100 second-feet).

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 affected by ice or log jams. Rating curve fairly well defined. Gage read to half-tenths twice daily, except during winter when it is read twice a day, three times a week. Daily discharge determined by applying mean daily gage height to rating curve. Open-water record good; winter record fair.

Discharge measurements of Dead River at The Forks, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 15	E. W. Conners	[a] 2.70	615	Apr. 25	F. E. Pressey	4.49	7,280
Feb. 12	do	[a] 1.40	427	May 10	do	5.14	10,800
Apr. 17	F. E. Pressey	2.08	1,790				

[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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	370	148	2,750	610	510	325	3,050	4,710	3,550	1,780	8,200	1,390
2	325	160	3,550	560	510	325	3,150	5,240	3,550	1,940	4,970	1,240
3	257	325	2,750	510	510	370	3,250	6,140	3,990	2,200	4,460	1,100
4	224	325	1,860	510	460	415	3,350	2,750	3,140	2,030	3,990	902
5	160	325	1,540	560	460	415	3,550	4,460	3,770	1,320	3,550	665
6	160	240	1,540	610	460	415	3,650	4,220	3,990	840	1,860	610
7	130	176	1,540	560	460	460	3,770	4,460	4,970	560	1,240	720
8	100	160	1,390	510	460	460	3,340	3,550	4,970	610	1,030	560
9	200	160	1,240	415	415	510	3,140	3,990	2,940	610	1,320	510
10	510	112	1,100	325	415	510	2,750	3,990	2,470	665	1,540	510
11	160	100	900	240	415	510	2,560	3,990	4,460	720	1,700	580
12	100	100	720	160	427	460	2,380	3,990	8,940	840	1,320	520
13	112	130	560	100	415	460	2,120	3,340	10,500	780	1,100	460
14	200	160	510	415	370	415	1,860	7,130	8,570	720	1,170	400
15	282	200	510	615	370	415	1,940	3,550	6,790	780	2,120	340
16	240	160	510	720	325	415	2,030	3,550	5,240	665	2,380	300
17	160	160	510	780	325	460	2,030	4,970	4,460	610	2,290	340
18	160	160	510	780	325	510	2,560	5,530	13,800	560	2,200	400
19	160	160	510	720	325	610	3,140	3,340	8,940	610	2,200	480
20	840	100	510	720	325	610	3,550	6,140	8,940	510	2,470	600
21	1,620	100	510	720	325	610	3,990	3,140	17,800	510	2,030	760
22	1,540	100	560	720	325	660	4,220	4,710	10,500	510	1,940	660
23	1,100	100	1,540	660	325	720	7,480	3,550	4,970	510	1,860	600
24	780	325	1,240	720	325	720	10,500	3,140	3,340	610	1,940	580
25	610	840	840	660	325	1,240	8,940	3,140	3,550	560	2,200	600
26	610	1,100	720	610	325	1,940	8,940	3,140	2,750	510	2,030	640
27	510	1,100	720	610	325	2,200	8,570	3,550	2,030	510	1,860	500
28	397	1,100	660	610	325	2,550	4,460	3,140	1,700	510	1,780	440
29	240	965	610	560	.....	3,250	4,970	3,140	1,940	415	1,460	400
30	176	1,390	610	560	.....	3,150	4,970	3,990	1,860	510	1,320	380
31	160	.....	610	510	.....	3,050	.....	3,990	.....	14,600	1,460	.....

NOTE.—Stage-discharge relation affected by ice Dec. 26 to Apr. 4; discharge determined from a study of observed gage heights, two discharge measurements, temperature records, and hydrograph comparison with East Branch of Penobscot River at Grindstone; affected by log jams Sept. 11–30, and discharge determined by comparisons with near-by streams. Discharge estimated Apr. 5–6, and also June 18, 21, and July 31, when water was over the gage.

Monthly discharge of Dead River at The Forks, Maine, for the year ending Sept. 30, 1917.

[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	1,620	100	406	0.463	0.53
November	1,390	100	356	.405	.45
December	3,550	510	1,080	1.23	1.42
January	780	100	560	.638	.74
February	510	325	389	.443	.46
March	3,250	325	941	1.07	1.23
April	10,500	1,860	4,140	4.72	5.27
May	7,130	2,750	4,120	4.69	5.41
June	17,800	1,700	5,610	6.39	7.13
July	14,600	415	1,260	1.44	1.66
August	8,200	1,030	2,290	2.61	3.01
September	1,390	300	606	.690	.77
The year	17,800	100	1,820	2.07	28.08

SEBASTICOOK RIVER AT PITTSFIELD, MAINE.

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

DRAINAGE AREA.—320 square miles.

RECORDS AVAILABLE.—July 27, 1908, to September 30, 1917.

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, 7.7 feet at 6.20 a. m. June 19 (discharge, 5,590 second-feet); minimum stage recorded during year, 2.7 feet at 6 a. m. October 10 and 9 a. m. and 6 p. m. October 15 (discharge, 148 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 American Woolen Co. (Pioneer Mills) and the Smith Textile Co.; and about half a mile farther upstream is the dam of the American Woolen Co.'s Waverly Mill; the storage of water at these dams causes diurnal fluctuation at the gage.

ACCURACY.—Stage-discharge relation shifts occasionally. Rating curve fairly well defined. Gage read to tenths twice daily. Owing to lack of exact information in regard to the stage at night when mills are shut down, figures for daily discharge are not published.

The following discharge measurement was made by F. E. Pressey:

May 15, 1917: Gage height, 3.70 feet; discharge, 602 second-feet.

Twice-daily discharge, in second-feet, of Sebasticook River at Pittsfield, Maine, for the year ending Sept. 30, 1917.

Day.	Oct.		Nov.		Dec.		Jan.		Feb.		Mar.	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
1	180	180	289	250	1,320	1,550	530	530	376	424	376	376
2	214	250	214	331	2,030	2,550	530	530	424	424	376	331
3	250	289	214	289	2,550	2,550	530	530	424	424	376	148
3	214	289	214	214	2,290	2,290	424	424	376	376	148	148
5	214	289	180	180	2,290	2,290	424	424	376	376	331	376
6	214	289	214	331	2,290	2,160	424	424	376	331	331	376
7	214	214	214	289	2,160	2,160	424	424	376	376	331	376
8	214	214	214	289	2,030	1,910	424	475	331	376	331	376
9	214	289	214	289	1,670	1,550	475	475	376	289	376	331
10	148	250	214	289	1,320	1,320	424	475	289	289	815	148
11	214	250	214	289	1,210	1,210	475	475	289	289	148	148
12	214	250	180	180	1,100	1,100	424	475	331	376	289	331
13	214	214	180	250	1,000	1,000	250	250	289	376	331	331
14	214	180	250	331	905	815	289	289	331	376	331	331
15	148	148	331	376	815	815	424	590	376	376	289	331
16	180	250	250	331	732	732	530	530	289	289	250	331
17	214	289	289	331	732	732	530	530	376	289	289	148
18	214	289	289	331	657	657	590	590	289	289	148	148
19	180	250	214	214	590	590	590	590	475	376	331	289
20	214	289	250	331	590	530	590	530	376	331	289	250
21	214	214	250	331	475	475	475	475	376	376	289	331
22	214	214	289	331	475	475	590	590	331	376	250	331
23	250	289	289	289	530	530	475	530	331	331	289	331
24	214	331	289	376	657	657	530	530	331	148	289	214
25	250	331	331	376	732	732	475	475	148	148	214	214
26	214	289	250	250	815	815	475	475	331	376	289	331
27	250	331	289	331	815	815	475	475	331	376	331	376
28	214	214	289	331	732	732	475	475	424	376	1,430	1,790
29	214	250	331	331	657	657	424	376	.....	.....	1,670	1,670
30	214	289	331	331	590	590	376	376	.....	.....	1,670	1,670
31	180	250	.....	.....	590	590	376	424	.....	.....	1,670	1,790

Day.	Apr.		May.		June.		July.		Aug.		Sept.	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
1	1,910	2,160	1,320	1,320	331	331	530	530	2,030	2,030	732	590
2	2,420	2,420	1,210	1,210	331	289	590	590	2,030	2,030	590	590
3	2,420	2,420	1,210	1,210	289	331	530	590	2,030	2,030	590	590
4	2,420	2,550	1,100	1,100	376	424	530	590	2,030	1,910	590	590
5	2,550	2,550	1,000	530	424	424	530	530	1,790	1,670	590	530
6	2,550	2,680	590	657	424	424	530	475	1,550	1,320	475	475
7	3,770	4,050	815	815	376	376	475	331	1,210	1,210	475	475
8	4,470	4,610	815	657	331	331	289	289	1,000	1,000	475	475
9	4,750	4,470	657	657	331	250	289	289	815	732	475	475
10	4,190	4,050	657	590	250	289	331	331	732	815	475	424
11	3,910	3,770	590	590	424	590	331	331	815	732	475	424
12	3,630	3,350	590	590	1,210	1,550	331	331	732	732	424	424
13	3,070	2,810	590	590	2,030	2,160	331	331	732	732	424	424
14	2,680	2,680	590	530	2,290	2,290	331	331	657	732	331	376
15	2,680	2,680	530	530	2,290	2,290	331	331	657	331	376	376
16	2,680	2,550	475	475	2,290	2,290	331	331	475	475	289	331
17	2,550	2,550	475	424	2,420	2,940	331	331	530	530	289	289
18	2,550	2,550	376	376	4,890	5,450	331	331	475	475	331	331
19	2,550	2,550	376	331	5,590	5,450	331	376	475	475	331	331
20	2,550	2,550	331	376	5,030	4,750	331	331	475	530	331	376
21	2,810	2,810	289	289	4,330	4,050	331	331	530	530	376	331
22	2,810	2,810	289	289	3,490	3,070	331	331	475	475	331	250
23	2,940	2,940	331	331	2,680	2,420	376	376	475	475	250	250
24	3,070	3,070	331	289	1,910	1,790	331	331	530	530	331	376
25	3,070	2,940	250	250	1,670	1,550	331	331	657	815	331	376
26	2,680	2,550	250	250	1,430	1,430	331	331	1,100	1,100	331	376
27	2,290	2,160	250	250	1,320	1,210	331	331	1,000	1,000	376	376
28	2,030	1,910	289	289	1,100	1,000	289	214	905	905	376	376
29	1,670	1,550	331	289	905	905	214	331	815	815	331	250
30	1,430	1,430	250	289	732	657	376	424	815	815	250	250
31	.....	.....	331	331	.....	.....	1,550	2,030	732	732	.....	.....

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, 1917.

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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,670	1,630	1,060	1,820	2,110	2,400	1,550	1,940	2,160	4,600	2,520	1,630
2	1,740	1,590	1,080	1,850	2,150	2,460	1,610	1,960	2,160	3,860	2,480	1,750
3	1,720	1,640	1,090	1,880	2,150	2,450	1,770	1,980	2,180	3,550	2,480	1,950
4	1,720	1,640	1,300	1,860	2,130	2,490	1,690	1,970	2,190	3,100	2,500	1,930
5	1,760	1,640	1,440	1,850	2,130	2,540	1,640	1,970	2,410	2,220	2,490	1,890
6	1,790	1,640	1,430	1,830	2,140	2,550	1,590	1,940	2,670	2,460	2,540	1,860
7	1,880	1,640	1,430	1,820	2,150	2,490	1,550	1,920	3,280	2,040	2,460	1,800
8	1,930	1,760	1,420	1,870	2,100	2,500	1,500	1,910	4,540	2,390	2,420	1,780
9	1,950	1,810	1,510	2,010	2,020	2,500	1,470	1,900	4,980	2,230	2,310	1,830
10	1,940	1,780	1,540	1,970	2,020	2,440	1,840	1,730	4,890	2,030	2,060	1,870
11	1,870	1,760	1,510	1,970	2,040	2,440	1,830	1,200	4,800	1,560	2,270	1,900
12	1,850	1,870	1,500	2,010	2,030	2,460	1,660	930	5,360	1,760	2,360	1,940
13	1,770	1,810	1,570	2,030	2,040	2,480	1,570	951	7,170	2,160	2,320	1,940
14	1,640	1,760	1,620	1,880	2,050	2,480	1,530	941	9,060	2,190	2,380	1,980
15	1,680	1,820	1,580	1,830	2,040	2,430	1,380	1,670	9,880	2,350	2,310	2,010
16	1,790	1,930	1,470	1,810	2,050	2,140	1,330	1,850	9,360	2,370	2,190	1,940
17	1,760	1,960	1,630	1,810	2,060	2,080	1,330	1,850	9,270	2,340	1,710	1,930
18	1,800	1,930	1,700	1,800	2,110	2,090	1,330	1,850	9,630	2,300	1,500	1,930
19	1,740	1,790	1,730	1,840	2,200	2,060	1,310	1,870	10,600	2,390	2,080	1,900
20	1,110	1,750	1,780	1,900	2,350	2,060	1,110	1,880	11,900	2,400	1,780	1,880
21	1,000	1,810	1,800	1,970	2,380	2,070	844	1,910	12,500	2,310	1,550	1,680
22	1,140	1,820	1,800	1,990	2,470	2,040	939	1,940	12,300	2,240	1,430	1,660
23	1,450	1,720	1,800	1,990	2,490	2,220	1,110	2,490	11,900	2,200	1,410	1,700
24	1,620	1,210	1,800	1,950	2,510	2,250	1,440	2,860	11,500	2,240	1,380	1,830
25	1,630	1,430	1,810	1,940	2,520	2,230	1,760	2,780	10,600	2,360	1,280	1,860
26	1,640	1,560	1,810	1,970	2,530	2,200	1,790	2,640	9,190	2,600	1,280	1,770
27	1,640	1,690	1,810	2,060	2,460	1,890	1,820	2,340	8,190	2,720	1,330	1,830
28	1,640	1,600	1,690	2,100	2,410	1,630	1,820	2,290	7,030	2,580	1,540	1,840
29	1,640	1,300	1,710	2,130	.....	1,520	1,830	2,280	6,430	2,520	1,670	1,820
30	1,530	987	1,760	2,150	.....	1,680	1,870	2,230	5,730	2,580	1,700	1,850
31	1,620	.....	1,820	2,120	.....	1,630	.....	2,160	.....	2,560	1,690	.....

[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, 1917.

[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	1,950	1,000	1,670	1.53	1.76
November	1,960	987	1,680	1.53	1.71
December	1,820	1,060	1,580	1.44	1.66
January	2,150	1,800	1,940	1.77	2.04
February	2,530	2,020	2,210	2.02	2.10
March	2,550	1,520	2,220	2.03	2.34
April	1,870	844	1,530	1.40	1.56
May	2,860	930	1,940	1.77	2.04
June	12,500	2,160	7,130	6.51	7.26
July	4,600	1,560	2,490	2.27	2.62
August	2,540	1,280	1,980	1.81	2.09
September	2,010	1,630	1,850	1.69	1.89
The year	12,500	844	2,340	2.14	29.07

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 upper or sawmill dam of Berlin Mills Co. at Berlin, Coos County.

DRAINAGE AREA.—1,350 square miles.

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

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 George P. Abbott, 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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,600	1,950	3,500	1,980	2,150	2,450	2,400	4,650	3,650	10,600	1,800	2,200
2	2,400	1,970	3,100	2,050	2,150	2,450	2,200	4,600	3,800	7,600	1,900	2,200
3	1,950	1,980	2,700	2,000	2,150	2,500	2,500	4,300	3,800	6,760	1,900	2,200
4	2,150	1,970	2,070	2,000	2,150	2,500	2,650	4,100	3,900	6,000	1,900	2,200
5	1,940	2,050	2,100	2,000	2,150	2,500	2,600	4,100	3,900	4,200	1,800	2,000
6	1,940	1,960	2,220	1,990	2,150	2,500	2,650	4,000	3,600	3,000	1,800	1,900
7	1,940	1,930	2,250	1,980	2,150	2,500	2,750	3,800	3,650	3,000	1,800	2,000
8	1,950	1,940	2,160	1,980	2,150	2,500	2,750	3,600	4,300	1,850	1,800	1,700
9	2,000	1,950	2,080	1,990	2,150	2,500	2,700	3,800	5,800	2,700	1,800	2,400
10	1,990	2,000	2,060	2,070	2,150	2,500	2,600	3,850	6,500	2,200	1,800	2,000
11	1,950	1,975	2,050	2,130	2,150	2,500	2,550	3,750	7,500	1,750	1,800	1,900
12	1,940	1,975	2,030	2,100	2,150	2,500	2,500	3,600	10,800	1,900	1,700	1,800
13	2,000	1,960	1,940	2,080	2,150	2,500	2,300	3,600	12,000	2,100	1,800	1,800
14	1,950	1,950	2,030	2,080	2,150	2,480	1,900	3,600	11,000	1,600	1,800	2,000
15	1,930	1,940	2,080	2,080	2,150	2,500	1,900	3,450	11,000	1,600	1,900	2,000
16	1,930	1,950	2,000	2,080	2,150	2,500	1,890	3,300	11,000	2,100	2,100	2,100
17	1,940	1,970	2,000	2,100	2,150	2,500	1,830	3,300	12,000	2,000	2,100	2,300
18	1,950	2,040	2,030	2,150	2,150	2,460	2,080	3,300	20,000	2,000	2,200	2,200
19	1,950	2,080	2,050	2,120	2,250	2,280	2,420	3,300	18,000	1,900	2,000	2,000
20	2,150	2,030	2,050	2,100	2,450	2,320	3,300	3,350	17,500	1,900	2,500	2,300
21	2,050	1,950	2,080	2,100	2,500	2,300	3,600	4,100	18,000	1,900	2,600	2,300
22	1,800	1,980	2,150	2,100	2,500	2,280	4,500	3,700	17,600	2,000	2,700	2,300
23	1,860	2,050	2,150	2,100	2,500	2,250	5,900	3,600	17,400	2,000	2,300	2,300
24	1,940	2,350	2,150	2,100	2,500	2,400	5,300	4,200	16,000	1,900	2,200	2,200
25	1,940	2,850	2,170	2,100	2,500	2,400	4,600	4,700	15,200	1,900	2,300	2,000
26	1,970	2,700	2,150	2,100	2,500	2,400	4,450	4,450	13,900	2,000	2,400	1,800
27	1,990	2,470	2,075	2,100	2,550	2,500	4,350	4,350	12,800	2,000	2,200	1,760
28	1,970	2,350	2,100	2,100	2,470	2,650	4,200	4,000	11,200	1,700	2,200	1,800
29	1,970	2,200	2,060	2,100	.....	2,400	4,200	3,800	10,500	1,500	2,000	1,900
30	1,960	2,570	1,930	2,150	.....	2,400	4,700	4,050	10,600	2,500	2,000	1,900
31	1,930	.....	1,900	2,150	.....	2,400	.....	3,950	.....	2,500	1,800	.....

NOTE.—Discharge Sept. 3 estimated.

Monthly discharge of Androscoggin River at Berlin, N. H., for the year ending Sept. 30, 1917.

[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	2,600	1,800	2,000	1.48	1.71
November	2,850	1,930	2,100	1.56	1.74
December	3,500	1,900	2,170	1.61	1.86
January	2,150	1,980	2,070	1.53	1.76
February	2,550	2,150	2,260	1.67	1.74
March	2,650	2,250	2,450	1.81	2.09
April	5,900	1,830	3,140	2.33	2.60
May	4,700	3,300	3,880	2.87	3.31
June	20,000	3,600	10,600	7.85	8.76
July	10,600	1,500	2,860	2.12	2.44
August	2,700	1,700	2,030	1.50	1.73
September	2,400	1,700	2,010	1.52	1.70
The year	20,000	1,500	3,120	2.31	31.44

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, 1917.

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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,670	2,440	8,950	2,300	2,490	2,920	4,230	7,110	5,520	8,310	2,410	2,840
2	2,850	2,590	5,370	2,530	2,500	2,890	4,470	6,620	5,580	6,730	2,560	2,360
3	2,650	2,630	3,640	2,460	2,450	2,880	4,550	6,210	5,370	5,710	2,550	2,150
4	2,470	2,540	3,260	2,410	2,400	2,760	4,760	6,030	6,730	4,760	2,430	2,870
5	2,410	2,250	3,240	2,450	2,520	2,880	5,020	5,920	5,750	4,730	2,000	2,690
6	2,330	2,420	3,410	2,490	2,490	2,860	5,430	5,490	4,990	3,590	2,490	2,590
7	2,350	2,420	3,380	2,030	2,480	2,820	6,440	5,220	4,720	2,980	2,400	2,530
8	1,930	2,360	3,240	2,350	2,450	2,870	6,030	5,080	5,040	2,590	2,360	2,450
9	2,510	2,380	3,060	2,420	2,510	2,840	4,940	5,260	6,460	2,680	2,520	2,160
10	2,440	2,410	2,950	2,430	2,470	2,800	4,130	5,330	6,640	3,000	2,770	2,390
11	2,470	2,480	2,980	2,370	2,190	2,790	3,820	5,310	13,800	2,780	2,730	2,290
12	2,330	2,250	2,920	2,330	2,430	2,830	3,980	5,430	21,700	2,710	2,180	2,270
13	2,280	2,470	2,290	2,280	2,430	2,730	4,040	4,930	19,700	2,800	2,540	2,250
14	2,480	2,430	2,050	2,180	2,430	2,680	3,930	5,430	14,800	2,800	2,480	2,250
15	2,030	2,340	2,370	2,920	2,410	2,800	3,470	6,100	14,900	2,330	2,680	2,280
16	2,520	2,370	2,270	2,930	2,470	2,810	3,920	5,310	13,700	2,810	2,830	1,800
17	2,390	2,300	2,230	2,890	2,460	2,730	3,820	4,670	14,500	2,820	3,270	2,300
18	2,340	2,390	2,230	2,810	2,150	2,340	4,560	5,000	30,300	2,760	3,590	2,260
19	2,400	1,970	2,450	2,750	2,550	2,540	5,700	5,510	23,400	2,740	2,520	2,250
20	3,640	2,570	2,550	2,600	2,530	2,460	7,900	6,400	17,300	2,710	2,970	2,360
21	3,490	2,310	2,570	2,430	2,620	2,470	9,060	7,430	16,900	2,660	3,930	2,420
22	2,650	2,070	2,690	2,600	2,660	2,510	11,100	5,960	16,700	2,400	3,870	2,570
23	2,790	2,450	2,880	2,520	2,680	2,540	13,500	5,400	15,800	2,650	3,330	2,080
24	2,690	4,440	2,860	2,480	2,700	2,650	11,000	6,680	14,000	2,470	4,500	2,460
25	2,650	4,190	2,330	2,490	2,370	2,620	8,040	6,480	13,200	2,830	5,380	2,310
26	2,580	1,980	2,550	2,470	2,800	3,280	7,380	5,710	11,600	2,630	3,830	2,330
27	2,530	2,510	2,550	2,440	2,880	3,870	6,430	4,940	10,200	2,510	3,480	2,400
28	2,490	2,930	2,590	2,870	2,910	7,640	6,110	4,930	9,170	2,550	3,020	2,280
29	2,290	3,120	2,520	2,490	.....	7,290	6,450	4,970	8,620	2,090	2,880	2,160
30	2,550	4,960	2,310	2,520	.....	5,330	7,960	6,030	9,330	2,380	2,960	2,020
31	2,490	.....	2,140	2,510	.....	4,450	.....	5,540	.....	2,400	3,160	.....

Monthly discharge of Androscoggin River at Rumford Falls, Maine, for the year ending Sept. 30, 1917.

[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	3,640	1,930	2,540	1.22	1.41
November	4,960	1,970	2,630	1.26	1.41
December	8,950	2,050	2,990	1.43	1.65
January	2,930	2,030	2,510	1.20	1.38
February	2,910	2,150	2,510	1.20	1.25
March	7,640	2,340	3,220	1.54	1.78
April	13,500	3,470	6,070	2.90	3.24
May	7,430	4,930	5,690	2.72	3.14
June	30,300	4,720	12,200	5.85	6.53
July	8,310	2,090	3,220	1.54	1.78
August	5,380	2,000	2,990	1.43	1.65
September	2,870	1,800	2,350	1.12	1.25
The year	30,300	1,800	4,070	1.95	26.47

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 Aziscohos dam, Oxford County, about 15 miles above mouth.

DRAINAGE AREA.—215 square miles.

RECORDS AVAILABLE.—January 1, 1912, to September 30, 1917.

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 capacity of the storage reservoir above the dam is 9,593,000,000 cubic feet, and the discharge is regulated for power interests 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, 1917.

[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	1,800	97	1,220	5.67	6.54
November	1,450	86	946	4.40	4.91
December	1,400	87	514	2.39	2.76
January	184	183	183	.85	.98
February	801	165	259	1.67	1.74
March	1,560	164	957	4.45	5.13
April	1,070	76	240	1.12	1.25
May	1,200	81	277	1.29	1.49
June	4,660	99	1,650	7.67	8.56
July	1,610	216	404	1.88	2.17
August	1,780	99	548	2.55	2.94
September	1,880	502	1,400	6.53	7.29
The year	4,660	76	724	3.37	45.76

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.

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, 1917.

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 DISCHARGE.—Maximum stage recorded during year, 8.4 feet at 7 p. m. June 12 (discharge, 2,070 second-feet); minimum stage recorded during year, 1.5 feet several times in July and August (discharge, 20 second-feet).

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

REGULATION.—Storage at Snows 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 height. Records 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, 1917.

[Made by G. C. Danforth.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
April 16	5.81	421
Sept. 25	1.94	43.6

Daily discharge, in second-feet, of Little Androscoggin River near South Paris, Maine, for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	108	90	1,180	108	61	61	493	314	159	219	24	108
2	92	108	493	108	61	68	475	292	159	179	20	92
3	84	92	303	100	68	68	512	303	140	169	20	76
4	84	76	199	116	68	61	475	325	179	116	24	76
5	84	61	179	124	61	61	458	303	132	108	20	61
6	76	76	209	124	61	61	585	270	116	108	24	47
7	76	61	199	100	61	54	1,280	239	108	92	20	47
8	40	61	149	116	61	54	700	229	124	68	20	47
9	76	54	149	124	47	61	558	229	189	68	20	40
10	68	54	124	124	47	61	458	219	199	68	20	40
11	61	61	124	116	47	61	348	189	760	76	24	34
12	68	40	132	108	47	61	360	169	1,970	92	24	34
13	68	47	132	84	54	61	348	219	1,080	100	24	29
14	61	40	124	108	54	61	426	199	535	92	24	29
15	47	61	100	239	54	68	458	219	585	92	24	24
16	61	61	100	209	54	76	426	159	493	76	29	24
17	61	68	108	189	54	76	493	140	1,180	61	84	29
18	54	68	100	179	54	68	512	132	1,180	47	169	34
19	61	47	108	140	54	61	535	124	830	47	92	40
20	372	84	100	124	54	61	585	108	615	29	108	47
21	229	68	108	116	54	61	830	116	493	24	239	68
22	169	61	116	108	54	68	760	116	458	24	140	54
23	132	61	372	92	54	76	615	209	348	20	116	54
24	124	314	270	92	61	108	458	249	303	29	189	47
25	116	124	219	100	54	116	442	209	360	34	348	40
26	116	108	159	100	61	140	411	149	303	34	281	40
27	84	108	159	84	68	239	384	132	229	29	140	34
28	84	100	140	84	68	900	360	132	179	29	140	34
29	54	108	124	92	.....	900	348	169	132	29	169	30
30	76	360	108	84	.....	585	348	239	384	29	169	24
31	68	.....	108	68	.....	493	.....	199	.....	24	159	.....

NOTE.—Discharge estimated Feb. 15–22.

Monthly discharge of Little Androscoggin River near South Paris, Maine, for the year ending Sept. 30, 1917.

[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	372	40	95.3	1.27	1.46
November	360	40	90.7	1.21	1.35
December	1,180	100	200	2.67	3.08
January	239	68	118	1.57	1.81
February	68	47	57.0	.760	.79
March	900	54	160	2.13	2.46
April	1,280	348	515	6.87	7.66
May	325	108	203	2.71	3.12
June	1,970	108	464	6.19	6.91
July	219	20	71.4	.952	1.10
August	348	20	93.7	1.25	1.44
September	108	24	46.1	.615	.67
The year	1,970	20	176	2.35	31.85

PRESUMPSCOT RIVER BASIN.

PRESUMPSCOT RIVER AT OUTLET OF SEBAGO LAKE, MAINE.

LOCATION.—At outlet dam at Sebago Lake and 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, 1917. 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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	333	875	673	760	810	842	212	842	720	2,480	790	720
2	795	755	792	828	812	827	737	787	740	2,450	767	45
3	867	845	342	827	833	837	798	828	253	2,400	703	237
4	893	882	793	858	283	307	780	813	743	2,360	760	740
5	802	332	840	835	775	790	812	752	705	2,350	210	783
6	857	863	811	733	830	840	667	270	768	2,330	758	727
7	883	870	868	300	837	838	562	813	745	2,180	758	832
8	242	848	820	808	837	835	222	842	722	2,240	757	752
9	890	788	782	792	845	835	843	837	707	1,650	762	260
10	845	837	365	808	842	800	807	730	245	847	760	785
11	897	827	817	737	345	252	780	795	623	835	762	797
12	853	503	837	840	830	842	842	800	828	808	240	815
13	783	807	825	840	835	845	802	275	985	807	737	805
14	837	808	828	267	837	835	693	823	697	792	758	803
15	360	840	785	695	812	840	340	755	738	285	757	803
16	888	875	807	777	825	807	788	793	1,080	770	778	268
17	830	870	275	787	773	728	803	807	1,800	768	758	798
18	828	808	845	832	318	322	798	785	2,330	765	722	805
19	870	383	833	768	842	835	792	705	2,420	712	262	808
20	902	830	838	827	842	843	833	247	2,470	632	770	812
21	858	790	790	277	812	850	773	765	2,530	617	753	807
22	262	875	760	743	840	840	255	780	2,660	182	758	722
23	835	877	755	820	813	838	832	738	2,690	752	735	305
24	830	670	222	830	838	832	840	735	2,730	753	757	793
25	795	762	273	840	410	213	777	808	2,700	752	733	812
26	880	317	697	813	818	700	838	727	2,690	762	260	807
27	878	882	845	802	820	693	888	295	2,710	780	783	802
28	678	855	837	318	830	752	650	807	2,700	743	767	797
29	327	825	787	802	.....	700	385	712	2,500	263	770	762
30	892	730	723	835	.....	743	812	705	2,500	768	773	300
31	887	.....	347	840	.....	708	.....	757	.....	787	770	.....

Monthly discharge of Presumpscot River at outlet of Sebago Lake, Maine, for the year ending Sept. 30, 1917.

[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	902	242	761	1.75	2.02
November	882	317	768	1.76	1.96
December	845	222	704	1.61	1.86
January	858	277	737	1.69	1.95
February	845	283	755	1.73	1.80
March	845	213	734	1.68	1.94
April	888	212	699	1.60	1.78
May	842	247	714	1.64	1.89
June	2,730	245	1,560	3.58	3.99
July	2,480	182	1,150	2.64	3.04
August	790	210	691	1.58	1.82
September	832	45	677	1.55	1.73
The year	2.730	45	828	1.90	25.78

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.

RECORDS AVAILABLE.—June 4, 1916, to September 30, 1917.

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

DISCHARGE MEASUREMENTS.—Made from bridge.

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

EXTREMES OF DISCHARGE.—Maximum stage during period covered by record, 9.4 feet at 6.30 a. m. June 18, 1917 (discharge, from extension of rating curve, about 17,400 second-feet); minimum stage recorded, 0.8 foot at 4.30 p. m. August 16, 6.30 a. m. September 11 and September 22, 1917 (discharge, from extension of rating curve, about 635 second-feet).

ICE.—Stage-discharge relation seriously affected by ice which forms to considerable thickness.

REGULATION.—The operation of power plants at Swan Falls and Kezar Falls probably has little effect on flow at station.

ACCURACY.—Stage-discharge relation seriously affected by ice December to April. Rating curve fairly well defined between 1,000 and 9,000 second-feet. Daily discharge ascertained by applying mean daily gage height to rating table. Open-water records good; winter records fair.

Discharge measurements of Saco River at Cornish, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 14	E. W. Conners	1.47	1,150	May 1	F. E. Pressey	5.72	8,350
Feb. 2	do	[a] 3.71	1,290	8	do	5.04	6,570
Apr. 12	F. E. Pressey	5.05	6,700	17	do	4.50	4,960
20	G. C. Danforth	4.97	6,740	25	do	4.36	5,310

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Saco River at Cornish, Maine, for the period June 4, 1916, to Sept. 30, 1917.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1916.					1916.				
1	.....	4,600	2,020	1,260	16	9,940	3,420	2,140	1,900
2	.....	4,260	1,900	1,260	17	9,700	3,260	1,900	2,270
3	.....	4,600	1,790	1,180	18	10,200	2,960	1,900	2,400
4	4,420	4,960	1,680	1,180	19	9,940	2,680	1,680	2,140
5	4,600	5,960	1,680	1,130	20	9,940	2,400	1,570	2,020
6	4,960	6,180	1,570	1,090	21	9,940	2,400	1,460	1,900
7	4,780	6,180	1,570	1,180	22	9,460	2,400	1,460	1,790
8	4,780	6,180	1,460	1,180	23	8,730	2,400	1,260	1,680
9	4,960	5,750	1,790	1,180	24	7,770	2,400	1,260	1,900
10	6,840	5,340	2,140	1,130	25	7,300	2,400	1,260	1,900
11	8,010	4,960	2,540	1,090	26	7,070	2,400	1,260	1,900
12	8,970	4,600	2,680	1,090	27	6,620	2,270	1,260	1,790
13	10,200	4,420	2,540	1,090	28	5,960	2,270	1,260	1,790
14	10,900	4,260	2,400	1,010	29	5,540	2,270	1,360	1,570
15	10,400	3,920	2,270	1,090	30	4,960	2,270	1,260	1,570
					31	.....	2,140	1,260	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916-17.												
1	1,570	1,460	3,920	1,570	1,260	1,360	5,750	8,250	4,420	6,180	1,460	2,140
2	1,680	1,460	4,600	1,570	1,260	1,360	5,960	8,010	4,260	6,180	1,180	1,900
3	1,680	1,360	4,780	1,570	1,260	1,360	6,180	7,770	4,420	6,180	1,460	1,680
4	1,570	1,360	4,600	1,570	1,260	1,360	6,400	7,530	4,600	5,960	1,360	1,900
5	1,460	1,460	4,420	1,570	1,260	1,360	6,840	7,300	4,420	5,340	1,260	1,790
6	1,360	1,460	4,260	1,680	1,360	1,360	8,250	7,070	4,420	4,960	810	1,680
7	1,360	1,260	4,260	1,790	1,360	1,360	10,400	7,070	4,420	4,600	1,010	1,460
8	1,260	1,180	3,920	1,790	1,260	1,360	9,210	6,620	4,260	4,260	1,010	1,260
9	1,180	1,090	3,420	1,900	1,260	1,360	8,970	6,180	4,420	3,920	970	1,460
10	1,180	1,090	3,260	1,900	1,260	1,360	8,010	6,180	4,960	3,580	1,050	1,180
11	1,090	1,090	3,120	1,900	1,180	1,360	7,300	6,180	5,960	3,260	1,180	970
12	1,090	1,090	2,960	1,790	1,180	1,460	6,620	5,960	7,530	3,120	1,130	1,460
13	1,090	1,090	2,680	1,680	1,260	1,460	6,400	5,960	9,700	2,960	1,050	1,260
14	1,090	1,090	2,400	1,680	1,260	1,460	6,180	5,750	11,400	2,680	1,000	1,010
15	1,090	1,010	2,140	1,790	1,360	1,460	6,180	5,750	12,900	2,680	735	810
16	1,090	1,010	1,900	1,900	1,260	1,460	5,960	5,540	12,600	2,400	635	930
17	1,090	1,010	1,680	1,900	1,260	1,360	6,180	5,540	13,600	2,270	1,680	890
18	1,260	1,010	1,570	1,900	1,260	1,360	6,180	5,340	16,900	2,020	1,680	1,180
19	1,360	1,010	1,570	1,790	1,260	1,260	6,180	4,960	15,900	1,900	1,460	1,130
20	1,790	1,090	1,570	1,790	1,260	1,260	6,620	4,780	16,400	1,900	1,460	1,090
21	1,900	1,090	1,680	1,680	1,260	1,260	7,530	4,600	14,900	2,140	1,570	1,050
22	1,790	1,090	1,790	1,790	1,260	1,360	7,770	4,600	12,900	2,020	1,570	700
23	1,790	1,130	1,900	1,900	1,260	1,360	8,490	4,960	11,400	2,020	1,460	890
24	1,790	1,460	2,140	1,790	1,260	1,460	9,460	5,340	10,400	1,900	1,900	890
25	1,680	2,140	2,140	1,680	1,260	1,680	10,400	5,140	9,700	1,790	1,680	890
26	1,680	2,400	2,140	1,680	1,360	2,540	10,900	5,140	8,490	1,570	2,140	890
27	1,570	2,540	2,140	1,570	1,360	3,580	10,900	4,960	7,530	1,460	2,400	930
28	1,460	2,020	2,020	1,570	1,360	4,780	10,400	4,960	6,620	1,680	2,400	890
29	1,460	2,270	1,900	1,460	.....	6,180	9,460	4,600	6,180	1,680	2,270	890
30	1,570	2,820	1,790	1,360	.....	5,140	8,970	4,600	6,620	1,570	2,270	890
31	1,570	.....	1,680	1,360	.....	5,140	.....	4,600	.....	1,570	2,270	.....

NOTE.—Stage-discharge relation affected by ice from Dec. 11 to Mar. 28; discharge determined from gage heights, comparisons with records of flow at power plant at West Buxton, and one discharge measurement. Discharge estimated Sept. 26, 1917.

Monthly discharge of Saco River at Cornish, Maine, for the period June 4, 1916, to Sept. 30, 1917.

[Drainage area, 1,300 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1916.					
June 4–30	10,900	4,420	7,660	5.89	5.91
July	6,180	2,140	3,760	2.89	3.33
August	2,680	1,260	1,730	1.33	1.53
September	2,400	1,010	1,520	1.17	1.30
1916–17.					
October	1,900	1,090	1,440	1.11	1.28
November	2,820	1,010	1,420	1.09	1.22
December	4,780	1,570	2,720	2.09	2.41
January	1,900	1,360	1,710	1.32	1.52
February	1,360	1,180	1,280	.985	1.03
March	6,180	1,260	2,000	1.54	1.78
April	10,900	5,750	7,800	6.00	6.69
May	8,250	4,600	5,850	4.50	5.19
June	16,900	4,260	8,740	6.72	7.50
July	6,180	1,460	3,090	2.38	2.74
August	2,400	635	1,470	1.13	1.30
September	2,140	700	1,200	.923	1.03
The year	16,900	635	3,220	2.48	33.69

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.

RECORDS AVAILABLE.—July 5, 1916, to September 30, 1917.

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

DISCHARGE MEASUREMENTS.—Made from bridge.

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

EXTREMES OF DISCHARGE—Maximum stage during period covered by record, 7.25 feet at 6 a. m. June 18, 1917 (discharge, from extension of rating curve, about 6,480 second-feet); minimum stage, 1.0 feet several times in September and October, 1916, and 7 a. m. September 22, and 2 p. m. September 23, 1917 (discharge, 320 second-feet).

ICE.—Stage-discharge relation seriously affected by ice which forms to considerable thickness.

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

ACCURACY.—Stage-discharge relation affected by ice December 14 to March 26. Rating curve fairly well defined between 350 and 2,400 second-feet. Gage read to half tenths once daily. Discharge determined by applying daily gage height to rating table. Records fair.

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Discharge measurements of Ossipee River at Cornish, Maine, during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 13	E. W. Conners	1.10	372	Apr. 30,	F. E. Pressey	3.72	2,200
15	do	1.22	392	May 1	do	3.64	2,130
Feb. 2	do	[a]2.35	495	7	do	3.56	2,080
Apr. 11	G. C. Danforth	3.81	2,270	8	do	3.41	1,930
12	F. E. Pressey	3.64	2,070	18	do	2.78	1,300
20	do	3.78	2,290	25	do	2.68	1,250

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Ossipee River at Cornish, Maine, for the period July 5, 1916, to Sept. 30, 1917.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1916.				1916.				1916.			
1	.....	800	400	11	1,680	1,040	320	21	770	580	655
2	.....	770	400	12	1,330	1,010	320	22	800	555	580
3	.....	710	380	13	1,330	980	340	23	920	400	580
4	.....	680	380	14	1,500	920	320	24	920	360	710
5	2,710	630	340	15	1,410	800	360	25	920	360	800
6	2,930	605	360	16	1,330	770	980	26	860	360	710
7	2,490	580	380	17	1,040	680	830	27	800	380	710
8	2,280	605	360	18	920	680	860	28	890	440	710
9	2,080	740	360	19	800	630	860	29	980	440	655
10	1,880	1,040	340	20	740	630	680	30	920	420	555
								31	920	420	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916–17.												
1	530	555	1,500	580	555	462	2,930	2,180	1,040	1,880	462	630
2	530	530	1,500	530	485	440	2,710	2,080	1,040	1,880	555	605
3	630	485	1,500	508	462	420	2,710	2,080	1,040	1,680	508	605
4	580	508	1,410	462	508	420	2,710	2,080	1,040	1,500	508	605
5	485	555	1,330	462	508	420	2,710	2,080	1,040	1,250	462	530
6	485	630	1,330	580	508	460	2,930	2,080	1,040	1,180	462	508
7	485	485	1,330	630	508	420	3,720	2,080	920	1,180	440	485
8	485	440	1,180	740	508	485	3,370	1,980	920	1,040	420	440
9	420	400	1,040	800	508	508	3,150	1,880	1,040	1,040	485	440
10	360	420	980	655	400	530	2,930	1,780	1,500	920	485	440
11	340	420	980	630	400	530	2,280	1,680	1,680	860	485	440
12	320	380	980	605	400	555	2,180	1,590	3,150	860	420	420
13	340	360	920	580	400	580	2,080	1,590	3,600	800	400	400
14	360	400	890	655	400	555	2,080	1,500	3,600	800	380	380
15	340	400	800	680	400	530	2,080	1,500	3,480	800	380	340
16	320	360	740	680	400	555	2,080	1,330	3,370	800	400	380
17	320	360	680	710	400	630	2,080	1,330	4,850	800	555	400
18	320	360	580	680	420	630	2,080	1,330	6,410	740	580	400
19	530	360	605	655	530	485	2,080	1,250	5,110	740	580	380
20	800	420	580	655	530	462	2,280	1,180	4,850	740	555	380
21	740	485	580	630	508	440	2,710	1,180	4,200	680	555	340
22	485	530	605	630	508	440	3,150	1,180	3,370	630	605	300
23	485	530	655	655	420	400	3,370	1,180	3,150	605	645	300
24	485	800	800	680	462	630	3,260	1,180	3,150	605	680	320
25	485	770	860	710	420	800	3,040	1,250	2,930	580	680	340
26	485	740	740	605	485	980	2,930	1,250	2,710	555	680	340
27	462	740	860	655	485	1,410	2,710	1,180	2,280	530	630	360
28	440	710	860	655	462	2,280	2,600	1,110	2,180	530	630	380
29	440	740	710	655	.....	2,490	2,280	1,110	1,880	485	605	380
30	508	800	630	680	.....	2,710	2,280	1,040	2,280	462	630	420
31	530	.....	605	630	.....	2,710	.....	1,040	.....	462	630	.....

NOTE.—Stage-discharge relation affected by ice Dec. 14 to Mar. 26; discharge determined from gage heights, one discharge measurement, observer's notes, weather records, and a comparison with Saco River at Cornish. Discharge estimated Aug. 23, 1917.

Monthly discharge of Ossipee River at Cornish, Maine, for the period July 5, 1916, to Sept. 30, 1917.

[Drainage area, 448 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1916.					
July 5-31	2,930	740	1,340	2.99	3.00
August	1,040	360	646	1.44	1.66
September	980	320	541	1.21	1.35
1916-17.					
October	800	320	469	1.05	1.21
November	800	360	522	1.17	1.30
December	1,500	580	925	2.06	2.38
January	800	462	634	1.41	1.63
February	555	400	464	1.04	1.08
March	2,710	400	817	1.82	2.10
April	3,720	2,080	2,650	5.92	6.60
May	2,180	1,040	1,530	3.42	3.94
June	6,410	920	2,630	5.87	6.55
July	1,880	462	891	1.99	2.29
August	680	380	532	1.19	1.37
September	630	300	423	0.944	1.09
The year	6,410	300	1,040	2.32	31.54

MERRIMACK RIVER BASIN.

MERRIMACK RIVER AT FRANKLIN JUNCTION, N. H.

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

DRAINAGE AREA.—1,460 square miles.

RECORDS AVAILABLE.—July 8, 1903, to September 30, 1917.

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

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 15.1 feet at 5 p. m. June 18 (discharge, by extension of rating curve, 22,500 second-feet); minimum stage recorded, 3.95 feet at 6 a. m. August 13 (discharge, 1,040 second-feet).

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

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 as affected by ice December 17 to March 28. Rating curve fairly well defined below 10,000 second-feet. Gage read to half-tenths twice daily as a rule but readings were omitted at frequent intervals; accuracy of readings somewhat uncertain. Daily discharge ascertained by applying mean daily gage height to rating table with corrections for ice during winter. Records fair.

COOPERATION.—Gage-height record furnished by the proprietors of locks and canals on Merrimack River, Lowell, Mass.

The following discharge measurement was made by M. R. Stackpole:

July 16, 1917: Gage-height 4.83 feet; discharge 1,870 second-feet.

Daily discharge, in second-feet, of Merrimack River at Franklin Junction, N. H., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,000	1,700	10,800	8,500	6,000	3,790	4,300	1,440	1,800
2	2,280	1,820	8,720	8,300	5,800	3,960	4,300	1,400	1,700
3	2,040	1,720	6,800	7,880	5,600	4,600	4,000	1,440	1,620
4	1,930	1,720	5,020	7,040	5,800	5,200	3,620	1,440	1,930
5	1,820	1,750	2,820	6,410	5,600	6,000	3,450	1,400	1,820
6	1,720	1,820	3,280	6,410	5,600	4,660	2,970	1,400	1,720
7	1,620	1,720	2,970	8,510	5,600	3,790	2,700	1,350	1,720
8	1,600	1,620	2,680	7,200	5,020	3,450	2,540	1,300	1,620
9	1,620	1,620	2,540	6,000	5,400	5,200	2,280	1,220	1,600
10	1,440	1,530	2,500	4,130	4,840	6,100	2,040	1,300	1,530
11	1,530	1,440	2,410	3,960	4,660	7,040	2,280	1,170	1,350
12	1,550	1,450	2,280	3,790	4,840	14,000	2,280	1,100	1,350
13	1,530	1,480	2,040	3,450	4,800	20,500	2,040	1,080	1,440
14	1,530	1,350	1,900	3,280	4,840	8,930	1,900	1,350	1,480
15	1,600	1,440	1,720	3,200	5,600	6,830	1,820	1,400	1,440
16	1,720	1,260	1,620	3,120	4,840	5,400	1,620	1,440	1,400
17	1,700	1,260	1,600	3,280	4,660	12,300	1,600	1,530	1,350
18	1,720	1,080	1,550	3,620	4,840	19,200	1,620	1,620	1,260
19	1,620	1,150	1,450	3,450	4,840	14,000	1,530	1,650	1,170
20	1,620	1,260	1,450	3,790	5,200	8,300	1,530	1,670	1,170
21	1,530	1,350	1,550	10,400	5,600	7,040	1,600	1,620	1,440
22	1,500	1,350	1,950	13,000	5,800	6,000	1,620	1,620	1,350
23	1,440	1,350	2,280	15,700	5,200	6,100	1,820	1,530	1,400
24	1,530	2,680	2,300	12,100	5,800	6,300	1,720	1,620	1,440
25	1,620	4,660	2,280	10,000	5,300	6,410	1,620	1,530	1,440
26	1,720	3,400	2,160	7,880	4,840	5,600	1,530	1,500	1,350
27	1,720	2,040	2,040	7,250	4,500	4,840	1,530	1,440	1,350
28	1,620	1,820	1,930	7,040	4,130	4,660	1,500	1,350	1,350
29	1,600	2,160	1,820	6,700	3,960	4,300	1,440	1,260	1,350
30	1,620	2,280	1,820	6,410	3,790	4,130	1,350	1,620	1,350
31	1,620	.....	2,000	.....	3,790	.....	1,400	1,930	.....

NOTE.—Discharge on Sundays and other days when gage was not read estimated by comparison with other gaging stations.

Monthly discharge of Merrimack River at Franklin Junction, N. H., for the year ending Sept. 30, 1917.

[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	2,280	1,440	1,670	1.14	1.31
November	4,660	1,080	1,780	1.22	1.36
December	10,800	1,450	2,850	1.95	2.25
January	.....	.....	1,550	1.06	1.22
February	.....	.....	1,260	.863	.90
March	.....	.....	3,430	2.35	2.71
April	15,700	3,120	6,730	4.61	5.14
May	6,000	3,790	5,070	3.47	4.00
June	20,500	3,450	7,290	4.99	5.57
July	4,300	1,350	2,180	1.49	1.72
August	1,930	1,080	1,440	.986	1.14
September	1,930	1,170	1,480	1.01	1.13
The year	20,500	1,080	3,060	2.10	28.45

NOTE.—Mean monthly discharge for January, February, and March estimated on basis of 1.7 times discharge of Pemigewasset River at Plymouth plus discharge from Lake Winnepesaukee at Lakeport.

MERRIMACK RIVER AT LAWRENCE, MASS.

LOCATION.—At dam of 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, 1917.

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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,943	3,512	5,812	3,118	3,901	7,785	20,326	10,601	8,760	8,649	3,072	2,820
2	6,068	3,254	11,231	5,068	4,052	8,065	19,656	11,093	7,639	9,706	2,391	3,119
3	5,120	3,065	8,842	4,191	2,842	7,277	18,939	12,067	7,414	8,183	2,797	3,267
4	4,462	2,604	7,792	3,793	1,356	6,198	17,305	12,282	9,162	6,324	2,033	5,286
5	3,871	723	6,433	3,836	4,761	7,024	16,468	10,979	9,447	7,508	1,078	4,300
6	3,973	4,265	6,096	2,850	4,042	6,061	16,521	11,290	9,053	6,298	3,940	3,657
7	2,656	3,504	6,172	3,394	3,890	5,621	19,012	13,717	8,781	4,243	3,321	2,984
8	2,054	3,261	6,161	6,538	3,347	5,445	21,526	13,257	8,566	3,710	2,729	2,502
9	4,441	3,153	5,154	6,325	3,699	5,555	20,277	12,095	8,459	5,390	2,623	551
10	3,617	3,121	4,262	6,165	2,872	4,673	17,107	11,383	9,512	3,799	2,929	3,662
11	3,433	2,044	5,764	5,990	1,484	4,847	14,158	10,615	10,909	4,351	2,186	3,150
12	1,416	870	5,462	5,570	4,656	6,527	12,196	9,474	14,802	4,094	501	2,878
13	3,879	4,175	5,199	4,531	3,656	6,248	11,334	9,192	25,107	4,696	2,435	2,717
14	2,961	3,516	5,035	3,903	3,543	6,256	10,295	10,265	25,219	3,964	2,915	2,648
15	527	3,630	4,603	5,866	3,492	6,752	9,502	9,417	19,057	3,829	2,677	1,993
16	3,946	3,554	2,925	5,818	3,531	7,089	9,982	9,297	15,408	5,248	2,298	301
17	3,561	3,271	1,347	6,024	2,733	8,151	9,495	8,821	14,518	4,560	2,885	2,473
18	3,448	2,472	5,028	6,231	1,217	7,657	9,477	7,484	22,986	4,092	2,320	2,672
19	3,141	773	4,046	5,798	4,359	8,772	9,340	6,481	31,490	4,017	1,530	2,655
20	3,174	3,986	3,991	4,520	3,715	7,407	11,443	6,344	25,841	3,837	4,702	2,611
21	2,664	3,551	3,819	3,664	3,686	6,950	13,717	7,764	19,047	2,675	4,189	2,444
22	4,819	3,364	3,863	5,324	1,709	7,105	15,825	8,660	15,474	1,636	3,501	1,531
23	5,725	3,279	2,723	4,797	4,760	7,465	17,763	8,397	12,502	4,473	3,181	269
24	4,749	3,384	4,453	4,132	2,858	9,687	19,221	8,347	10,598	3,881	3,570	2,116
25	4,220	5,200	5,715	4,019	1,504	15,887	16,882	9,920	11,709	3,602	2,473	2,052
26	3,882	6,566	6,551	3,992	4,730	17,009	14,033	8,741	11,862	3,547	673	2,250
27	3,861	5,489	5,536	2,801	5,068	18,083	12,498	7,578	10,618	3,569	4,101	2,312
28	2,861	4,374	5,154	2,103	6,448	24,432	11,056	8,131	9,471	2,525	3,558	2,470
29	827	4,082	4,954	4,923	.....	31,116	10,158	7,660	8,576	1,549	3,162	1,855
30	4,441	2,049	3,501	3,971	.....	29,951	10,779	7,264	7,305	4,248	3,454	405
31	3,702	.....	2,906	3,885	.....	25,228	.....	9,893	.....	3,683	4,128	.....

NOTE—This 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, 1917.

[Weeks arranged in order of dryness.]

Week ending Sunday—	Measured at Lawrence (total drainage area, 4,663 square miles).	Wasting into Merrimack River from diverted drainage basins (211 square miles).	From net drainage area of 4,452 square miles.	Per square mile of net drainage area.
Sept. 30	1,923	14	1,909	0.429
23	2,094	15	2,079	0.467
Aug. 19	2,437	14	2,423	0.544
Sept. 16	2,478	16	2,462	0.553
Aug. 12	2,604	12	2,592	0.582
5	2,757	8	2,749	0.617
Nov. 12, 1916	2,888	11	2,877	0.646
Oct. 15, 1916	2,896	9	2,887	0.648
Nov. 5, 1916	3,043	12	3,031	0.681
19, 1916	3,056	20	3,036	0.682
Aug. 26	3,184	16	3,168	0.712
Sept. 9	3,221	25	3,196	0.718
Feb. 25	3,227	51	3,176	0.713
18	3,261	35	3,226	0.725
July 29	3,313	10	3,303	0.742
Feb. 11	3,442	52	3,390	0.761
Sept. 2	3,477	51	3,426	0.770
Oct. 22, 1916	3,536	8	3,528	0.792
Feb. 4	3,561	58	3,503	0.787
July 22	3,724	20	3,704	0.832
Oct. 29, 1916	3,732	11	3,721	0.836
Jan. 7	3,750	27	3,723	0.836
28	3,881	69	3,812	0.856
Dec. 24, 1916	3,989	29	3,960	0.889
Oct. 8, 1916	4,029	7	4,022	0.903
Nov. 26, 1916	4,190	48	4,142	0.930
July 15	4,303	31	4,272	0.960
Dec. 17, 1916	4,334	32	4,302	0.966
31, 1916	4,902	34	4,868	1.093
Jan. 21	5,417	98	5,319	1.195
14	5,575	57	5,518	1.239
Mar. 11	5,604	139	5,465	1.228
Dec. 3, 1916	5,983	58	5,925	1.331
10, 1916	6,010	50	5,960	1.339
Mar. 4	6,510	212	6,298	1.415
July 8	6,567	19	6,548	1.471
Mar. 18	6,954	206	6,748	1.516
June 3	8,109	210	7,899	1.774
May 20	8,301	148	8,153	1.831
27	8,487	68	8,419	1.891
June 10	8,997	63	8,934	2.007
Mar. 25	9,039	225	8,814	1.980
July 1	9,741	43	9,698	2.178
May 6	11,299	172	11,127	2.499
Apr. 22	11,326	72	11,254	2.528
May 13	11,390	260	11,130	2.500
Apr. 15	13,553	111	13,442	3.019
29	14,516	88	14,428	3.241
June 17	17,860	191	17,669	3.969
Apr. 8	18,490	152	18,338	4.119
June 24	19,705	163	19,542	4.389
Apr. 1	23,735	309	23,426	5.262
The year	6,546	74	6,472	1.454

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, 1917.

Month.	Mean discharge in second-feet.				Run-off.		Rainfall in inches.
	Measured at Lawrence (total drainage area, 4,663 square miles).	Wasting into Merrimack River from diverted drainage basins (211 square miles).	From net drainage area of 4,452 square miles.	Per square mile of net drainage area.	Depth in inches on net drainage area.	Per cent of rainfall.	
October	3,563	9	3,554	0.798	0.920	67.6	1.36
November	3,336	27	3,309	.743	.829	29.8	2.78
December	5,178	40	5,138	1.154	1.330	43.9	3.03
January	4,617	62	4,555	1.023	1.180	38.6	3.06
February	3,497	68	3,429	.770	.802	34.0	2.36
March	10,527	215	10,312	2.316	2.670	70.4	3.79
April	14,543	111	14,432	3.242	3.618	160.1	2.26
May	9,629	172	9,457	2.124	2.449	63.6	3.85
June	13,643	124	13,519	3.037	3.389	60.2	5.63
July	4,578	20	4,558	1.024	1.181	72.0	1.64
August	2,818	17	2,801	.629	.725	15.5	4.69
September	2,465	21	2,444	.549	.613	53.3	1.15
The year	6,536	74	6,462	1.451	19.706	55.4	35.60

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 mouth of Beaver Brook and about 1½ miles above confluence of Souhegan with Merrimack River, at Merrimack, Hillsboro County.

DRAINAGE AREA.—168 square miles.

RECORDS AVAILABLE.—July 13, 1909, to September 30, 1917.

GAGES.—Gurley-printing water-stage recorder on left bank about 350 feet above the falls used since October 15, 1913. A vertical staff on left bank, 40 feet above the falls, was used from July 13, 1909, to April 11, 1911, when it was washed out. From April 12, 1911, to October 14, 1913, a chain gage attached to a tree on left bank 350 feet above the falls was used.

DISCHARGE MEASUREMENTS.—Made by wading below the falls or from cable one-half mile below gage.

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.—Maximum stage, from water-stage recorder, 7.51 feet at 5 p. m. March 28 (discharge, from extension of rating curve about 3,060 second-feet); minimum stage, from water-stage recorder, 2.06 feet at 9 p. m. September 23 (discharge, 26 second-feet).

1909–1917.—Maximum stage recorded, 9.6 feet, August 5, 1915 (discharge from extension of rating curve about 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 the mills at Milford about 8 miles above.

ACCURACY.—Stage-discharge relation permanent except when affected by ice for short periods. Rating curve well defined below 2,000 second-feet. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying rating table to the mean of 24 hourly gage heights with corrections for ice during winter. Records good.

Discharge measurements of Souhegan River at Merrimack, N. H., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 15	Hardin Thweatt	3.15	250
July 11	M. R. Stackpole	2.62	103

Daily discharge, in second-feet, of Souhegan River at Merrimack, N. H., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	94	60	303	105	128	890	1,040	331	288	264	72	242
2	88	64	260	115	115	665	1,170	692	253	210	70	168
3	88	68	180	120	105	496	950	720	228	222	60	148
4	70	68	155	118	82	380	860	488	270	219	57	125
5	72	52	160	128	98	311	802	447	242	172	49	122
6	68	58	165	192	84	278	802	860	256	168	43	96
7	60	86	145	319	96	274	1,230	802	264	140	30	90
8	49	84	122	319	100	270	1,300	585	281	106	54	76
9	42	68	118	292	100	284	950	492	299	104	55	68
10	55	66	112	240	100	315	720	474	222	116	64	51
11	49	62	130	200	80	295	585	402	295	105	66	64
12	43	48	140	170	92	315	550	363	920	105	51	74
13	41	44	140	150	96	367	510	363	1,010	110	45	68
14	46	76	112	150	110	400	483	398	590	110	48	57
15	40	104	98	246	110	367	420	323	416	110	49	64
16	32	106	76	331	105	367	438	278	355	110	70	43
17	51	96	74	278	110	460	411	260	860	115	104	37
18	46	82	80	216	108	488	406	239	1,860	120	198	44
19	41	60	86	185	112	470	434	225	980	148	130	45
20	80	66	82	158	120	367	460	198	610	165	90	46
21	160	86	86	122	122	355	692	198	447	162	102	52
22	112	66	120	125	116	416	638	198	355	120	90	44
23	92	76	175	120	110	520	560	270	288	104	76	32
24	90	160	240	130	112	920	452	501	260	125	72	35
25	74	250	170	130	128	1,720	375	355	323	108	76	45
26	70	135	140	128	162	1,680	335	292	274	118	70	36
27	68	108	130	120	339	1,640	339	228	236	116	57	39
28	62	116	120	108	1,100	2,570	474	239	207	106	68	42
29	80	108	110	112	.....	2,100	420	319	188	70	72	46
30	39	116	105	116	.....	1,470	367	515	274	66	295	36
31	55	.....	100	130	.....	1,100	.....	371	.....	82	375	.....

NOTE.—Stage-discharge relation affected by ice Dec. 17-31, Jan. 1-3, 10-12, and Feb. 1-17. Discharge estimated July 11-17.

Monthly discharge of Souhegan River at Merrimack, N. H., for the year ending Sept. 30, 1917.

[Drainage area, 168 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	160	32	66.3	0.394	0.45
November	250	44	88.0	.524	.58
December	303	74	137	.815	.94
January	331	105	173	1.03	1.19
February	1,100	80	151	.900	.94
March	2,570	270	727	4.33	4.99
April	1,300	335	639	3.80	4.24
May	860	198	401	2.39	2.76
June	1,860	188	445	2.65	2.96
July	264	66	132	.786	.91
August	375	30	89.0	.530	.61
September	242	32	71.2	.423	.47
The year	2,570	30	260	1.55	21.04

SOUTH BRANCH OF NASHUA RIVER BASIN (WACHUSETT DRAINAGE BASIN) NEAR CLINTON, 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 1914–1917.

RECORDS AVAILABLE.—July, 1896, to September 30, 1917.

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 basin) near Clinton, Mass., for the year ending Sept. 30, 1917.

[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	472.0	0.140	0.217	0.250	17.6	1.42
November	1,047.6	.321	.496	.554	17.6	3.15
December	1,551.5	.460	.712	.820	29.2	2.18
January	2,315.2	.686	1.062	1.224	36.3	3.37
February	2,792.8	.916	1.418	1.476	48.3	3.05
March	8,339.6	2.472	3.824	4.409	104.8	4.21
April	4,794.2	1.468	2.272	2.535	140.6	1.80
May	4,444.5	1.317	2.038	2.350	60.5	3.89
June	4,014.3	1.229	1.902	2.122	47.4	4.47
July	891.5	.264	.409	.471	38.8	1.22
August	1,043.5	.309	.479	.552	12.4	4.46
September	272.9	.084	.129	.144	12.0	1.20
The year	31,979.6	.805	1.245	16.907	49.1	34.42

Summary of yield and rainfall in South Branch of Nashua River basin (Wachusett drainage basin) near Clinton, Mass., for the years ending Sept. 30, 1897–1917.

[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	35,445.8	0.499	0.772	0.890	24.0	3.71
November	50,728.7	.739	1.143	1.275	34.2	3.73
December	80,202.5	1.128	1.745	2.012	52.5	3.83
January	85,767.6	1.210	1.872	2.158	58.8	3.66
February	89,356.9	1.387	2.146	2.234	59.1	3.78
March	180,560.9	2.548	3.942	4.544	110.5	4.11
April	146,653.1	2.139	3.309	3.692	99.5	3.71
May	85,250.7	1.203	1.861	2.145	63.3	3.39
June	54,147.2	.790	1.222	1.363	36.6	3.72
July	30,878.9	.436	.674	.777	19.0	4.10
August	30,353.5	.428	.663	.764	18.2	4.20
September	21,647.1	.316	.488	.545	16.0	3.42
The year	890,992.9	1.069	1.653	22.399	41.0	45.36

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

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

DRAINAGE AREA.—Area of Sudbury basin from 1875 to 1878, inclusive, was 77.8 square miles; 1879–80, 78.2 square miles; 1881–1917, 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 1917, 17.58 square miles.

RECORDS AVAILABLE.—Of Sudbury River, January, 1875, to September, 1917; of Lake Cochituate, January, 1863, to September, 1917. 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 sewage 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 Wachusett 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, 1917.

[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	−12.2	−0.005	−0.008	−0.009	−0.6	1.49
November	247.3	.110	.170	.189	8.3	2.28
December	734.2	.315	.487	.562	17.4	3.22
January	1,188.2	.510	.789	.909	25.9	3.50
February	1,589.1	.755	1.168	1.216	45.5	2.68
March	5,148.5	2.209	3.417	3.940	79.4	4.96
April	3,169.5	1.405	2.174	2.425	100.5	2.41
May	3,440.4	1.476	2.283	2.632	53.4	4.93
June	2,354.8	1.044	1.615	1.802	42.7	4.28
July	99.5	.043	.066	.076	6.8	1.11
August	471.5	.202	.313	.361	5.6	6.40
September	130.5	.058	.090	.100	6.6	1.52
The year	18,561.3	.676	1.046	14.203	36.7	38.73

Summary of yield and rainfall in Sudbury River basin near Framingham, Mass., for the years ending Sept. 30, 1876–1917.

[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	40,237.9	0.411	0.636	0.733	19.4	3.78
November	69,597.1	.735	1.137	1.269	34.1	3.72
December	93,868.4	.959	1.484	1.711	44.7	3.83
January	117,433.4	1.199	1.855	2.139	52.3	4.09
February	147,901.2	1.658	2.565	2.671	64.6	4.13
March	266,858.8	2.726	4.217	4.862	112.0	4.34
April	185,902.7	1.962	3.035	3.386	96.5	3.51
May	104,847.3	1.071	1.657	1.910	57.7	3.31
June	46,318.4	.489	.756	.844	28.4	2.97
July	17,364.3	.177	.274	.316	8.7	3.63
August	23,416.8	.239	.370	.427	10.9	3.92
September	20,161.8	.213	.330	.368	11.3	3.25
The year	1,133,908.1	.983	1,521	20.636	46.4	44.48

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

Yield and rainfall in Lake Cochituate basin near Cochituate, Mass., for the year ending Sept. 30, 1917.

[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	36.3	0.067	0.103	0.12	9.3	1.28
November	72.1	.137	.215	.24	10.8	2.18
December	151.6	.278	.430	.50	15.6	3.18
January	269.1	.494	.764	.88	26.9	3.28
February	392.9	.798	1.235	1.29	45.8	2.81
March	1,090.8	2.002	3.097	3.57	74.1	4.82
April	677.8	1,285	1.988	2.22	83.1	2.67
May	769.5	1.412	2.185	2.52	51.5	4.89
June	575.7	1.092	1.689	1.88	43.5	4.33
July	94.3	.173	.268	.31	30.3	1.02
August	120.6	.221	.342	.39	6.8	5.79
September	48.2	.091	.141	.16	8.9	1.77
The year	4,298.9	.670	1.036	14.08	37.0	38.02

Summary of yield and rainfall in Lake Cochituate basin near Cochituate, Mass., for the years ending Sept. 30, 1864–1917.

[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	15,211.7	0.517	0.800	0.922	22.9	4.02
November	20,983.3	.737	1.140	1.272	32.5	3.91
December	26,462.8	.899	1.391	1.604	44.6	3.60
January	32,276.6	1.097	1.697	1.957	50.6	3.87
February	40,276.1	1.502	2.324	2.420	61.7	3.92
March	63,093.1	2.144	3.317	3.825	88.7	4.31
April	47,259.1	1.660	2.568	2.865	82.8	3.46
May	28,550.5	.970	1.501	1.731	48.2	3.59
June	13,398.0	.471	.729	.813	26.8	3.03
July	7,735.6	.263	.407	.469	12.6	3.72
August	11,157.6	.379	.586	.676	16.4	4.12
September	10,880.0	.382	.591	.659	18.9	3.48
The year	317,284.4	.916	1.417	19.213	42.7	45.03

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

CONNECTICUT RIVER BASIN.

CONNECTICUT RIVER AT FIRST LAKE, NEAR PITTSBURG, N. H.

LOCATION.—At outlet of First Lake, 5 miles northeast of Pittsburg, Coos County.

DRAINAGE AREA.—81.4 square miles. (From surveys by engineers of the Connecticut Valley Lumber Co.)

RECORDS AVAILABLE.—April 1 to September 30, 1917.

GAGES.—Inclined staff on right bank about one-fourth mile below the outlet dam; installed in November, 1917, and used in determining sluice gate ratings; scales on gate frames indicate amount of sluice gate openings; staff gage in lake above dam.

DISCHARGE MEASUREMENTS.—Made from log bridge 1 mile below the gage, by wading, or from cable 200 feet above gage.

CHANNEL AND CONTROL.—Bed rough, with rock bottom. Control for river gage is rock ledge extending completely across the stream with about 3 feet of fall immediately below.

COMPUTATION OF DISCHARGE.—Discharge through 3 sluice gates, 6 feet, 8 feet, and 20 feet in width, determined from gate ratings based on current-meter measurements and comparative readings of river gage; theoretical rating used for a part of the discharge through the 20-foot gate and lower leaf of 6-foot and 8-foot gates, under conditions not covered by the current-meter measurements. Discharge through one water wheel, used when slasher was in operation, determined from figures of water-wheel efficiency and power output.

ICE.—Little effect from ice on the control section for river gage; formation of ice in the sluice materially changes conditions at gates.

REGULATION.—About 4.1 billion cubic feet of storage has been developed in lakes and ponds above gage; records of monthly discharge have been corrected for effect of storage in First Lake but not for effect of storage in lakes tributary to First Lake.

ACCURACY.—Discharge through the gates possibly affected by ice April 1–7. Rating curves well defined for middle and upper leaves of the 6-foot and 8-foot gates; theoretical ratings for the 20-foot gate for high stages of the lake and for lower leaves of 6-foot and 8-foot gates, not completely checked by current-meter measurements. Daily discharge ascertained by applying rating tables to records of gate openings, giving due consideration to times of opening and closing gates and changes in gate settings. Records good, except for few days in April, when accuracy of results may have been affected by ice.

No discharge measurements were made prior to September 30, 1917.

Daily gage height, in feet, of First Lake near Pittsburg, N. H., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	15.1	12.25	9.2	6.1	3.3	2.4	3.05	8.45	22.4	22.4	20.95	21.85
2	14.9	12.05	9.35	6.0	3.2	2.4	3.1	9.25	22.7	22.45	20.95	21.85
3	14.6	11.8	9.45	5.85	3.1	2.45	3.2	9.8	22.6	22.4	21.25	21.85
4	14.3	11.55	9.5	5.75	2.95	2.4	3.25	10.4	22.75	22.3	21.3	21.8
5	13.9	11.3	9.45	5.7	2.85	2.4	3.35	10.65	22.95	22.3	21.4	21.65
6	13.65	11.2	9.4	5.6	2.75	2.35	3.4	11.0	22.7	22.3	21.4	21.5
7	13.3	11.05	9.35	5.5	2.7	2.3	3.5	11.3	22.55	22.15	21.35	21.45
8	13.0	10.95	9.3	5.4	2.65	2.25	3.65	11.6	22.4	22.05	21.25	21.35
9	12.1	10.85	9.25	5.35	2.55	2.3	3.8	12.0	22.2	22.15	21.2	21.2
10	12.06	10.75	9.15	5.3	2.5	2.35	3.85	12.35	22.05	22.05	21.55	21.1
11	12.03	10.5	8.95	5.2	2.45	2.4	3.9	12.95	22.15	21.95	21.95	20.9
12	12.1	10.25	8.75	5.1	2.4	2.4	4.0	13.55	22.3	21.95	21.85	20.8
13	12.0	10.2	8.4	5.05	2.3	2.5	4.1	14.1	22.5	22.0	21.8	20.6
14	12.1	10.15	8.3	4.95	2.25	2.45	4.15	14.4	22.5	21.95	21.7	20.6
15	12.1	10.15	8.25	4.9	2.2	2.4	4.2	14.9	22.4	21.85	21.75	20.55
16	12.1	9.9	8.1	4.85	2.15	2.4	4.25	15.6	22.4	21.8	21.95	.....
17	12.2	9.75	7.9	4.8	2.1	2.45	4.45	15.95	22.3	21.7	22.2	20.2
18	12.4	9.55	7.7	4.75	2.15	2.45	4.45	16.3	22.95	21.6	22.75	20.45
19	12.55	9.4	7.55	4.7	2.25	2.45	4.45	16.8	23.85	21.5	23.3	20.85
20	12.8	9.25	7.45	4.6	2.3	2.5	4.6	17.35	23.4	21.5	23.2	20.95
21	12.85	9.15	7.25	4.55	2.35	2.5	4.9	18.45	23.25	21.4	23.2	21.25
22	12.8	9.05	7.1	4.5	2.4	2.5	5.35	19.15	22.95	21.45	23.3	21.25
23	12.8	9.05	7.1	4.45	2.25	2.45	5.8	19.75	22.7	21.5	23.0	21.1
24	12.7	9.1	6.95	4.4	2.25	2.45	6.25	20.35	22.35	21.4	22.5	20.9
25	12.65	8.95	6.85	4.2	2.3	2.5	6.55	20.85	22.25	21.3	22.6	20.9
26	12.75	8.75	6.75	4.1	2.3	2.55	6.85	21.4	22.25	21.25	22.35	20.75
27	12.75	8.8	6.55	3.95	2.35	2.6	7.05	21.95	22.15	21.2	22.4	20.75
28	12.85	8.85	6.45	3.85	2.35	2.8	7.25	22.1	22.1	21.1	22.25	20.55
29	12.75	8.85	6.35	3.65	.....	2.9	7.5	22.3	22.05	21.05	22.35	20.35
30	12.75	8.85	6.25	3.55	.....	2.9	7.85	22.45	22.15	21.0	22.05	20.15
31	12.4	.....	6.15	3.4	.....	3.0	.....	22.5	.....	21.0	21.95	.....

Daily discharge, in second-feet, of Connecticut River at First Lake, near Pittsburg, N. H., for the period Apr. 1 to Sept. 30, 1917.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May	June.	July.	Aug.	Sept.
1	299	6	414	359	133	244	16	3	14	382	195	147	395
2	305	7	556	334	132	241	17	3	15	372	199	207	307
3	316	7	673	327	86	181	18	3	16	820	185	97	178
4	320	8	911	285	165	236	19	3	17	1,290	174	305	65
5	329	8	940	241	179	266	20	4	18	1,210	172	517	57
6	278	8	878	238	163	243	21	4	22	1,170	163	367	106
7	124	27	787	229	174	234	22	4	24	994	99	542	265
8	3	9	617	226	193	220	23	4	26	731	180	490	278
9	3	10	459	214	183	196	24	5	28	429	159	398	248
10	3	10	418	221	102	219	25	5	30	358	205	418	335
11	3	11	315	219	231	196	26	5	102	374	175	377	393
12	3	11	367	211	213	167	27	5	287	205	155	382	448
13	3	12	550	219	194	131	28	5	306	121	146	278	463
14	3	12	626	210	174	137	29	5	376	285	140	391	422
15	3	13	443	205	181	240	30	6	482	333	136	344	195
							31	.....	501	.....	134	309	.....

Monthly discharge of Connecticut River at First Lake, near Pittsburg, N. H., for the period Apr. 1 to Sept. 30, 1917.

[Drainage area 81.4 square miles.]

Month.	Observed discharge (second-feet).			Gain or loss in storage at First Lake (millions of cubic feet).	Discharge corrected for storage (second-feet).		Run-off (depth in inches in drainage area).
	Maximum.	Minimum.	Mean.		Mean.	Per square mile.	
April	329	3	68.6	+ 448	242	2.97	3.31
May	501	6	78.2	+1,655	696	8.55	9.86
June	1,290	121	601	− 44.5	584	7.17	8.00
July	359	99	205	− 144	151	1.86	2.14
August	542	86	260	+ 119	304	3.73	4.30
September	463	57	244	− 223	158	1.94	2.16

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 mouth of Waits River.

DRAINAGE AREA.—3,100 square miles.

RECORDS AVAILABLE.—August 6, 1900, to September 30, 1917.

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, 21.3 feet at 7 a. m. and 6 p. m. April 24 (discharge, 29,500 second-feet); minimum stage recorded, 4.6 feet several times in September (discharge, 1,720 second-feet). Minimum discharge of 1,550 second-feet occurred February 25, when the stage-discharge relation was affected by ice.

1900–1917: Maximum stage recorded, 33.4 feet at 12 noon March 28, 1913 (discharge, by extension of rating curve, about 57,300 second-feet); minimum 24-hour discharge, 288 second-feet, September 28, 1908.

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

REGULATION.—About 4.1 billion cubic feet of storage has been developed in First Lake and in lakes and ponds tributary to First 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. Several rating curves adjusted to condition of flashboards were used during the year. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table with corrections for ice during the winter. Records good, except for September, for which they are fair.

Discharge measurements of Connecticut River at Orford, N. H., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 5	Hardin Thweatt	6.99	3,170	Feb. 13	H. H. Khachadoorian	[a]5.74	1,480
6	do	6.69	2,920	13	do	[a]5.74	1,570
26	C. H. Pierce	7.35	3,470	Mar. 6	do	[a]6.80	1,980
Nov. 29	Hardin Thweatt	12.12	5,500	6	do	[a]6.58	1,930
Dec. 1	do	16.42	15,900	July 19	Hardin Thweatt	5.54	2,840
2	do	15.61	17,900	Sept. 12	M. R. Stackpole	5.57	2,820
Jan. 3	do	[a]6.28	2,390	13	do	5.53	2,740

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Connecticut River at Orford, N. H., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5,920	2,640	16,700	2,450	2,450	2,050	22,100	14,200	6,900	8,600	2,200	5,640
2	5,440	2,710	17,800	2,550	2,250	2,100	26,300	15,300	7,460	9,620	2,110	5,520
3	4,650	3,180	17,000	2,550	2,100	2,050	26,700	15,900	7,880	8,740	2,110	4,920
4	3,830	3,540	12,000	2,450	2,000	2,050	22,900	14,400	8,600	7,040	1,950	4,360
5	3,180	3,450	8,300	2,650	2,200	2,050	19,700	11,800	8,600	5,460	2,850	3,920
6	2,860	3,180	8,020	2,800	2,050	1,950	17,800	11,000	8,160	4,840	2,650	3,300
7	2,570	3,180	8,300	3,100	1,900	1,800	20,100	10,400	7,180	4,150	2,380	2,670
8	2,500	3,020	8,020	2,950	2,000	1,750	18,900	9,620	6,630	3,600	2,110	2,670
9	2,430	2,860	6,900	2,950	2,050	1,850	15,300	9,470	8,020	2,950	2,110	2,750
10	2,360	2,860	6,220	2,950	2,150	1,700	13,000	9,620	8,300	2,850	2,560	2,430
11	2,360	2,860	5,960	2,900	2,000	1,800	9,920	9,470	9,470	2,650	3,930	2,430
12	2,290	2,860	5,840	2,650	1,900	1,850	8,450	10,700	17,000	2,750	4,500	2,430
13	2,290	2,710	5,330	2,550	1,850	1,750	8,020	12,300	23,400	3,270	3,490	2,280
14	2,150	2,780	4,500	3,050	1,750	1,750	8,160	12,500	20,100	3,490	3,050	2,140
15	2,360	2,780	4,200	2,850	1,700	1,750	8,020	12,000	16,300	3,270	2,470	2,000
16	2,780	2,780	3,850	3,350	1,650	1,750	7,460	11,300	12,300	3,820	2,380	2,000
17	3,020	2,710	3,850	3,550	1,550	1,750	7,320	10,400	10,100	4,260	3,160	1,860
18	2,710	2,710	3,750	3,650	1,600	1,850	8,020	8,880	20,700	3,050	6,120	1,860
19	2,500	2,640	3,850	3,650	1,650	1,750	10,100	8,300	27,100	2,850	8,920	1,720
20	3,020	2,640	3,850	3,100	1,650	1,700	13,900	8,880	22,900	2,850	8,660	1,720
21	4,330	2,570	3,650	2,750	1,650	1,700	20,500	11,000	20,500	3,050	7,680	1,720
22	5,680	2,570	3,850	2,400	1,600	1,800	25,900	11,300	16,800	3,270	9,570	2,350
23	5,200	2,500	4,200	2,250	1,650	1,900	28,400	10,400	13,700	3,490	9,700	2,590
24	4,650	3,180	4,050	2,100	1,650	2,100	29,500	10,100	10,700	3,380	7,440	2,430
25	4,030	6,280	3,850	2,200	1,550	3,200	28,000	9,920	9,620	3,490	9,180	2,430
26	3,540	7,810	3,450	2,200	1,600	6,500	24,000	9,470	8,300	2,950	9,570	2,430
27	3,180	7,290	3,250	2,200	1,700	10,700	18,700	8,020	7,180	2,470	8,160	2,140
28	2,940	6,280	3,250	2,100	1,850	21,300	14,400	7,600	6,100	2,110	6,120	1,860
29	2,710	5,440	3,050	2,150	.....	26,500	13,200	7,180	5,200	2,110	4,580	1,720
30	2,640	6,040	2,550	2,150	.....	25,700	13,200	7,180	5,960	2,030	4,250	1,930
31	2,640	.....	2,450	2,450	.....	22,900	.....	7,180	.....	2,290	5,040	.....

NOTE.—Stage-discharge relation affected by ice Nov. 19–30, and Dec. 15 to Mar. 27; discharge determined from study of gage heights, discharge measurements, weather records, and comparisons of similar studies of nearby streams.

Monthly discharge of Connecticut River at Orford, N. H., for the year ending Sept. 30, 1917.

[Drainage area, 3,100 square miles.]

Month.	Observed discharge (second-feet).			Gain or loss in storage at First Lake (millions of cubic feet).	Discharge corrected for storage (second-feet).		Run-off (depth in inches in drainage area).
	Maximum.	Minimum.	Mean.		Mean.	Per square mile.	
October	5,920	2,150	3,310	− 329	3,190	1.03	1.19
November	7,810	2,500	3,600	− 371	3,460	1.12	1.25
December	17,800	2,450	6,190	− 265	6,090	1.96	2.26
January	3,650	2,100	2,700	− 249	2,610	.842	.97
February	2,450	1,550	1,850	− 91.1	1,810	.584	.61
March	26,500	1,700	5,200	+ 56.1	5,220	1.68	1.94
April	29,500	7,320	16,900	+ 448	17,100	5.52	6.16
May	15,900	7,180	10,500	+1,655	11,100	3.58	4.13
June	27,100	5,200	12,000	− 44.5	12,000	3.87	4.32
July	9,620	2,030	3,900	− 144	3,850	1.24	1.43
August	9,700	1,950	4,870	+ 119	4,910	1.58	1.82
September	5,640	1,720	2,670	− 223	2,580	.832	.93
The year	29,500	1,550	6,150	.....	6,170	1.99	27.01

CONNECTICUT RIVER AT SUNDERLAND, MASS.

LOCATION.—At five-span steel highway bridge at Sunderland, Franklin County, on 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, 1917. From 1880 to 1899 records were obtained at Holyyoke, 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; bottom of coarse gravel and alluvial deposits. Control at low stages not well defined but practically permanent; at high stages the control is at the crest of the dam at Holyoke.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 20.0 feet at 7 a. m. March 30 (discharge, 63,700 second-feet); minimum stage recorded, 0.8 foot at 7. a. m. September 24 (discharge, 880 second-feet).

1904–1917: Maximum stage recorded, 30.7 feet during the night of March 28, 1913, determined by leveling from flood marks (discharge, computed from extension of rating curve, about 108,000 second-feet[1]); minimum stage recorded, 0.6 foot September 28, 1914 (discharge, computed from extension of rating curve, about 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 oscasionally 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 Turners Falls, Mass., and by regulation of Deerfield River. The effect of the regulation is shown by low water at the gage on Sundays and Mondays. Storage in Somerset reservoir and First Lake has very little effect on the run-off as observed at Sunderland.

[1] Supersedes figures previously published.

ACCURACY.—Stage-discharge relation practically permanent except when affected by ice. 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 daily gage height to rating table with corrections for ice during the winter. Records good except for 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, 1917.

[Made by A. H. Davison.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Dec. 7	8.60	19,300	Feb. 1	[a] 6.36	6,700
Jan. 3	[a] 5.92	6,490	Mar. 3	[a] 8.44	10,600

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Connecticut River at Sunderland, Mass., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	14,300	6,950	26,200	4,590	6,270	15,700	40,400	23,200	19,900	10,100	3,330	11,300
2	8,960	5,620	30,800	6,720	5,830	13,600	46,200	30,800	16,700	17,400	3,330	10,700
3	10,100	5,200	29,300	6,490	6,270	9,810	46,200	34,600	23,600	17,000	4,210	10,100
4	10,100	5,830	27,000	6,270	3,020	8,960	47,800	33,800	11,300	16,400	7,910	9,810
5	8,690	5,200	22,500	6,720	3,330	5,200	50,100	31,900	18,100	11,000	2,720	9,240
6	7,180	6,720	18,800	7,660	5,200	7,180	46,600	33,100	20,300	10,400	2,080	9,520
7	6,050	6,950	18,800	7,660	5,620	6,270	44,700	32,700	19,200	10,400	4,030	8,690
8	3,020	6,050	17,400	11,700	5,200	6,270	45,500	30,000	22,800	6,050	4,590	6,050
9	5,410	5,620	17,400	10,400	5,200	6,720	45,100	28,900	22,100	7,910	4,400	3,330
10	6,050	5,620	15,300	10,400	4,590	7,910	40,400	27,000	21,700	7,420	4,400	3,330
11	5,620	6,490	14,000	8,690	2,450	6,490	33,100	25,500	23,200	6,270	6,050	4,400
12	4,030	5,620	14,000	7,910	3,020	5,830	30,400	24,000	36,900	6,490	3,330	5,620
13	4,990	4,590	13,300	7,180	5,200	8,160	20,300	30,800	48,600	6,270	5,200	4,790
14	5,200	6,490	12,000	4,210	4,210	8,420	24,000	19,900	47,800	7,660	6,950	4,790
15	3,020	6,950	11,700	11,700	4,210	9,810	27,700	24,000	43,100	4,790	5,200	4,210
16	3,500	7,420	11,300	11,700	4,400	9,520	18,100	24,000	35,700	6,050	6,490	2,720
17	6,050	7,420	8,960	12,300	4,400	8,690	21,000	22,500	30,400	7,910	6,490	3,500
18	5,200	6,720	7,180	12,300	2,200	5,830	21,700	20,300	28,500	8,160	7,420	4,990
19	6,050	3,330	9,520	11,000	1,960	8,690	24,700	17,800	38,000	7,660	10,700	4,790
20	6,720	3,330	9,520	10,700	4,590	8,160	33,100	15,700	39,600	6,950	10,700	4,400
21	10,400	5,620	8,420	7,420	4,400	7,660	48,200	17,800	35,300	6,490	12,600	4,210
22	8,960	5,620	9,810	6,270	4,030	9,520	56,500	18,800	31,500	7,910	13,300	3,020
23	10,100	5,200	7,420	7,910	4,030	10,100	59,700	20,300	27,700	5,200	12,000	1,620
24	10,700	9,810	10,100	6,720	4,210	11,700	58,100	22,900	22,500	6,490	15,000	2,200
25	8,960	22,500	11,300	6,490	2,200	34,500	53,300	22,100	24,000	6,950	14,000	3,300
26	7,910	19,500	9,520	6,270	3,020	32,300	48,200	20,300	22,500	6,720	11,300	3,170
27	6,950	14,700	9,240	6,050	6,950	38,400	43,500	19,900	18,800	7,180	16,000	3,330
28	6,050	14,000	8,420	4,590	14,000	56,500	37,700	17,000	16,700	5,830	12,000	3,330
29	4,210	13,300	10,100	5,200	.....	61,300	36,100	19,900	14,700	3,020	10,400	3,020
30	5,830	17,000	7,910	6,720	.....	59,700	29,300	25,600	11,000	3,500	10,700	1,960
31	6,950	.....	5,410	5,830	.....	45,500	.....	23,600	.....	4,210	11,700	.....

NOTE.—Stage-discharge relation affected by ice Dec. 16–Mar. 24; discharge during this period determined from study of gage-height graph, discharge measurements, weather records, and comparison with similar study for Connecticut River at Orford, and Turners Falls.

Monthly discharge of Connecticut River at Sunderland, Mass., for the year ending Sept. 30, 1917.

[Drainage area, 8,000 square miles.]

Month.	Observed discharge (second-feet).			Gain or loss in storage (millions of cubic feet).		Discharge corrected for storage (second feet).		Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	First Lake.	Somerset Reservoir.	Mean.	Per square mile.	
October	14,300	3,020	7,010	− 329	−369	6,750	0.844	0.97
November	22,500	3,330	8,180	− 371	+ 29	8,050	1.01	1.13
December	30,800	5,410	14,000	− 265	−130	13,900	1.74	2.01
January	12,300	4,210	7,930	− 249	−246	7,740	.968	1.12
February	14,000	1,960	4,640	− 91.1	−448	4,420	.552	.57
March	61,300	5,200	17,200	+ 56.1	+153	17,300	2.16	2.49
April	59,700	18,100	39,300	+ 448	+541	39,700	4.96	5.53
May	34,600	15,700	24,500	+1,655	+464	25,300	3.16	3.64
June	48,600	11,000	26,400	− 44.5	+268	26,500	3.31	3.69
July	17,400	3,020	7,930	− 144	− 71	7,850	.981	1.13
August	16,000	2,080	8,020	+ 119	− 59	8,040	1.00	1.15
September	11,300	1,620	5,180	− 223	−438	4,920	.615	.69
The year	61,300	1,620	14,200	.....	.....	14,200	1.78	24.12

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, 1917.

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 and W. I. 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, 8.5 feet at 8 p. m. November 30 (discharge, by extension of rating curve, about 3,630 second-feet); minimum stage recorded, 1.55 feet at 5 p. m. August 8 and 7 a. m. August 9 (discharge, 141 second-feet); minimum discharge, 100 second-feet, March 20 (stage-discharge relation affected by ice).

1909–1917: 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 when water is being held back by mills.

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

REGULATION.—A small diurnal fluctuation is caused by the operation of Pierce's mills, just above the 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, mean discharge for the period determined from twice-a-day gage heights was found to be identical with that obtained from hourly gage heights.

ACCURACY.—Stage-discharge relation practically permanent, but many individual discharge measurements 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 mean daily gage height to rating table with corrections for ice during the winter. Records good.

Discharge measurements of Passumpsic River at Pierce's mills, near St. Johnsbury, Vt., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 2	Hardin Thweatt	[a] 2.38	213	July 20	M. R. Stackpole	2.48	467
Mar. 7	H. H. Khachadoorian	[a] 2.45	153	20	Hardin Thweatt	2.47	447
Apr. 4	do	4.55	1,310				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Passumpsic River at Pierce's mills, St. Johnsbury, Vt., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	640	260	1,560	220	240	300	1,660	1,040	360	870	202	405
2	375	600	790	215	240	240	2,000	1,220	360	1,000	176	530
3	290	420	560	220	240	240	1,760	1,120	360	600	164	460
4	245	360	420	220	240	220	1,260	870	560	420	176	320
5	216	290	640	230	220	190	1,170	830	375	390	176	275
6	202	260	870	290	190	190	1,220	790	340	390	152	305
7	189	260	600	260	210	170	1,560	750	290	360	152	360
8	189	230	500	260	210	170	1,120	710	420	260	152	260
9	202	245	460	230	220	170	870	710	670	260	460	245
10	216	290	560	230	220	160	670	710	500	245	670	290
11	189	260	460	220	220	150	600	870	830	216	320	260
12	189	230	420	230	210	160	600	950	2,000	340	230	230
13	189	230	320	230	210	150	600	830	1,040	320	176	230
14	320	202	300	230	190	140	640	710	640	275	164	202
15	260	260	290	520	190	150	600	750	560	750	189	202
16	216	260	300	400	190	150	640	600	500	360	530	202
17	230	260	290	340	190	140	600	560	530	275	1,560	202
18	230	245	280	240	190	140	1,000	530	1,660	245	1,510	176
19	202	245	290	240	190	130	1,360	530	790	275	670	176
20	750	260	260	240	200	100	1,880	670	560	360	830	216
21	870	230	250	240	190	120	2,480	600	530	560	1,080	360
22	530	245	260	240	190	120	2,480	500	460	530	600	245
23	360	245	260	240	190	140	2,480	560	390	420	420	202
24	290	1,560	260	240	190	220	1,710	640	530	290	420	202
25	275	910	230	240	190	520	1,080	560	500	230	1,000	202
26	275	500	260	240	190	830	1,080	530	390	202	500	164
27	260	460	250	220	280	1,510	950	460	360	176	360	164
28	245	460	200	220	440	3,140	950	405	305	152	305	176
29	230	305	230	220	.....	2,240	1,040	390	500	152	530	176
30	216	1,660	230	240	.....	1,310	1,120	500	1,360	216	560	320
31	216	.....	230	240	.....	950	.....	405	.....	305	500	.....

NOTE.—Stage-discharge relation affected by ice Dec. 14 to Mar. 26; discharge determined from study of gage-height graph, discharge measurements, weather records, and comparison with similar studies for near-by streams.

Monthly discharge of Passumpsic River at Pierce's mills, near St. Johnsbury, Vt., for the year ending Sept. 30, 1917.

[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	870	189	300	1.27	1.46
November	1,660	202	408	1.72	1.92
December	1,560	200	414	1.75	2.02
January	520	215	253	1.07	1.23
February	440	190	217	.916	.95
March	3,140	100	470	1.98	2.28
April	2,480	600	1,240	5.23	5.84
May	1,220	390	687	2.90	3.34
June	2,000	290	622	2.62	2.92
July	1,000	152	369	1.56	1.80
August	1,560	152	482	2.03	2.34
September	530	164	259	1.09	1.22
The year	3,140	100	477	2.01	27.32

WHITE RIVER AT WEST HARTFORD, VT

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

DRAINAGE AREA.—687 square miles (measured on topographic maps, and Post Route map of Vermont, edition of 1915).

RECORDS AVAILABLE.—June 9, 1915, to September 30, 1917.

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. Bed covered with gravel and small boulders. Control formed by rock ledge 100 feet below the gage; well defined.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11.1 feet at 6 p. m. June 12 (discharge, by extension of rating curve, about 11,700 second-feet); minimum stage recorded, 2.40 feet at 6 p. m. September 27 (discharge, by extension of rating curve, about 36 second-feet).

1915-1917: Maximum stage recorded June 12, 1917; minimum stage recorded, 2.33 feet at 6 a. m. August 29, 1916 (discharge, by extension of rating curve,[1] about 26 second-feet). The highwater of March 27, 1913, reached a stage of 18.9 feet, as determined from reference point on scale platform opposite gage (discharge not determined).

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

REGULATION.—There are several power plants on the main stream and tributaries above the station, the nearest being that of the Vermont Copper Co., at Sharon; when this plant is in operation it causes some diurnal fluctuation in discharge at low stages. The effect of power plants farther upstream is eliminated by the large amount of pondage at Sharon.

ACCURACY.—Stage-discharge relation practically permanent except when affected by ice. 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 mean daily gage height to rating table with corrections for ice during the winter. Records good.

[1] Revised, and supersedes minimum published in Water-Supply paper 431.

Discharge measurements of White River at West Hartford, Vt., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 27	Hardin Thweatt	3.37	286	Apr. 3	C. H. Pierce	7.21	4,440
Jan. 4	do	[a] 4.08	405	5	H. H. Khachadoorian	7.10	4,110
Feb. 15	H. H. Khachadoorian	[a] 3.92	296	July 17	M. R. Stackpole	3.90	550
Mar. 14	do	[a] 4.46	455				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of White River at West Hartford, Vt., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	465	260	2,880	340	460	1,050	3,930	2,610	1,570	1,120	240	280
2	440	300	1,770	440	440	740	5,270	2,880	1,470	1,040	205	320
3	240	300	1,290	360	360	640	4,410	3,170	1,290	855	166	365
4	222	280	1,120	390	360	580	4.250	2,610	1,380	690	166	320
5	222	280	1,380	390	440	520	4,090	2,350	1,120	660	205	260
6	188	320	1,670	600	390	440	3,930	2,610	1,040	630	172	205
7	134	260	1,570	960	340	420	4,250	2,480	855	490	205	222
8	74	280	1,570	680	360	440	3,620	2,350	1,290	465	172	205
9	163	260	1,040	540	390	440	3,020	2,230	2,480	440	205	240
10	169	280	1,200	520	340	460	2,480	2,230	1,770	390	820	166
11	169	365	960	460	300	390	2,110	2,110	2,880	390	465	188
12	123	300	925	280	360	520	2,230	2,110	10,100	342	280	205
13	151	330	855	300	340	440	1,990	2,110	5,270	690	300	205
14	169	320	570	490	340	390	2,110	1,880	3,320	570	240	205
15	188	300	540	1,550	320	420	1,990	1,770	2,610	570	205	205
16	205	260	520	1,550	320	420	1,900	1,670	2,110	720	320	139
17	240	205	420	1,200	300	440	1,880	1,470	2,230	515	440	145
18	188	240	340	1,100	300	520	2,610	1,380	2,610	465	570	15
19	240	320	360	960	340	440	3,020	1,380	1,770	465	465	166
20	960	342	320	820	340	340	5,630	1,770	1,470	660	365	142
21	960	342	280	680	360	420	7,500	1,880	1,290	465	320	166
22	785	280	320	720	340	460	7,500	1,380	1,120	342	320	188
23	515	222	360	680	320	520	7,500	1,470	855	465	280	188
24	415	3,320	340	580	340	740	5,090	1,990	1,120	342	300	166
25	342	2,110	340	580	320	2,000	3,770	1,670	1,299	280	570	169
26	320	925	300	520	360	4,200	3,320	1,770	1,040	280	365	157
27	280	785	240	460	390	6.730	3.020	1,670	960	280	320	72
28	280	855	320	440	1,400	8.700	2.740	1.470	855	280	260	154
29	260	785	280	540	.....	4.200	2,480	1.380	820	240	205	157
30	260	3,020	280	440	.....	3.300	2,610	2.350	1,770	260	280	160
31	260	.....	260	460	.....	2,900	.....	1,880	.....	240	320	.....

NOTE.—Stage-discharge relation affected by ice, Dec. 15 to Mar. 26; and by log jams, May 22–23; discharge determined from study of gage-heights graph, discharge measurements, weather records, and observers notes.

Monthly discharge of White River at West Hartford, Vt., for the year ending Sept. 30, 1917.

[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	960	74	311	0.453	0.52
November	3,320	205	614	.894	1.00
December	2,880	240	794	1.16	1.34
January	1,550	280	646	.940	1.08
February	1,400	300	392	.571	.59
March	8,700	340	1,430	2.08	2.40
April	7,500	1,880	3,680	5.36	5.98
May	3,170	1,380	2,000	2.91	3.36
June	10,100	820	1,990	2.90	3.24
July	1,120	240	505	.735	.85
August	820	166	314	.457	.53
September	365	72	197	.287	.32
The year	10,100	72	1,070	1.56	21.21

ASHUELOT RIVER AT HINSDALE, N. H.

LOCATION.—At 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, 1917.

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

DISCHARGE MEASUREMENTS.—Made from bridge.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.25 feet at 4 p. m. March 29 (discharge, from extension of rating curve, about 4,820 second-feet); minimum stage recorded, 2 10 feet at 8 a. m. August 29 (discharge, from extension of rating curve, about 12 second-feet.)

1914–1917.—Maximum stage recorded, 7.5 feet at 5 p. m. February 26, 1915 (discharge, from extension of rating curve, about 5,190 second-feet); minimum stage recorded, 2.0 feet at 4 p. m. October 4, 1914 (discharge, from extension of rating curve, about 10 second-feet).

ICE.—Stage discharge relation affected for short periods by ice which forms below bridge on control.

REGULATION.—The mills immediately above station are operated continuously except for Sundays and holidays, but cause little fluctuation in stage. Storage in the mill ponds above affects distribution of flow. The effect of power regulation was studied by a temporary installation of water-stage recorder during July and August, 1917.

ACCURACY.—Stage-discharge relation practically permanent except when affected by ice. Rating curve fairly well defined below 4,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table with corrections for ice during the winter. Records good.

Discharge measurements of Ashuelot River at Hinsdale, N. H., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 25	C. H. Pierce	3.60	401	Apr. 24	Hardin Thweatt	5.15	1,840
Jan. 16	Hardin Thweatt	*a* 4.50	928	July 9	do	3.29	303
Apr. 23	do	5.40	2,030	9	M. R. Stackpole	3.44	330
24	do	5.20	1,900				

a Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Ashuelot River at Hinsdale, N. H., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	950	350	1,670	810	730	2,170	2,170	900	590	460	134	161
2	660	350	1,550	810	810	2,040	2,580	1,000	555	520	122	155
3	590	350	1,260	770	855	1,670	3,140	770	590	490	88	191
4	490	375	1,000	810	1,000	1,430	3,000	660	520	460	155	185
5	460	400	555	900	810	1,210	2,580	660	590	400	68	155
6	400	375	490	1,050	810	1,100	2,440	1,320	730	300	106	158
7	400	350	460	1,100	770	1,100	2,300	1,100	1,160	255	106	161
8	400	375	590	950	730	1,100	1,910	950	1,550	273	132	155
9	375	375	590	810	730	695	1,670	1,320	1,670	310	129	115
10	330	350	590	770	770	590	1,430	1,100	1,670	300	129	155
11	300	375	625	730	770	855	1,210	1,100	2,440	305	102	155
12	330	350	625	660	770	855	1,100	950	2,860	325	86	155
13	350	340	590	695	900	730	900	1,000	3,280	335	191	161
14	310	350	590	855	900	660	1,100	900	3,000	350	129	155
15	280	400	590	900	900	660	1,100	810	2,300	215	142	134
16	255	350	555	930	855	730	590	660	1,550	330	855	129
17	239	340	520	1,000	810	810	520	590	1,320	305	1,000	129
18	231	340	770	900	770	810	520	520	1,100	286	1,000	132
19	235	247	855	900	770	810	490	520	1,380	273	1,000	111
20	400	350	730	900	730	810	460	460	1,670	235	950	111
21	730	340	770	900	695	855	1,380	460	1,380	215	950	106
22	950	340	810	900	660	900	1,910	460	1,100	197	460	106
23	1,000	350	1,210	900	660	1,100	2,170	400	855	278	350	60
24	490	350	1,100	900	660	1,380	1,910	460	810	340	278	111
25	400	340	770	900	660	1,910	1,670	695	695	215	251	118
26	400	660	730	855	810	2,440	400	660	660	170	212	115
27	350	660	695	855	1,380	3,000	1,210	660	555	132	155	115
28	345	590	660	855	1,910	3,430	1,100	660	520	155	158	106
29	260	520	660	855	.....	4,590	1,000	1,000	520	30	161	106
30	320	730	770	855	.....	4,150	810	1,000	590	106	173	54
31	310	.....	810	810	.....	2,860	.....	900	.....	129	173	.....

NOTE.—Stage-discharge relation affected by ice Jan. 14, to Feb. 22; discharge determined from gage-heights, one discharge measurement, observer's notes, and weather records. Discharge estimated Oct. 15.

Monthly discharge of Ashuelot River at Hinsdale, N. H., for the year ending Sept. 30, 1917.

[Drainage area, 440 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,000	231	437	0.993	1.14
November	730	247	399	.909	1.01
December	1,670	460	780	1.77	2.04
January	1,100	660	866	1.97	2.27
February	1,910	660	844	1.92	2.00
March	4,590	590	1,530	3.48	4.01
April	3,140	400	1,490	3.39	3.78
May	1,320	400	795	1.81	2.09
June	3,280	520	1,270	2.89	3.22
July	520	30	280	.636	.73
August	1,000	68	321	.729	.84
September	191	54	132	.300	.33
The year	4,590	30	761	1.73	23.46

MILLERS RIVER NEAR WINCHENDON, MASS.

LOCATION.—At steel highway bridge known locally as Nolan's bridge, half a mile below mouth of Sip Pond Brook and 2 miles west of Winchendon, Worcester County.

DRAINAGE AREA.—80 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 5, 1916, to September 30, 1917.

GAGE.—Stevens continuous water-stage recorder on right bank just below bridge; installed July 4, 1917. Chain gage on downstream side of bridge June 5, 1916, to February 28, 1917. Foxboro water-stage recorder June 5 to July 3, 1917. Gages read by Arthur Lehman and Franklin Epps.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed covered with gravel and alluvial deposits. Control for low and medium stages is gravel bar about 200 feet below gage; shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1917, occurred during period of unrecorded gage height; minimum stage, from water-stage recorder, 2.60 feet at 8.30 a. m. August 13 (discharge, about 6 second-feet).

1916–17: Maximum stage recorded, 5.53 feet at 6 p. m. June 19, 1916 (discharge about 481 second-feet[1]); minimum stage recorded August 13, 1917.

ICE.—Stage-discharge relation seriously affected by ice. Complete ice cover usually remains intact throughout the winter. Owing to large diurnal fluctuation caused by operation of power plants above, water frequently overflows the ice cover.

REGULATION.—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 subject to changes on account of shifts in low water control; also affected by ice. Rating curve for 1917 is well defined between 20 and 250 second-feet and fairly well defined between 250 and 600 second-feet. Daily gage height June 5, 1916, to February 28, 1917, is mean of two readings per day, to hundredths, on chain gage; gage heights June 5 to July 3, 1917, is mean of 24 gage heights per day from Foxboro water-stage recorder. Daily discharge June 5, 1916, to July 3, 1917, ascertained by applying mean daily gage height to rating table with corrections for ice during the winter; discharge July 4 to September 30, 1917, determined by use of discharge integrator. Records for periods during which water-stage recorders were in operation are good; those for other periods are fair.

[1] Revised determination; supersedes that published in Water-Supply Paper 431.

Discharge measurements of Millers River near Winchendon, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 13	C. H. Pierce	[a] 3.67	118	June 4	Hardin Thweatt	4.12	220
Jan. 17	Hardin Thweatt	[a] 5.16	221	11	.....do	4.44	257
Feb. 20	H. H. Khachadoorian	4.45	108	12	.....do	4.77	342
Apr. 3	Hardin Thweatt	5.34	462	15	C. H. Pierce	3.90	179
4	.....do	5.16	388	18	Hardin Thweatt	5.67	480
June 4	.....do	4.12	220	18	M. R. Stackpole	5.58	505

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Millers River near Winchendon, Mass., for the years ending Sept. 30, 1916–1917.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1916.					1916.				
1	.....	54	87	58	16	192	15	73	224
2	.....	14	82	47	17	314	78	50	68
3	.....	133	80	25	18	246	76	52	150
4	.....	97	101	21	19	383	67	27	192
5	135	205	37	43	20	280	51	26	109
6	125	123	28	68	21	170	48	33	75
7	123	135	76	64	22	272	39	37	64
8	89	89	85	55	23	200	40	45	105
9	125	35	76	40	24	95	111	70	150
10	133	97	74	21	25	97	53	29	300
11	185	178	58	45	26	272	82	41	190
12	336	105	56	61	27	212	178	18	80
13	334	99	31	67	28	182	312	48	79
14	300	93	53	54	29	137	212	39	93
15	242	64	109	125	30	117	79	73	182
					31	.....	150	97	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	June.	July.	Aug.	Sept.
1916–17.									
1	111	58	105	54	50	.....	107	56	305
2	129	45	218	84	25	.....	103	47	130
3	101	31	53	125	45	.....	103	44	65
4	82	34	55	135	18	.....	38	39	144
5	62	16	78	135	40	45	63	34	61
6	70	31	53	115	62	76	66	37	70
7	54	58	53	27	78	129	58	62	68
8	29	61	82	93	55	125	17	59	65
9	53	53	109	125	62	79	47	76	25
10	58	53	31	125	35	61	73	88	65
11	67	35	47	121	25	131	77	64	65
12	64	24	53	105	55	248	114	19	72
13	67	42	76	85	55	274	61	42	70
14	45	61	51	50	70	252	90	63	62
15	16	73	76	125	62	175	17	65	58
16	55	47	73	170	145	125	66	104	17
17	42	53	39	78	105	284	63	210	69
18	49	41	53	70	25	475	94	315	62
19	51	27	76	70	95	405	82	174	69
20	76	40	56	70	85	327	100	186	62
21	41	43	89	25	40	246	70	146	86
22	29	39	76	40	22	148	18	114	48
23	73	39	117	78	45	115	76	92	15
24	78	76	47	45	25	109	76	89	58
25	70	105	95	50	16	180	106	65	60
26	66	53	125	45	62	178	116	36	54
27	51	93	125	35	78	160	118	87	52
28	33	99	125	18	240	66	66	72	49
29	21	82	115	40	.....	78	21	190	34
30	36	101	105	45	.....	80	70	340	17
31	55	.....	32	62	.....	.....	82	340	.....

NOTE.—1916: Revised determinations based on data obtained during 1917; supersede those published in Water-Supply Paper 431.

1917: Stage-discharge relation affected by ice Dec. 26-30, 1916, and Jan. 3 to Feb. 28, 1917; discharge determined from study of gage-height graph, discharge measurements, weather records, and comparison with similar study for Millers River at Erving. No gage-height record Mar. 1 to June 4. Discharge Sept. 6–10 estimated by comparison with record of flow of Sip Pond Brook near Winchenden.

Monthly discharge of Millers River near Winchendon, Mass., for the years ending Sept. 30, 1916–17.

[Drainage area, 80.0 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1916.					
June 5–30	383	89	204	2.55	2.46
July	312	14	100	1.25	1.44
August	109	18	57.8	.722	.83
September	300	21	95.1	1.19	1.33
1916–17.					
October	129	16	59.2	.740	.85
November	105	16	53.8	.672	.75
December	218	31	80.3	1.00	1.15
January	170	18	78.9	.986	1.14
February	240	18	61.4	.768	.80
June 5–30	475	45	176	2.20	2.13
July	118	17	72.8	.910	1.05
August	340	14	108	1.35	1.56
September	305	15	69.2	.865	.97

NOTE.—Determination for 1916 revised by means of data obtained during 1917; supersede those published in Water- Supply Paper 431.

MILLERS RIVER AT ERVING, MASS.

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

DRAINAGE AREA.—372 square miles (measured on topographic maps).

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

GAGES.—Barrett & Lawrence 7-day hydrochronograph installed February 3, 1916, to replace Barrett & Lawrence gage installed July 1, 1915. Vertical staff attached to downstream end of factory, used August 1, 1914, to July 1, 1915, and at times when hydrochronographs were out of order. All gages at same site and datum; read by C. H. Gary and E. F. Bancroft.

DISCHARGE MEASUREMENTS.—Made from cable near gage or by wading.

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

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 5.32 feet at 6 p. m. March 28 (discharge, 4,820 second-feet); minimum stage, from water-stage recorder, 0.87 foot at 3.30 p. m. October 29 (discharge practically zero).

1914–1917: Maximum stage recorded, 5.6 feet at 4 p. m. February 25, 1915 (discharge, 5,160 second-feet [1]); minimum discharge, practically zero at various times during 1915, and at 3.30 p. m. October 29, 1916, when water was 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 operation of power-plants.

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

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

ACCURACY.—Stage-discharge relation practically permanent except when affected by ice. Rating curve well defined below 4,000 second-feet. Staff gage read to hundredths twice daily. Daily discharge ascertained by use of discharge integrator except for periods when continuous gage-height record was not obtained. For these periods the staff gage records were used with corrections as determined by various comparisons with the water-stage recorder. Records 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, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 8	A. H. Davison	3.03	805	Jan. 30	Hardin Thweatt	[a] 2.72	344
19	Hardin Thweatt	[a] 2.38	334	Feb. 23	H. H. Khachadoorian	[a] 3.76	300
Jan. 20	do	[a] 3.55	710	Sept. 18	M. R. Stackpole	2.21	319

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Millers River at Erving, Mass., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	700	250	1,080	440	390	1,550	2,350	880	780	560	260	1,140
2	650	330	1,080	310	360	1,500	2,200	960	700	630	210	800
3	600	295	800	380	320	1,250	2,050	1,140	610	490	240	570
4	510	255	820	390	310	1,100	1,900	1,020	640	320	220	490
5	420	155	650	460	300	1,000	1,720	1,060	520	410	82	430
6	410	340	600	630	320	960	1,660	1,200	620	375	250	370
7	350	310	570	550	290	880	1,840	1,360	680	360	210	320
8	265	330	520	670	300	780	1,920	1,160	840	255	160	315
9	310	320	410	740	300	780	1,780	1,140	850	315	240	315
10	300	290	470	650	320	720	1,580	1,020	710	275	620	295
11	300	255	450	600	250	610	1,340	860	780	365	520	315
12	230	182	490	490	290	730	1,220	820	1,280	450	280	290
13	345	275	530	460	290	870	1,260	680	1,520	530	375	270
14	410	230	480	640	280	920	1,020	740	1,300	410	240	275
15	90	415	430	1,150	270	770	840	750	1,180	330	270	240
16	315	190	400	960	300	810	900	720	930	395	280	120
17	280	470	400	940	300	880	890	610	930	340	340	275
18	300	300	380	700	200	850	880	560	1,400	470	740	235
19	310	95	370	520	320	1,020	800	460	1,380	470	800	250
20	415	325	370	490	300	860	980	465	1,240	435	700	245
21	490	300	360	500	320	830	1,160	570	880	420	510	255
22	330	260	390	450	200	820	1,080	445	780	360	540	275
23	330	330	680	520	280	1,020	1,140	670	600	260	440	96
24	375	690	560	480	270	1,660	1,100	850	430	315	360	270
25	330	800	530	450	300	2,250	1,040	880	680	390	345	215
26	350	590	810	470	450	2,800	770	740	600	420	260	200
27	330	620	650	500	800	3,000	930	570	550	395	275	188
28	390	570	520	380	1,200	4,350	890	450	540	360	325	240
29	115	540	530	370	.....	4,500	810	850	410	260	350	245
30	290	650	490	340	.....	3,450	760	1,080	540	295	880	63
31	280	.....	450	370	.....	2,600	.....	980	.....	210	1,280	.....

NOTE.—Stage-discharge relation affected by ice Dec. 16–22, Dec. 30–Jan. 1, and Jan. 11–Mar. 10; discharge for these periods determined from study of gage-height graph, discharge measurements, weather records, and comparison with similar study for Millers River near Winchendon. Discharge determined from mean of two gage heights daily, Nov. 13–18, Dec. 9, Jan. 13, 19–22, 24, Feb. 3, 5–17, 22–24, 28; Mar. 1–8, 20, and Apr. 12–14.

Monthly discharge of Millers River at Erving, Mass., for the year ending Sept. 30, 1917.

[Drainage area, 372 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	700	90	359	0.965	1.11
November	800	95	365	.981	1.09
December	1,080	360	557	1.50	1.73
January	1,150	310	548	1.47	1.70
February	1,200	200	351	.944	.98
March	4,500	610	1,490	4.01	4.62
April	2,350	760	1,290	3.47	3.87
May	1,360	445	829	2.23	2.57
June	1,520	410	830	2.23	2.49
July	630	210	383	1.03	1.19
August	1,280	82	407	1.09	1.26
September	1,140	63	320	.860	.96
The year	4,500	63	646	1.74	23.57

SIP POND BROOK NEAR WINCHENDON, MASS.

LOCATION.—About 500 feet above highway bridge, a quarter of a mile below Massachusetts-New Hampshire State line, 1½ miles below outlet of Sip Pond, and 3 miles northwest of Winchendon, Worcester County.

DRAINAGE AREA.—18.8 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 29, 1916, to September 30, 1917.

GAGES.—Gurley 7-day water-stage recorder, installed June 26, 1917, and vertical staff gage installed June 9, 1917, on left bank 500 feet above highway bridge. Inclined staff gage on right bank 50 feet above highway bridge used May 29 to June 29 and December 13, 1916, to June 26, 1917; Stevens 8-day water-stage recorder at same site and datum used June 30 to December 12, 1916. Gages read by W. G. Greenall and Hazel Greenall. All gages at same datum but owing to slope of stream readings on present gage are higher than those on gages previously used.

DISCHARGE MEASUREMENTS.—Made from footbridge 15 feet below Gurley water-stage recorder or by wading.

CHANNEL AND CONTROL.—Bed rough; covered with boulders. Control clearly defined. Considerable aquatic vegetation in channel below inclined staff gage during summer months.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.21 feet (on inclined gage) at 6 p. m. March 28 (discharge, from extension of rating curve, 294 second-feet); minimum discharge, about 6 second-feet, occurred February 18, when stage-discharge relation was affected by ice; minimum open-water discharge, 7.2 second-feet at 7 a. m. October 28 (stage, inclined gage, 2.01 feet).

1916–17: Maximum stage recorded March 28, 1917; minimum stage, from water-stage recorder, 1.88 feet at 7 a. m. September 15, 1916 (discharge, from extension of rating curve, 5 second-feet).

REGULATION.—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 occasionally at lower gage but apparently permanent at upper one. Rating curves used to June 26 fairly well defined between 9 and 130 second-feet; from June 27 to September 30, well defined between 9 and 100 second-feet. Inclined staff read to hundredths twice daily. Operation of both water-stage recorders satisfactory. Daily discharge October 1 to December 12 ascertained by applying mean daily gage height from water-stage recorder to rating table; December 13 to June 26, by applying to rating table mean of two readings per day on inclined gage with corrections for ice during the winter; June 27 to September 30, by use of discharge integrator. Records good.

Discharge measurements of Sip Pond Brook near Winchendon, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.		Discharge.	Date.	Made by—	Gage height.		Discharge.
		New location.	Original location.				New location.	Original location.	
		Feet.	*Feet.*	*Sec.-ft.*			*Feet.*	*Feet.*	*Sec.-ft.*
Oct. 14	C. H. Pierce	.....	2.23	12.8	June 3	Hardin Thweatt	.....	2.46	22.5
Nov. 7	Hardin Thweatt	.....	2.56	25.5	3	do	.....	2.50	25.6
Dec. 21	do	.....	2.72	36.0	9	do	6.47	2.93	43.4
Jan. 18	H. H. Khachadoorian	.....	3.05	56.4	12	do	.....	3.35	[b] 64
					13	C. H. Pierce	6.95	3.45	80
Feb. 21	do	.....	[a] 4.22	33.0	21	do	6.55	3.05	53
Apr. 3	Hardin Thweatt	.....	3.86	116	July 5	Hardin Thweatt	5.93	2.45	23.7
3	do	.....	3.90	120	7	M. R. Stackpole	5.46	2.06	11.7

[a] Stage-discharge relation affected by ice.
[b] Results uncertain.

Daily discharge, in second-feet, of Sip Pond Brook near Winchendon, Mass., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	61	15	56	30	17	62	120	48	36	19	14	100
2	58	13	55	27	17	68	124	60	34	24	14	76
3	30	14	48	24	17	69	121	58	26	23	14	65
4	32	18	44	18	9	51	109	52	34	20	14	51
5	31	10	34	25	15	48	101	61	30	18	9	38
6	25	19	37	40	17	50	103	63	32	18	15	35
7	24	17	35	24	15	44	120	61	36	15	11	33
8	15	20	28	30	18	43	114	55	36	11	13	28
9	22	16	21	35	15	43	112	54	40	15	13	24
10	22	18	12	32	15	42	98	51	37	19	14	27
11	20	15	22	33	7	26	83	47	41	22	14	25
12	20	9	20	34	15	39	74	48	57	18	10	22
13	18	15	24	32	15	37	60	42	74	18	15	21
14	16	18	26	18	15	38	60	48	68	16	14	18
15	8	18	24	32	15	39	58	42	54	10	16	16
16	15	20	29	46	15	38	54	36	44	15	45	12
17	15	20	16	57	15	39	44	30	68	17	136	14
18	18	18	26	47	7	31	42	27	86	18	176	15
19	17	10	29	39	16	41	42	26	77	21	136	14
20	24	16	31	32	21	53	46	19	56	13	70	15
21	24	19	25	20	17	49	68	26	48	16	63	14
22	13	18	30	17	14	37	58	24	38	10	55	13
23	21	20	26	21	17	38	70	26	34	14	43	11
24	21	29	14	20	18	51	60	29	29	22	39	14
26	19	32	19	19	7	96	55	34	37	24	32	14
26	14	19	26	18	39	117	51	34	32	23	28	13
27	17	30	29	19	60	146	54	29	27	28	28	14
28	14	30	30	9	46	290	48	36	24	20	24	15
29	9	28	30	18	.....	237	46	36	21	13	35	15
30	17	31	29	20	.....	202	48	36	23	17	112	10
31	17	.....	18	21	.....	152	.....	38	.....	17	128	.....

NOTE.—Stage-discharge relation affected by ice Dec. 26 to Jan. 5, Jan. 11–15, and Jan. 19–Mar. 9: discharge determined from study of gage-height graph, observer's notes, and weather records. Discharge estimated July 4, 14, and Aug. 9–12.

Monthly discharge of Sip Pond Brook near Winchendon, Mass., for the year ending Sept. 30, 1917.

[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.	
October	61	8	21.8	1.16	1.34
November	32	9	19.2	1.02	1.14
December	56	12	28.8	1.53	1.76
January	57	9	27.6	1.47	1.70
February	60	7	18.4	.979	1.02
March	290	26	74.7	3.97	4.58
April	124	42	74.8	3.98	4.44
May	63	19	41.2	2.19	2.52
June	86	21	42.6	2.27	2.53
July	24	10	17.7	.941	1.08
August	176	9	43.5	2.31	2.66
September	100	10	26.1	1.39	1.55
The year	290	7	36.5	1.94	26.32

PRIEST BROOK NEAR WINCHENDON, MASS.

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

DRAINAGE AREA.—18.8 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 25, 1916, to September 30, 1917.

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 station is straight; section fairly uniform; gravel bottom. Control formed by the foundation of an old dam 30 feet below gage; permanent.

EXTREMES OF DISCHARGE.—1916–17: Maximum stage recorded, 4.88 feet at 7 a. m. March 28 and 29, 1917 (discharge, 306 second-feet); minimum stage recorded, 2.30 feet several times in August, 1917 (discharge, by extension of rating curve, about 1.5 second-feet).

ICE.—Brook freezes over at gage, and on control; stage-discharge relation somewhat affected.

REGULATION.—Flow not appreciably affected by regulation.

ACCURACY.—Stage-discharge relation practically permanent, except when affected by ice. Rating curve well defined between 2 and 180 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table with corrections for ice during the winter. Records good.

Discharge measurements of Priest Brook near Winchendon, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 22	Hardin Thweatt	a 3.00	17.8	June 8	C. H. Pierce	3.37	49.0
Jan. 17	...do	a 3.53	45.8	8	Hardin Thweatt	3.40	50
Feb. 20	H. H. Khachadoorian	a 2.85	12.3	Aug. 2	M. R. Stackpole	2.37	2.58
Apr. 3	Hardin Thweatt	4.04	138	Oct. 13	.....do	2.91	15.4

a Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Priest Brook near Winchendon, Mass., for the years ending Sept. 30, 1916–17.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916.												
1									26	18	29	6.2
2									24	17	21	7.7
3									16	30	18	2.6
4									32	50	29	2.5
5									29	47	19	2.6
6									24	35	19	4.2
7									34	35	8.6	11
8									30	20	4.8	5.6
9									27	21	25	10
10									30	21	27	3.8
11									61	27	17	2.1
12									37	21	15	3.4
13									50	17	13	4.0
14									43	19	16	2.0
15									33	17	18	8.0
16									29	16	11	129
17									41	15	9.5	65
18									73	15	8.0	60
19									77	15	6.8	52
20									81	11	14	42
21									75	15	5	35
22									65	15	3.0	32
23									48	22	9.5	36
24									39	19	22	95
25								35	33	19	11	65
26								28	53	20	11	49
27								24	48	88	3.0	40
28								18	32	150	13	32
29								20	26	77	15	32
30								27	21	43	9.8	59
31								35		35	9.2	
1917.												
1	54	23	52	12	12	80	150	29	35	13	2.4	132
2	40	18	71	17	12	93	150	50	29	11	2.0	99
3	33	16	36	19	12	62	150	52	26	11	6.5	66
4	29	16	45	20	13	50	132	46	29	11	2.5	45
5	25	19	41	14	10	40	125	46	23	12	2.0	38
6	22	21	46	32	10	40	112	56	29	16	1.6	32
7	20	17	41	46	10	35	150	61	32	8.0	1.7	21
8	17	14	49	35	9.2	29	150	56	44	9.5	2.0	23
9	18	16	48	36	8.4	32	112	37	60	9.5	2.8	20
10	14	16	40	39	8.0	34	91	36	59	9.8	32	19
11	14	16	36	36	8.0	30	82	37	58	13	7.4	18
12	14	13	27	32	8.0	30	56	38	84	23	2.2	9.2
13	12	13	24	19	7.1	32	70	39	122	21	6.8	9.5
14	13	15	21	25	6.5	30	56	33	102	11	8.3	17
15	13	19	20	31	6.5	32	48	27	71	7.1	14	11
16	13	19	20	64	6.8	33	46	22	56	7.4	41	8.3
17	15	18	16	46	8.0	36	43	22	67	13	150	7.7
18	19	16	14	35	8.0	42	46	22	82	15	159	13
19	13	13	14	29	7.1	44	33	20	91	15	66	8.0
20	32	13	13	24	12	39	42	16	67	15	81	11
21	32	22	14	19	7.7	35	61	17	36	13	58	8.6
22	25	17	22	17	5.3	35	38	21	24	9.2	36	8.0
23	23	13	29	16	10	39	60	28	22	8.0	51	8.0
24	28	82	26	15	12	81	52	39	22	9.5	38	7.5
25	23	61	21	11	15	168	42	34	27	27	23	7.0
26	21	58	25	10	14	178	26	24	23	16	19	6.5
27	17	34	27	18	31	226	28	19	20	13	17	6.5
28	16	38	27	12	54	299	35	19	26	8.9	8.6	2.9
29	19	29	26	12		288	32	58	22	5.3	29	2.8
30	15	24	22	15		246	29	57	30	4.6	206	2.5
31	15		21	16		168		42		3.4	159	

NOTE.—1916: Revised determinations based on data obtained in 1917; supersede those published in Water-Supply Paper 431.

1917: Stage discharge relations affected by ice Dec. 13–29, and Jan. 12–Feb. 27, 1917; discharge determined from study of gage-height graph, discharge measurements, and weather records. Discharge estimated, Sept. 23–26.

Monthly discharge of Priest Brook near Winchendon, Mass., for the years ending Sept. 30, 1916–17.

[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.	
1916.					
May 25–31	35	18	26.7	1.42	0.37
June	81	16	41.2	2.19	2.44
July	150	11	31.3	1.66	1.91
August	29	3.0	14.2	.755	.87
September	129	2.0	30.0	1.60	1.78
1916–17.					
October	54	12	21.4	1.14	1.31
November	82	13	23.6	1.26	1.41
December	71	13	30.1	1.60	1.84
January	64	10	24.9	1.32	1.52
February	54	5.3	11.8	.628	.65
March	299	29	84.1	4.47	5.15
April	150	26	74.9	3.98	4.44
May	61	16	35.6	1.89	2.18
June	122	20	47.3	2.52	2.81
July	27	3.4	11.9	.633	.73
August	206	1.6	39.9	2.12	2.44
September	132	2.5	22.3	1.19	1.33
The year	299	1.6	35.8	1.90	25.81

NOTE.—Determinations for 1916 revised by means of data obtained during 1917; supersede those published in Water Supply-Paper 431.

OTTER RIVER NEAR GARDNER, MASS.

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

DRAINAGE AREA.—20 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 28, 1916, to September 30, 1917, when station was discontinued.

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

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Growth of aquatic vegetation in channel during summer months seriously affects stage-discharge relation.

EXTREMES OF DISCHARGE: Maximum stage during periods covered by records, 3.60 feet at 6 p. m. March 28, 1917 (discharge, 189 second-feet); minimum stage recorded, about −0.4 foot several times in October, 1917 (discharge not determined).

ICE.—Stage-discharge relation seriously affected by ice; river freezes over.

REGULATION.—Operation of a filter plant a quarter of a mile above the gage causes occasional fluctuations in discharge.

ACCURACY.—Stage-discharge relation seriously affected by ice and by aquatic vegetation. Frequent discharge measurements required. Standard rating curve fairly well defined. Gage read to hundredths twice daily. Daily discharge determined by shifting-control method, adjusted gage heights being applied to rating table for standard curve. Records fair.

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Discharge measurements of Otter River near Gardner, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 14	C. H. Pierce	0.44	5.8	June 14	C. H. Pierce	2.02	71
Nov. 8	Hardin Thweatt	.32	11.4	28	Hardin Thweatt	1.85	34.0
Dec. 21	do	[a] .29	8.6	28	M. R. Stackpole	1.84	34.8
Jan. 18	do	[a] 1.75	31.0	Aug. 1	do	.71	15.6
Feb. 22	H. H. Khachadoorian	[a] .64	15.5	Sept. 10	do	1.03	6.7
Apr. 4	Hardin Thweatt	1.67	88	Oct. 15	do	— .08	6.4
4	do	1.67	92	15	do	— .08	5.7
June 4	do	1.75	39.5				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Otter River near Gardner, Mass., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	27	9.7	48	20	15	74	100	48	50	35	17	38
2	27	10	52	17	13	76	100	48	47	32	18	38
3	23	10	48	13	9.4	70	98	54	41	30	30	39
4	16	9.7	37	11	9.2	60	94	50	42	31	37	35
5	11	10	44	7.6	9	62	90	56	45	25	37	25
6	9.4	13	46	24	15	62	110	62	45	19	38	24
7	8.4	12	44	48	15	60	125	64	47	16	31	31
8	8.6	11	37	54	18	62	120	60	52	15	26	30
9	8.6	10	30	58	16	68	110	52	49	13	32	35
10	7.3	10	30	56	15	68	92	50	46	14	38	25
11	6.2	10	28	52	13	72	84	49	46	16	38	21
12	5.8	9.4	24	44	10	64	62	46	64	28	38	20
13	5.2	9.5	22	37	6.2	70	60	44	72	35	28	24
14	5.5	13	16	37	12	64	50	41	66	37	20	23
15	5.0	16	12	44	13	60	40	42	56	32	20	19
16	4.9	15	8.2	40	12	60	40	36	46	32	19	17
17	4.7	13	13	37	14	64	46	32	52	30	28	18
18	4.0	11	12	33	16	74	54	34	76	29	49	11
19	4.0	11	10	31	14	76	56	37	64	34	49	7.9
20	12	12	9.0	25	16	76	44	35	52	31	38	8.2
21	13	9.8	7.9	24	19	66	74	33	47	27	27	8.4
22	14	8.2	10	22	16	74	62	35	44	25	23	10
23	14	8.1	19	18	16	76	58	39	37	22	24	7.9
24	10	35	37	15	24	100	56	50	37	21	31	6.8
25	8.7	48	50	16	27	155	54	50	36	22	28	8.9
26	10	52	50	14	31	155	48	50	39	20	20	6.3
27	9.8	42	46	12	96	130	46	43	36	19	16	5.1
28	9.4	44	40	11	84	185	54	40	33	21	13	5.2
29	9.7	40	35	10	.....	170	50	52	32	19	17	5.2
30	11	46	28	15	.....	140	46	54	38	17	29	5.0
31	10	.....	24	15	.....	110	.....	52	.....	15	38	.....

NOTE.—Stage-discharge relation affected by ice Dec. 12-23, Dec. 31-Jan. 6, and Jan. 12-Feb. 26; by shifting control and vegetation in the bed of the stream Oct. 1-Nov. 7, Mar. 25-Apr. 16, and May 1-Sept. 30. Daily discharge determined from study of gage-height graph, discharge measurements, and weather records.

Monthly discharge of Otter River near Gardner, Mass., for the year ending Sept. 30, 1917.

[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.	
October	27	4.0	10.4	0.520	0.60
November	52	8.1	18.6	.930	1.04
December	52	7.9	29.6	1.48	1.71
January	58	7.6	27.8	1.39	1.60
February	96	6.2	20.5	1.02	1.06
March	185	60	87.2	4.36	5.03
April	125	40	70.8	3.54	3.95
May	64	32	46.4	2.32	2.68
June	76	32	47.9	2.40	2.68
July	37	13	24.6	1.23	1.42
August	49	13	28.9	1.44	1.66
September	39	5.0	18.6	.930	1.04
The year	185	4.0	36.0	1.80	24.47

EAST BRANCH OF TULLY RIVER NEAR ATHOL, MASS.

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

DRAINAGE AREA.—50.2 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 13, 1916, to September 30, 1917.

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. Control sections are formed by rocks and boulders in the two channels; probably permanent.

EXTREMES OF DISCHARGE.—1916–17: Maximum stage recorded, 3.76 feet at 1 p. m. March 28, 1917 (discharge, 780 second-feet); minimum stage recorded, 0.30 foot at 6 p. m. August 8 and 7 a. m. August 9, 1917 (discharge, 6.0 second-feet).

ICE.—Ice forms along banks; stage-discharge relation affected for short periods.

DIVERSIONS.—About half a mile below station water is diverted through a canal into Packard Pond; a discharge measurement made June 14, 1917, showed 13.0 second-feet diverted through canal.

REGULATION.—Flow not seriously affected by regulation.

ACCURACY.—Stage-discharge relation permanent except for short periods when affected by ice. Rating curve well defined between 10 and 300 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table with corrections for ice during the winter. Records good.

Discharge measurements of East Branch of Tully River near Athol, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 8	Hardin Thweatt	1.22	44.0	Apr. 5	Hardin Thweatt	2.54	279
Dec. 20	do	1.28	46.3	June 14	C. H. Pierce	2.38	226
Jan. 19	do	1.84	118	Aug. 2	M. R. Stackpole	.48	9.2

Daily discharge, in second-feet, of East Branch of Tully River near Athol, Mass., for the years ending Sept. 30, 1916 and 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1916.												
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	56	106	28
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	42	79	22
3	.....	.....	.....	.....	.....	.....	.....	.....	.....	59	61	17
4	.....	.....	.....	.....	.....	.....	.....	.....	.....	80	49	15
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	92	38	14
6	.....	.....	.....	.....	.....	.....	.....	.....	.....	85	32	15
7	.....	.....	.....	.....	.....	.....	.....	.....	.....	70	26	17
8	.....	.....	.....	.....	.....	.....	.....	.....	.....	57	26	17
9	.....	.....	.....	.....	.....	.....	.....	.....	.....	51	52	20
10	.....	.....	.....	.....	.....	.....	.....	.....	.....	56	62	14
11	.....	.....	.....	.....	.....	.....	.....	.....	.....	51	49	12
12	.....	.....	.....	.....	.....	.....	.....	.....	.....	44	42	11
13	.....	.....	.....	.....	.....	.....	.....	.....	161	36	39	11
14	.....	.....	.....	.....	.....	.....	.....	.....	141	49	42	10
15	.....	.....	.....	.....	.....	.....	.....	.....	120	45	37	15
16	.....	.....	.....	.....	.....	.....	.....	.....	100	30	28	282
17	.....	.....	.....	.....	.....	.....	.....	.....	125	31	24	289
18	.....	.....	.....	.....	.....	.....	.....	.....	223	28	18	197
19	.....	.....	.....	.....	.....	.....	.....	.....	234	22	15	147
20	.....	.....	.....	.....	.....	.....	.....	.....	243	20	14	113
21	.....	.....	.....	.....	.....	.....	.....	.....	215	18	14	89
22	.....	.....	.....	.....	.....	.....	.....	.....	172	20	12	71
23	.....	.....	.....	.....	.....	.....	.....	.....	139	45	14	77
24	.....	.....	.....	.....	.....	.....	.....	.....	112	53	65	170
25	.....	.....	.....	.....	.....	.....	.....	.....	96	45	78	149
26	.....	.....	.....	.....	.....	.....	.....	.....	120	51	59	112
27	.....	.....	.....	.....	.....	.....	.....	.....	128	168	40	77
28	.....	.....	.....	.....	.....	.....	.....	.....	104	401	43	70
29	.....	.....	.....	.....	.....	.....	.....	.....	84	273	54	63
30	.....	.....	.....	.....	.....	.....	.....	.....	74	176	45	115
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	134	35	115
1917.												
1	137	31	200	43	46	141	330	109	106	60	11	312
2	110	39	185	42	46	141	355	143	92	51	10	237
3	88	40	141	43	46	123	326	161	80	45	9.5	190
4	71	37	113	45	43	104	295	147	80	38	8.8	149
5	62	41	103	46	43	90	273	128	68	35	8.2	121
6	56	49	100	80	42	80	260	165	72	29	7.2	89
7	49	49	90	117	40	67	312	165	90	25	6.8	77
8	40	45	80	123	37	65	316	143	128	20	6.2	66
9	38	42	72	120	36	76	273	139	161	21	6.2	59
10	35	41	74	110	34	78	229	125	137	18	89	54
11	29	36	76	101	34	76	195	112	123	16	127	45
12	28	32	77	101	35	78	179	104	210	39	74	39
13	28	30	73	65	34	85	165	200	282	51	55	34
14	30	40	71	93	31	85	153	99	229	40	40	30
15	30	57	63	137	29	80	145	85	193	34	31	27
16	30	53	58	165	29	76	136	71	170	33	59	24
17	30	43	56	157	28	85	132	65	157	24	100	22
18	28	42	53	134	26	113	127	60	188	35	223	20
19	27	38	51	113	25	120	125	55	170	41	223	19
20	58	37	49	88	24	96	125	48	134	43	151	18
21	84	32	47	71	24	90	170	47	110	36	115	17
22	78	29	54	67	24	93	176	45	89	28	94	17
23	65	31	84	60	23	107	165	67	80	26	74	15
24	56	112	103	56	25	202	155	107	73	20	67	14
25	49	155	104	53	29	344	143	104	88	38	63	14
26	44	109	90	51	33	381	127	88	78	34	51	14
27	42	89	77	51	93	445	127	66	66	25	43	12
28	35	78	70	46	123	775	128	67	58	19	36	12
29	32	71	65	46	.....	675	121	99	51	16	50	14
30	31	90	57	45	.....	510	117	145	69	14	377	14
31	30	.....	49	45	.....	429	.....	130	.....	12	413	.....

NOTE.—1916: Record revised by means of data obtained in 1917; supersedes that published in Water-Supply Paper 431.
1917: Stage-discharge relation affected by ice Feb. 9–26; discharge determined from study of gage-height graph, observer's notes, and weather records.

Monthly discharge of East Branch of Tully River near Athol, Mass., for the years ending Sept. 30, 1916 and 1917.

[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.	
1916.					
June 13–30	243	74	144.	2.87	1.92
July	401	18	77.0	1.53	1.76
August	106	12	41.9	.835	.96
September	289	10	75.3	1.50	1.67
1916–17.					
October	137	27	50.0	0.996	1.15
November	155	29	53.9	1.07	1.19
December	200	47	83.4	1.66	1.91
January	165	42	81.1	1.62	1.87
February	123	23	38.6	.769	.80
March	775	65	191	3.80	4.38
April	355	117	196	3.90	4.35
May	165	45	103	2.05	2.36
June	282	51	121	2.41	2.69
July	60	12	31.2	.622	.72
August	413	6.2	84.8	1.69	1.95
September	312	12	59.2	1.18	1.32
The year	775	6.2	91.3	1.82	24.69

NOTE.—Record for 1916 revised by means of data obtained in 1917, and supersedes that published in Water-Supply Paper 431.

MOSS BROOK AT WENDELL DEPOT, MASS.

LOCATION.—About a quarter of a mile above confluence with Millers River and a quarter of a mile from Wendell Depot, Franklin County.

DRAINAGE AREA.—12.2 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 7, 1916, to September 30, 1917. 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 site.

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

DISCHARGE MEASUREMENTS.—Made by wading.

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

EXTREMES OF DISCHARGE.—1916–17: Maximum stage recorded during the year, 3.52 feet at 12.45 p. m. March 28, 1917 (discharge, by extension of rating curve, about 187 second-feet); minimum stage recorded, 0.86 foot at 7.30 a. m., August 29, 1917 (discharge, by extension of rating curve, about 0.6 second-foot).

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

REGULATION.—Flow not affected by regulation.

ACCURACY.—Stage-discharge relation permanent, except when affected by ice. Rating curve well defined between 2 and 20 second-feet and fairly well defined between 20 and 60 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table with corrections for ice during the winter. Records good.

Discharge measurements of Moss Brook at Wendell Depot, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 9	Hardin Thweatt	1.33	7.4	Feb. 3	H. H. Khachadoorian	1.43	10.8
Dec. 8	A. H. Davison	1.52	14.7	Apr. 5	Hardin Thweatt	2.16	52
8	do	1.51	12.8	5	do	2.16	52
20	Hardin Thweatt	[a] 1.43	8.8	June 2	do	1.75	27.2
Jan. 19	H. H. Khachdoorian	1.75	23.8	2	do	1.75	25.8
19	Hardin Thweatt	1.75	20.5	Aug. 3	M. R. Stackpole	1.09	2.9

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Moss Brook at Wendell Depot, Mass., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	18	6.3	44	9	12	42	59	24	28	18	1.6	19
2	11	6.1	36	9	10	30	72	35	25	14	2.0	13
3	9.2	7.0	23	9	10	23	61	33	24	11	2.7	9.7
4	7.8	6.3	20	9	10	19	58	28	21	10	1.7	6.1
5	7.0	10	18	10	10	18	52	36	19	8.9	1.4	4.3
6	6.6	12	18	22	10	17	55	50	25	7.8	1.3	4.0
7	5.7	9.4	16	21	10	17	63	41	34	7.3	1.2	3.6
8	5.2	8.1	13	32	10	16	59	35	44	6.8	1.0	3.6
9	4.5	7.5	15	25	10	19	45	32	45	6.3	1.2	3.0
10	4.1	7.5	19	21	9	19	42	29	39	5.9	27	2.7
11	4.1	7.0	14	19	9	20	37	27	31	6.3	7.8	2.3
12	4.0	6.1	15	18	9	20	35	27	61	18	4.0	2.1
13	3.6	6.1	18	13	9	21	34	25	62	12	2.5	1.8
14	4.6	12	18	20	9	22	32	23	49	10	2.1	1.8
15	3.8	12	17	32	8	21	31	21	54	10	1.7	1.7
16	3.8	9.4	13	45	8	20	30	19	43	8.4	2.8	1.6
17	3.8	8.1	12	35	8	23	27	18	52	6.8	5.7	1.5
18	3.4	7.5	10	26	8	33	27	17	43	12	3.8	1.5
19	3.4	7.5	9	22	8	34	27	16	33	12	2.7	1.4
20	21	7.5	9	20	8	31	31	15	27	10	1.8	1.3
21	16	7.5	8	16	8	28	40	14	23	8.1	1.6	1.8
22	10	7.3	28	15	8	27	37	16	19	7.0	1.6	1.6
23	8.6	7.0	20	13	8	37	33	32	16	5.7	1.6	1.4
24	7.8	33	27	13	8	63	29	39	21	4.5	2.1	1.4
25	6.8	29	28	13	10	112	25	29	22	3.8	1.6	1.4
26	6.6	25	17	12	20	98	22	24	20	3.3	1.2	1.3
27	5.9	22	14	10	63	98	25	22	18	3.0	1.0	1.4
28	5.2	15	13	11	47	161	31	22	14	2.4	.8	2.5
29	5.2	12	11	11	.....	108	27	49	13	2.4	10	1.8
30	5.0	35	11	13	.....	74	24	48	23	2.4	45	1.7
31	5.2	.....	9	12	.....	70	.....	36	.....	1.8	31	.....

NOTE.—Stage-discharge relation affected by ice Dec. 14 to Jan. 21, and Feb. 8–13; discharge determined from a study of gage-height graph, discharge measurements, and weather records.

Monthly discharge of Moss Brook at Wendell Depot, Mass., for the year ending Sept. 30, 1917.

[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.	
October	21	3.4	7.00	0.574	0.66
November	35	6.1	11.9	.975	1.09
December	44	8	17.5	1.43	1.65
January	45	9	17.9	1.47	1.70
February	63	8	12.8	1.05	1.09
March	161	16	43.3	3.55	4.09
April	72	22	39.0	3.20	3.57
May	50	14	28.5	2.34	2.70
June	62	13	31.6	2.59	2.89
July	18	1.8	7.93	.650	.75
August	45	.8	5.60	.459	.53
September	19	1.3	3.41	.280	.31
The year	161	.8	18.9	1.55	21.03

DEERFIELD RIVER AT CHARLEMONT, MASS.

LOCATION.—1 mile below village of Charlemont, Franklin County.

DRAINAGE AREA.—362 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 19, 1913, to September 30, 1917.

GAGES.—Friez water-stage recorder on left bank, referred 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.—Bed covered with coarse gravel and boulders; section fairly uniform. Control practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 7.53 feet at 10.30 p. m. April 21 (discharge, 9,760 second-feet); minimum stage during year, from water-stage recorder, 1.41 feet at 10 a. m. August 7 (discharge, 34 second-feet).

1913–1917: Maximum stage recorded, 15.7 feet on July 8, 1915 (discharge by extension of rating curve, about 45,000 second-feet); minimum stage recorded, 1.35 feet on September 21 and November 3, 1914 (discharge, 23 second-feet).

ICE.—River is 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 as affected by ice. Rating curve well defined. Operation of the water-stage recorder satisfactory except for short periods as shown in the footnote to the daily-discharge table. Daily discharge ascertained by use of discharge integrator. Records excellent.

Discharge measurements of Deerfield River at Charlemont, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan 2	A. H. Davison	[a] 6.19	819	Feb. 24	H. H. Khachadoorian	[a] 4.94	596
22	H. H. Khachadoorian	[a] 5.09	530	Apr. 7	Hardin Thweatt	3.85	1,880
29	Hardin Thweatt	[a] 5.30	825				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Deerfield River at Charlemont, Mass., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	380	445	2,200	460	660	2,000	3,100	1,540	990	300	180	590
2	235	440	1,200	760	470	1,100	4,250	1,720	760	310	205	560
3	325	510	980	620	310	760	2,800	1,700	710	520	250	360
4	325	395	660	600	175	540	2,650	1,200	810	300	250	340
5	240	410	840	620	440	440	2,650	1,560	640	240	255	250
6	150	350	1,300	940	580	430	2,200	1,720	800	235	130	170
7	265	325	980	880	560	460	1,780	1,840	2,000	190	126	166
8	255	390	730	780	580	540	1,440	2,000	2,100	160	220	192
9	90	510	720	470	580	540	1,300	2,200	1,460	195	325	126
10	435	840	810	330	380	390	1,040	1,980	1,120	255	360	225
11	425	680	650	185	185	350	920	1,680	980	350	305	250
12	465	300	620	220	195	740	1,020	1,520	2,400	660	250	330
13	425	450	500	220	370	1,100	910	1,580	1,560	435	174	380
14	580	640	400	640	400	860	1,060	1,420	1,100	320	225	400
15	520	560	340	1,800	480	660	900	1,540	1,020	380	210	310
16	610	465	380	1,000	540	580	960	1,200	840	325	530	160
17	530	385	330	720	300	520	970	1,020	700	420	460	300
18	500	380	370	560	155	500	1,660	910	700	375	670	360
19	500	255	640	420	400	320	2,300	910	580	285	230	350
20	1,820	225	700	330	430	330	5,740	960	440	390	178	320
21	950	315	700	190	420	520	6,200	990	350	285	196	330
22	470	410	720	360	360	620	7,140	830	365	245	150	335
23	450	860	840	500	430	740	5,220	1,110	300	156	124	102
24	280	4,900	640	560	460	2,700	3,500	1,100	420	200	200	410
25	330	1,780	470	640	270	5,100	2,500	960	470	250	440	385
26	275	750	370	500	480	2,300	2,150	1,020	410	300	370	340
27	250	650	540	420	2,800	2,450	1,640	800	450	240	160	365
28	365	560	660	260	3,100	5,600	1,200	870	415	230	114	375
29	260	520	500	440	.....	2,600	1,340	2,500	400	220	166	210
30	375	2,700	380	640	.....	1,600	1,740	2,000	500	195	650	280
31	445	.....	260	660	.....	1,360	.....	1,280	.....	200	1,180	.....

NOTE.—Stage-discharge relation affected by ice Dec. 14–Mar. 25; discharge determined from study of gage-height graph, discharge measurements, and weather records. Discharge estimated because of no gage-height record Oct. 23–27, July 24, 25, 28, and Aug. 3–4.

Monthly discharge of Deerfield River at Charlemont, Mass., for the year ending Sept. 30, 1917.

[Drainage area, 362 square miles.]

Month.	Observed discharge. (Second-feet).			Gain or loss in storage at Somerset, Vt. (Millions of cubic feet).	Discharge corrected for storage. (Secont-feet).		Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.		Mean.	Per square mile.	
October	1,820	90	436	−369	298	0.823	0.95
November	4,900	225	747	+ 29	758	2.09	2.33
December	2,200	260	691	−130	642	1.77	2.04
January	1,800	185	572	−246	480	1.33	1.53
February	3,100	155	590	−448	405	1.12	1.17
March	5,100	320	1,250	+153	1,310	3.62	4.17
April	7,140	900	2,410	+541	2,620	7.24	8.08
May	2,500	800	1,410	+464	1,580	4.36	5.03
June	2,400	300	891	+268	994	2.75	3.07
July	660	156	296	− 71	270	.746	.86
August	1,180	114	299	− 59	277	.765	.88
September	590	102	309	−438	140	.387	.43
The year	7,140	90	821	306	814	2.25	30.54

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

DRAINAGE AREA.—201 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 20, 1912, to September 30, 1917.

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.—Bed rough; subject to aquatic vegetation during 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, 5.25 feet at 6 p. m. March 28 (discharge, 2,430 second-feet); a stage of 6.0 feet was recorded at 10 a. m. February 27, but the water was held back by an ice jam; minimum stage during year, from water-stage recorder, 1.45 feet at 4 p. m. September 30 (discharge, 21 second-feet).

1912–1917: 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 second-feet).

ICE.—River usually freezes over, and the stage-discharge relation is seriously affected by the ice; the large diurnal fluctuation in flow causes a variable backwater effect.

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, when affected by ice. Rating curve well defined. Operation of water-stage recorder satisfactory, except for short periods as shown in footnote to daily-discharge table. Daily discharge ascertained by use of discharge integrator. Records good.

Discharge measurements of Ware River at Gibbs Crossing, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 24	H. H. Khachadoorian..	[a] 3.16	223	Mar. 4	Hardin Thweatt.....	2.97	451
Feb. 26	.....do.....	[a] 3.94	382	Aug. 13	M. R. Stackpole.....	2.05	119

[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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	100	94	270	165	115	1,040	1,120	435	425	275	80	92
2	142	100	265	210	120	600	1,060	560	360	290	70	70
3	130	86	205	195	88	520	960	630	310	290	94	64
4	134	60	195	200	76	465	890	485	360	178	68	114
5	116	42	205	240	130	440	800	485	300	225	34	114
6	114	82	180	260	125	370	750	630	305	250	85	114
7	54	100	160	330	120	365	890	720	330	134	91	112
8	30	120	160	370	110	460	920	650	370	120	78	87
9	80	120	120	350	110	710	920	600	310	200	82	35
10	90	110	140	300	95	790	790	540	270	190	80	99
11	85	80	170	300	85	640	690	510	420	205	93	100
12	90	50	210	300	90	770	610	460	610	200	58	86
13	90	120	205	350	90	840	590	430	750	200	98	67
14	60	110	210	450	100	750	530	500	610	146	97	56
15	50	102	180	680	140	700	475	500	530	184	96	44
16	100	140	125	500	130	750	490	410	415	170	93	20
17	84	130	125	435	75	830	470	370	410	172	112	48
18	98	80	120	340	72	930	440	340	640	150	78	68
19	110	100	120	250	180	850	385	245	600	148	73	68
20	120	130	115	220	135	710	430	260	510	138	132	65
21	90	100	125	180	130	680	500	315	440	96	95	59
22	120	100	180	170	100	740	420	325	365	72	88	50
23	125	130	250	190	76	780	510	225	310	130	84	50
24	115	180	290	130	80	1,120	480	390	245	124	73	75
25	120	255	220	110	110	1,500	415	340	310	108	58	61
26	108	180	320	105	320	1,400	390	335	295	120	30	69
27	100	160	410	100	1,720	1,400	405	240	325	110	71	80
28	62	180	200	72	2,060	2,160	445	350	270	64	78	75
29	35	135	220	100	.....	2,160	380	530	245	29	114	50
30	94	145	200	120	.....	1,730	415	510	260	110	156	20
31	90	.....	180	90	.....	1,260	.....	490	.....	102	142	.....

NOTE.—Stage-discharge relation affected by ice Dec. 17–21, Dec. 30–Jan. 2, Jan. 12–13, and Jan. 20–Feb. 28; discharge for these periods determined from study of gage-height graph, discharge measurements, weather records, and comparison with similar studies for near-by streams. Discharge estimated June 1 and Sept. 22–24.

Monthly discharge of Ware River at Gibbs Crossing, Mass., for the year ending Sept. 30, 1917.

[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	30	94.7	0.471	0.54
November	255	42	117	.582	.65
December	410	115	196	.975	1.12
January	680	72	252	1.25	1.44
February	2,060	72	242	1.20	1.25
March	2,160	365	918	4.57	5.27
April	1,120	380	619	3.08	3.44
May	720	225	445	2.21	2.55
June	750	245	397	1.98	2.21
July	290	29	159	.791	.91
August	156	30	86.5	.430	.50
September	114	20	70.4	.350	.39
The year	2,160	20	300	1.49	20.27

SWIFT RIVER AT WEST WARE, MASS.

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

DRAINAGE AREA.—186 square miles (measured on topographic maps).

RECORDS AVAILABLE.—July 15, 1910, to September 30, 1917.

GAGES.—Barrett & Lawrence water-stage recorder on left bank, referred 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 foot bridge 600 feet upstream from the present station.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and alluvial deposits; some aquatic vegetation in channel during summer. Control practically permanent after change during high water of April 3, 1916, when part of dam was destroyed; 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, 7.9 feet some time between March 23 and April 1 (discharge, 1,800 second-feet); minimum stage during year, from water-stage recorder, 1.87 feet at 8 a. m. August 9 (discharge, 67 second-feet).

1910–1917: 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; stage-discharge relation somewhat affected by 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 exceeds 200 second-feet.

ACCURACY.—Stage-discharge relation practically permanent, except for a change during high water April 3, 1916, caused by the washing out of a portion of an old timber dam just above the station. Rating curve fairly well defined below 1,200 second-feet. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting gage-height graph or, for days of considerable fluctuation, by averaging the mean gage heights of 4-hour periods with corrections for ice during the winter. Records December 12, 1916, to March 25, 1917, only fair; good for remainder of year.

Discharge measurements of Swift River at West Ware, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 24	H. H. Khachadoorian	[a] 3.32	222	Mar. 5	Hardin Thweatt	[a] 4.05	352
Feb. 27	do	[a] 4.59	603	Aug. 13	M. R. Stackpole	2.27	123

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Swift River at West Ware, Mass., for the years ending Sept. 30, 1916 and 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915–16.												
1	89	101	156	665	625	985	1,590	560	255	214	455	164
2	96	104	152	591	565	840	1,740	545	245	192	322	146
3	110	101	137	518	490	770	1,770	530	225	214	252	128
4	109	102	128	444	460	690	1,590	515	238	262	209	121
5	110	104	121	397	420	635	1,380	470	288	325	182	112
6	130	100	117	447	390	625	1,200	434	350	440	170	118
7	127	98	115	420	365	590	1,110	416	380	425	157	121
8	154	98	120	394	340	545	970	425	380	312	158	115
9	182	84	117	368	315	470	900	440	338	262	198	109
10	188	85	109	355	305	460	848	410	320	288	216	107
11	156	85	109	332	290	440	830	350	338	262	223	110
12	149	86	98	324	280	395	865	308	485	238	218	97
13	130	82	94	314	265	420	935	262	500	225	202	97
14	121	84	82	330	255	410	1,040	232	440	238	184	97
15	127	110	100	292	250	360	1,120	245	350	202	164	113
16	145	123	101	280	245	340	1,110	312	345	162	157	230
17	141	143	112	255	240	335	1,040	440	425	153	148	298
18	136	166	215	240	235	320	935	690	515	153	135	308
19	127	168	402	220	230	300	848	882	605	162	123	280
20	136	194	550	210	210	320	725	830	690	135	106	245
21	143	225	610	210	215	300	690	655	708	131	118	216
22	137	277	550	187	220	300	672	545	638	144	97	182
23	136	232	447	410	220	290	708	470	545	190	109	170
24	127	210	376	475	230	300	778	440	440	240	144	252
25	109	184	333	505	290	275	812	410	374	209	178	290
26	101	156	595	505	830	370	795	380	440	220	184	308
27	109	150	848	610	1,200	535	725	350	455	345	176	282
28	96	145	1,100	742	1,100	785	638	312	365	605	168	245
29	107	143	1,000	830	1,000	900	605	295	312	830	194	228
30	100	150	812	742	.....	1,000	575	288	250	812	204	275
31	96	.....	738	672	.....	1,290	.....	275	.....	620	190	.....
1916–17.												
1	300	144	325	180	130	720	1,120	375	500	255	102	275
2	310	148	385	190	140	600	1,000	425	440	255	98	265
3	285	146	410	180	130	500	935	455	375	245	104	240
4	250	140	405	210	120	420	900	440	340	225	89	192
5	225	142	400	210	120	350	850	455	300	210	82	150
6	198	158	360	340	150	340	800	530	295	185	99	140
7	182	172	325	410	140	340	760	540	310	170	83	135
8	180	186	300	460	120	400	720	560	355	155	83	114
9	162	184	260	400	130	520	690	530	375	170	82	110
10	142	176	240	220	110	660	660	500	350	150	82	110
11	144	166	230	180	100	530	610	455	330	150	126	100
12	155	154	220	180	100	500	580	410	485	180	93	104
13	140	148	220	200	100	760	580	405	610	180	110	102
14	126	154	230	240	100	560	530	390	610	155	102	104
15	126	174	220	360	110	350	500	370	560	170	108	95
16	126	188	190	420	110	410	470	340	500	182	106	95
17	128	196	190	420	110	500	440	310	470	180	106	97
18	120	192	190	340	120	560	420	295	500	168	146	95
19	120	176	180	280	140	530	420	275	470	184	196	96
20	138	158	180	240	140	500	410	255	440	172	154	93
21	156	140	180	180	140	500	440	250	380	160	150	97
22	164	142	220	150	150	500	455	250	335	158	144	93
23	172	136	380	160	150	500	470	290	295	160	128	85
24	168	182	360	180	160	860	455	345	270	144	114	93
25	162	250	350	140	180	900	425	355	260	144	108	93
26	156	320	320	140	180	920	395	350	245	138	110	90
27	154	310	300	150	600	1,000	385	325	250	134	108	88
28	144	270	250	120	830	1,120	380	320	240	122	100	92
29	140	240	190	110	.....	1,260	380	410	225	116	99	88
30	140	230	180	130	.....	1,220	375	560	245	120	154	86
31	130	.....	180	130	.....	1,160	.....	560	.....	104	300	.....

NOTE.—1915–16: Stage-discharge relation affected by ice Jan. 7–10, 15–19, and Feb. 4–24; discharge determined from study of gage-height graph, discharge measurements, weather records, and comparison with similar studies for nearby streams. Discharge Dec. 31 to Jan. 3 and Feb. 24 to Mar. 29 estimated by comparison of records of flow of nearby streams. Determinations after Apr. 3 revised by means of data obtained in 1917; supersede those published in Water-Supply Paper 431.

1916–17: Stage-discharge relation affected by ice Dec. 12 to Mar. 25; discharge determined from study of gage-height graph, discharge measurements, and comparison with similar studies for nearby streams. Discharge Nov. 25, Mar. 26–31, Apr. 2–6, 8–19, May 7, July 5–15, and Sept. 6–7, estimated by hydrographic comparison with records of flow of nearby streams.

Monthly discharge of Swift River at West Ware, Mass., for the years ending Sept. 30, 1916–17.

[Drainage area, 186 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1915–16.					
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	575	985	5.30	5.91
May	882	232	442	2.38	2.74
June	708	225	408	2.19	2.44
July	830	131	297	1.60	1.84
August	455	97	185	.995	1.15
September	308	97	185	.995	1.11
The year	1,770	82	373	2.01	27.31
1916–17.					
October	310	120	169	.909	1.05
November	320	136	184	.989	1.10
December	410	180	270	1.45	1.67
January	460	110	234	1.26	1.45
February	830	100	172	.925	.92
March	1,260	340	645	3.47	4.00
April	1,120	375	585	3.15	3.51
May	560	250	398	2.14	2.47
June	610	225	379	2.04	2.28
July	255	104	169	.909	1.05
August	300	82	118	.634	.73
September	275	85	121	.651	.73
The year	1,260	82	288	1.55	20.96

NOTE.—Record for 1916 revised by means of data obtained during 1917; supersedes that published in Water-Supply Paper 431.

QUABOAG RIVER AT WEST BRIMFIELD, MASS.

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

DRAINAGE AREA.—150 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 23, 1909, to September 30, 1917.

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 bowlders, gravel, and alluvial deposits. Control shifts at infrequent intervals.

EXTREMES OF DISCHARGE.—Maximum open-water stage during year ending September 30, 1916, from water-stage recorder, 4.23 feet at 7.45 a. m. April 3 (discharge,[1] 1,250 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,[1] 26 second-feet).

Maximum open-water stage during year ending September 30, 1917, from water-stage recorder, 4.02 feet at 8:15 a. m. March 29 and 8.30 a. m. March 30 (discharge, 1,100 second-feet); a stage of 4.85 feet was recorded at 8.15 a. m. March 13, but the water was held back by an ice jam; minimum stage during year, from water-stage recorder, 1.57 feet at 12 noon September 30 (discharge, about 13 second-feet).

1909–1917: 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.—River usually freezes over; stage-discharge relation affected by ice. The large diurnal fluctuation in flow causes a variable effect from backwater.

REGULATION.—Flow affected by operation of power plants at West Warren, 3 miles above station, which at low stages causes 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 since change in March, 1916, except when affected by ice. Rating curve well defined. Operation of the water-stage recorder was satisfactory except for short periods as shown in the footnotes to daily-discharge tables. Daily discharge ascertained as follows: October 1, 1915, to March 28, 1916, by applying rating table to mean daily gage heights determined by planimeter; March 29, 1916, to September 30, 1917, by discharge integrator; with corrections for ice during the winter. Records good except for periods affected by ice, for which they are fair.

Discharge measurements of Quaboag River at West Brimfield, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 23	Hardin Thweatt	[a] 2.37	106	May 25	Hardin Thweatt	2.67	263
Jan. 25	do	[a] 3.78	219	Aug. 18	M. R. Stackpole	2.54	214
Mar. 3	do	[a] 4.18	407				

[a] Stage-discharge relation affected by ice.

[1] Revised determination; supersedes that published in Water-Supply Paper 431.

Daily discharge, in second-feet, of Quaboag River at West Brimfield, Mass., for the years ending Sept. 30, 1916 and 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915-16.												
1	59	101	103	340	380	774	1,080	510	240	225	455	130
2	61	96	98	293	360	756	1,100	470	225	215	430	110
3	56	87	98	270	350	749	1,140	455	200	240	395	114
4	63	87	96	200	270	709	1,120	475	210	225	370	114
5	78	98	65	350	350	682	1,080	445	210	220	340	138
6	94	81	105	417	325	661	1,020	420	235	210	325	120
7	100	69	87	391	325	640	930	410	225	200	310	114
8	110	87	83	365	230	575	870	405	230	180	325	122
9	110	94	67	340	293	483	840	365	245	176	350	93
10	94	83	73	315	250	444	790	350	270	188	320	104
11	118	69	73	340	250	423	780	325	310	184	310	132
12	110	71	60	293	145	407	770	275	355	174	295	104
13	100	69	73	302	145	380	740	285	360	172	280	97
14	101	46	90	293	210	340	780	280	360	172	260	93
15	105	105	110	176	175	315	800	280	350	150	240	110
16	110	94	125	270	175	293	770	270	335	152	220	184
17	90	89	176	250	145	293	740	460	390	160	220	172
18	100	87	210	230	175	270	670	475	420	150	210	178
19	110	110	401	200	175	250	610	440	445	142	194	178
20	110	154	284	230	175	250	610	420	475	132	186	168
21	120	133	250	250	175	250	580	415	455	168	190	164
22	130	145	210	297	175	270	580	400	440	144	170	160
23	130	125	210	380	175	250	620	385	415	210	152	144
24	110	118	222	401	175	250	610	375	385	215	176	146
25	136	110	238	370	210	280	580	345	380	210	160	150
26	125	130	391	391	797	320	560	325	395	245	146	128
27	123	98	306	417	688	450	530	300	355	465	144	120
28	113	98	455	407	783	570	550	290	325	620	162	120
29	110	125	455	380	774	660	540	280	290	530	152	120
30	91	110	325	385	.....	850	530	250	260	510	156	160
31	77	.....	293	385	.....	1,040	.....	255	.....	490	140	.....
1916-17.												
1	134	91	168	140	135	680	960	265	300	180	85	130
2	142	95	150	140	125	540	930	290	285	162	91	128
3	120	85	152	145	120	420	850	275	275	142	96	124
4	120	77	158	150	120	380	780	275	250	128	74	138
5	116	90	148	230	145	370	730	325	240	126	77	120
6	112	130	142	320	160	320	720	355	235	93	91	120
7	90	106	118	320	160	320	710	355	245	73	84	112
8	92	104	130	250	155	520	690	350	240	72	80	93
9	120	100	132	140	150	640	670	350	220	92	79	96
10	91	94	134	160	130	580	580	320	210	80	84	114
11	92	79	136	155	125	520	560	290	250	83	75	84
12	94	89	148	150	115	620	570	300	340	102	91	83
13	96	114	132	280	110	720	540	310	310	102	93	80
14	71	100	124	360	120	460	490	290	295	92	86	86
15	75	96	120	340	130	435	460	265	280	114	90	64
16	112	95	120	320	130	435	415	260	285	134	81	55
17	87	96	115	280	130	460	395	245	310	118	122	91
18	85	85	110	220	120	500	380	235	320	118	120	70
19	94	80	105	210	145	390	360	220	320	114	93	69
20	140	114	100	195	145	440	350	200	305	112	102	70
21	136	90	95	175	140	450	345	182	280	106	87	63
22	126	90	100	160	130	465	345	186	255	114	85	55
23	124	100	105	155	125	485	310	225	230	120	91	54
24	116	160	150	150	120	650	295	225	220	102	86	80
25	114	122	120	145	120	720	270	220	210	92	66	70
26	110	114	220	150	250	740	260	215	200	100	67	62
27	106	142	260	150	840	790	270	220	235	93	96	62
28	80	134	180	145	760	970	260	240	180	82	77	62
29	77	108	170	150	.....	1,000	265	340	134	74	85	43
30	110	140	170	140	.....	990	265	320	180	104	126	30
31	90	.....	155	130	.....	980	.....	310	.....	88	174	.....

NOTE.—1915-16: 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 determined for these periods from study of gage-height graph, discharge measurements, weather records, and comparison with similar studies for near-by streams. Discharge estimated Oct. 5, 7-9, 12, 13, 16-24, and Dec. 10-13. Records revised after Mar. 25, and supersede those published in Water-Supply Paper 431.

1916-17: Stage-discharge relation affected by ice Dec. 14-Mar. 13; discharge determined from study of gage-height graph, discharge measurements, weather records, and comparison with similar studies for near-by streams.

Monthly discharge of Quaboag River at West Brimfield, Mass., for the years ending Sept. 30, 1916 and 1917.

[Drainage area, 150 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1915–16.					
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	1,040	250	480	3.20	3.69
April	1,140	530	764	5.09	5.68
May	510	250	369	2.46	2.84
June	475	200	326	2.17	2.42
July	620	132	241	1.61	1.86
August	455	140	251	1.67	1.92
September	184	93	133	.887	.99
The year	1,140	46	298	1.99	27.01
1916–17.					
October	142	71	106	.707	.82
November	160	77	104	.693	.77
December	260	95	141	.940	1.08
January	360	130	199	1.33	1.53
February	840	110	184	1.23	1.28
March	1,000	320	580	3.87	4.46
April	960	260	501	3.34	3.73
May	355	182	273	1.82	2.10
June	340	134	255	1.70	1.90
July	180	72	107	.713	.82
August	174	66	91.4	.609	.70
September	138	30	83.6	.557	.62
The year	1,000	30	219	1.46	19.81

NOTE.—Determinations for 1916 revised by means of data obtained in 1917; supersede those published in Water-Supply Paper 431.

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 (measured on topographic maps).

RECORDS AVAILABLE.—August 26, 1909, to September 30, 1917.

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, 5.8 feet at 7 a. m. March 28 (discharge, 3,030 second-feet); minimum stage recorded, 0.81 foot several times in September (discharge, 16 second-feet).

1909–1917: Maximum open-water stage recorded, 8.9 feet on March 27, 1913 (discharge by extension of rating curve, about 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 and seriously affects the stage-discharge relation.

REGULATION.—Flow not seriously affected by regulation.

ACCURACY.—The 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 obtaining 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 was read once daily. Daily discharge ascertained by applying mean daily gage heights to rating table with corrections for ice during the winter. Records good.

Discharge measurements of Westfield River at Knightville, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 5	A. H. Davison	2.17	238	May 24	Hardin Thweatt	2.64	470
5	do	2.18	278	June 1	do	.57	398
Jan. 5	do	*a* 2.44	126	1	do	2.57	400
Feb. 5	do	*a* 2.40	99	Aug. 7	M. R. Stackpole	1.14	35.2
Mar. 2	do	*a* 4.12	386	7	do	1.12	34.0
28	Hardin Thweatt	5.27	2,590	17	do	1.02	28.1

a Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Westfield River at Knightville, Mass., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	222	94	730	120	140	640	1,520	412	412	200	50	55
2	125	129	395	195	110	420	1,690	595	390	172	47	52
3	97	104	272	165	90	310	1,280	512	345	167	55	47
4	88	97	238	140	88	240	1,120	435	305	138	57	45
5	82	139	255	110	82	180	1,120	460	265	117	50	37
6	73	182	255	680	100	165	980	980	655	103	44	30
7	64	174	207	520	90	180	1,120	780	910	92	43	27
8	66	153	185	270	82	240	1,120	715	1,120	81	37	30
9	60	143	196	250	74	400	845	655	568	81	41	37
10	55	166	291	240	74	270	655	540	460	89	47	33
11	54	151	158	220	68	210	595	460	1,050	107	43	30
12	54	134	207	120	68	270	568	435	1,690	625	30	27
13	54	104	185	155	60	500	540	435	1,360	215	27	23
14	54	123	156	290	60	350	485	345	780	147	31	22
15	82	174	139	920	60	310	512	285	980	157	29	22
16	66	125	135	780	60	270	460	285	540	162	29	22
17	60	101	135	640	60	350	435	248	485	138	30	22
18	56	114	130	580	60	400	595	230	412	152	28	22
19	56	114	130	370	60	240	625	200	345	305	29	21
20	238	116	120	220	74	210	1,120	200	305	248	27	21
21	171	116	120	165	74	210	1,050	183	215	145	23	19
22	129	114	155	155	60	350	980	200	200	115	22	18
23	92	121	450	130	48	560	780	655	180	103	20	19
24	82	1,050	330	120	68	980	625	485	230	87	41	18
25	77	291	270	110	60	2,140	485	390	265	73	65	18
26	80	185	195	100	82	1,690	435	265	197	70	39	17
27	77	148	120	90	920	1,780	435	230	265	76	30	17
28	73	158	165	82	980	2,730	485	248	230	68	24	18
29	70	169	155	82	.....	1,440	390	2,140	167	58	26	19
30	64	920	130	82	.....	1,050	485	1,050	655	58	68	21
31	61	.....	130	100	.....	910	.....	540	.....	56	68	.....

NOTE.—Stage-discharge relation affected by ice Dec. 16-Mar. 24; discharge determined from study of gage-height graph, discharge measurements, weather records, and comparison with similar study for Westfield River near Westfield.

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Monthly discharge of Westfield River at Knightville, Mass., for the year ending Sept. 30, 1917.

[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	238	54	86.5	0.534	0.62
November	1,050	94	197	1.22	1.36
December	730	120	217	1.34	1.54
January	920	82	265	1.64	1.89
February	980	48	138	.852	.89
March	2,730	165	645	3.98	4.59
April	1,690	390	784	4.84	5.40
May	2,140	183	503	3.10	3.57
June	1,690	167	533	3.29	3.67
July	625	56	142	.877	1.01
August	68	20	38.7	.239	.28
September	55	17	27.0	.167	.19
The year	2,730	17	298	1.84	25.01

WESTFIELD RIVER NEAR WESTFIELD, MASS.

LOCATION.—At point known locally as Trap Rock Crossing, about 3 miles east of Westfield, Hampden County, 1 mile below mouth of Big Brook, and 2 miles below mouth of Westfield Little River.

DRAINAGE AREA.—496 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 27, 1914, to September 30, 1917.

GAGES.—Stevens continuous water-stage recorder on right bank, referred to gage datum by means of a hook gage inside the well; an inclined staff gage is used for auxiliary readings.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed covered with gravel and alluvial deposits. Riffle of bowlders 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, 14.46 feet at 2.30 a. m. March 28 (discharge by extension of rating curve, about 13,000 second-feet); minimum stage during year from water-stage recorder, 3.23 feet at 1 p. m. October 15, 1916, and 2 a. m. September 23 (discharge, 103 second-feet).

1914–1917: Maximum stage recorded, 17.4 feet on August 4, 1915 (discharge by extension of rating curve, about 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 when affected by ice; slight change about April 1. Rating curves well defined below 7,500 second-feet. Operation of water-stage recorder satisfactory except for short periods as shown in the footnote to the daily-discharge table. Daily discharge ascertained by discharge integrator. Records excellent.

Discharge measurements of Westfield River near Westfield, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 6	A. H. Davison	4.44	683	Aug. 14	M. R. Stackpole	3.52	172
Feb. 2	do	a 4.27	435	14	do	3.47	170

a Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Westfield River near Westfield, Mass., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	640	250	1,780	460	480	2,200	3,700	1,060	1,350	670	210	330
2	485	270	1,060	560	460	1,320	5,200	1,560	1,200	600	184	335
3	310	325	790	490	450	1,020	3,200	1,360	1,100	530	205	215
4	295	260	710	500	290	830	2,850	1,100	1,020	385	215	240
5	290	265	660	560	400	790	2,850	1,400	830	445	235	295
6	270	560	650	940	390	670	2,800	2,250	1,200	360	178	210
7	250	505	600	1,220	380	600	2,750	2,200	2,100	365	205	190
8	300	380	550	1,010	340	660	2,700	1,900	2,500	330	180	200
9	192	420	505	830	320	820	2,300	1,720	1,500	315	154	275
10	184	405	630	760	290	880	1,800	1,420	1,180	325	305	185
11	184	470	590	660	290	780	1,540	1,220	1,980	370	280	162
12	200	335	590	680	280	840	1,600	1,100	3,750	620	220	156
13	225	320	610	620	270	1,200	1,480	1,080	2,450	640	180	162
14	260	325	480	930	270	1,140	1,440	1,020	1,720	540	180	172
15	162	400	435	1,840	260	950	1,360	900	2,500	380	140	176
16	310	360	370	1,340	260	930	1,320	810	1,660	485	220	200
17	250	325	460	1,080	250	1,050	1,200	800	1,450	480	172	178
18	196	285	400	860	250	1,220	1,420	750	1,250	480	158	154
19	240	310	420	770	240	1,040	1,520	720	1,000	520	210	140
20	455	370	430	680	220	840	2,050	630	850	630	180	146
21	620	330	430	570	220	900	2,350	640	750	700	186	130
22	365	250	490	610	210	1,060	2,250	610	640	530	180	136
23	360	295	1,280	640	200	1,320	1,820	1,200	590	480	180	160
24	225	1,940	1,140	510	220	2,900	1,500	1,360	580	450	230	128
25	260	1,140	980	490	260	3,650	1,260	1,000	770	420	215	134
26	275	620	1,000	500	390	3,800	1,120	830	620	380	230	136
27	220	520	650	560	1,400	5,200	1,180	720	730	295	235	140
28	285	490	630	370	3,930	8,700	1,220	750	720	300	220	152
29	250	500	610	480	.....	4,100	1,000	4,800	590	380	192	120
30	245	1,560	570	460	.....	3,000	980	2,400	950	200	335	175
31	235	.....	460	460	.....	2,400	.....	1,600	.....	215	335	.....

NOTE.—Stage-discharge relation affected by ice Feb. 1–26; discharge determined from study of gage-height graph, one discharge measurement, weather records, and comparison with similar study for Westfield River at Knightville. No gage-height record Apr. 6–7, May 28–31, June 1–2, and 17–23; discharge estimated.

Monthly discharge of Westfield River near Westfield, Mass., for the year ending Sept. 30, 1917.

[Drainage area, 496 square miles.]

Month.	Observed discharge in second-feet.			Diversion from Westfield Little River in millions of gallons.	Total discharge in second-feet.		Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.		Mean.	Per square mile.	
October	620	162	291	397.9	311	0.627	0.72
November	1,940	250	493	356.8	511	1.03	1.15
December	1,780	370	676	360.9	694	1.40	1.61
January	1,840	370	724	373.9	743	1.50	1.73
February	3,930	200	472	348.7	491	.990	1.03
March	8,700	600	1,830	369.2	1,850	3.73	4.30
April	5,200	980	1,990	354.6	2,010	4.05	4.52
May	4,800	610	1,340	360.7	1,340	2.70	3.11
June	3,750	580	1,320	370.8	1,340	2.70	3.01
July	700	200	446	385.7	465	.938	1.08
August	335	140	211	416.2	232	.468	.54
September	335	120	184	381.8	204	.411	.46
The year	8,700	120	831	4,477.2	850	1.71	23.26

NOTE.—The effect of storage in Borden Brook Reservoir not taken into account in computing 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 (measured on topographic maps).

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

GAGES.—Water-stage recorder on upstream side of bridge abutment on right bank, referred to gage datum by means of a 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.—Bed covered with coarse gravel and boulders. Control somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 3.82 feet at 6 p. m. April 1 (discharge, 1,330 second-feet); minimum stage during year, from water-stage recorder, 0.76 foot at 10 a. m. September 29 (discharge, 4.8 second-feet).

1910–1917: Maximum open-water stage recorded, 7.33 feet at 9 p. m. July 8, 1915 (discharge by extension of rating curve, about 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 causing several feet of backwater occasionally form below the gage.

REGULATION.—Flow somewhat affected at times by operation of small power plant about 2 miles above station.

ACCURACY.—Stage-discharge relation changed during high water in March, 1917; seriously affected by ice from December to March. Rating curve used to March 24, 1917, well defined below 400 second-feet by discharge measurements and is very nearly parallel to preceding curve; above 400 second-feet the new curve was extended as a parallel curve; rating curve used March 24 to September 30, fairly well defined by discharge measurements up to 1,000 second-feet. Operation of water-stage recorders not entirely satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting recorder graph, except for periods as noted in footnote to daily discharge table. Records fair.

Discharge measurements of Middle Branch of Westfield River at Goss Heights, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 4	A. H. Davison	1.24	62	Mar. 30	Hardin Thweatt	2.12	313
4	do	1.23	62	May 23	do	1.78	177
Jan. 5	do	[a] 1.84	46.0	23	do	1.79	181
26	Hardin Thweatt	[a] 2.66	40.9	Aug. 8	M. R. Stackpole	.81	6.8
Feb. 3	A. H. Davison	[a] 2.54	27.8	8	do	.81	6.8
Mar. 1	do	[a] 3.48	177	17	do	.83	7.2
28	Hardin Thweatt	3.22	927				

[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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	60	28	143	25	40	175	759	112	104	37	8.0	10
2	35	43	110	86	33	145	642	186	98	35	8.0	8.5
3	30	35	84	78	28	105	428	123	86	28	9.0	8.0
4	28	28	70	62	27	72	365	90	70	24	10	7.5
5	25	43	82	46	26	74	328	182	61	21	8.0	7.5
6	20	62	82	250	25	78	314	260	162	18	7.0	7.5
7	18	56	70	160	22	82	340	235	328	17	7.0	7.0
8	17	48	58	82	20	120	350	219	296	17	6.5	9.0
9	16	43	62	62	17	160	270	182	142	15	7.0	8.5
10	15	48	105	52	16	130	175	129	139	14	8.5	8.0
11	15	43	52	28	14	105	139	109	346	19	8.5	8.0
12	14	34	72	26	13	145	142	101	532	44	8.0	8.0
13	13	27	62	35	12	190	129	95	235	35	7.5	7.0
14	12	31	58	62	11	160	129	79	252	25	7.5	7.0
15	25	43	54	380	10	145	120	66	305	24	7.0	7.5
16	15	32	50	300	10	130	109	56	172	32	7.0	6.0
17	14	38	46	190	9.5	160	109	51	139	33	7.5	7.0
18	14	28	43	130	9.0	190	162	47	104	37	8.0	6.0
19	16	35	40	94	8.5	130	215	44	77	44	8.0	5.4
20	64	32	37	72	8.0	82	365	41	61	54	8.0	5.7
21	40	31	35	62	8.0	43	332	37	48	28	7.5	5.4
22	27	28	82	58	7.5	82	296	44	40	21	7.5	5.7
23	24	43	220	52	7.5	160	197	132	34	17	7.0	5.7
24	22	380	145	62	10	260	142	104	43	14	7.0	5.7
25	20	160	105	43	17	400	104	70	41	14	8.5	5.4
26	25	92	62	41	62	435	86	60	30	12	9.0	5.4
27	22	90	43	28	385	465	101	60	54	12	7.5	5.4
28	20	92	62	26	435	880	104	83	37	11	6.5	5.4
29	18	66	46	24	.....	400	86	658	33	10	6.5	6.5
30	17	380	37	35	.....	320	93	256	70	10	9.5	6.0
31	16	.....	28	52	.....	310	.....	142	.....	9.0	13	.....

NOTE.—Stage-discharge relation affected by ice Dec. 15–Mar. 24; discharge determined from study of gage-height graph, discharge measurements, weather records, and comparison with similar study for Westfield River at Knightville. Discharge estimated by comparison with Westfield River at Knightville, because of no gage-height record Oct. 1–15, 24–31, Nov. 1–9, 20–25, 30, Dec. 5–14; Mar. 26–29, Apr. 7–10, July 1–2, 17, and Aug. 4–7.

Monthly discharge of Middle Branch of Westfield River at Goss Heights, Mass., for the year ending Sept. 30, 1917.

[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	64	12	23.1	0.436	0.50
November	380	27	71.3	1.35	1.51
December	220	28	72.4	1.37	1.58
January	380	24	87.2	1.65	1.90
February	435	7.5	45.7	.862	.90
March	880	43	204	3.85	4.44
April	759	86	238	4.49	5.01
May	658	37	131	2.47	2.85
June	532	30	138	2.60	2.90
July	54	9.0	23.6	.445	.51
August	13	6.5	7.92	.149	.17
September	10	5.4	6.86	.129	.14
The year	880	5.4	87.5	1.65	22.41

WESTFIELD LITTLE RIVER NEAR WESTFIELD, MASS.

LOCATION.—At diversion dam of Springfield waterworks, in town of Russell, Hampden County, 3 miles below 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, 1917.

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 storages 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, 880 second-feet, March 27; minimum discharge for 24 hours recorded, 1.2 second-feet, October 16.

1909–1917: 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.

[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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	80.4	28.1	160	40.2	37.7	123	584	115	111	37.7	15.6	19.8
2	58.1	29.4	109	43.9	32.3	55.5	651	163	112	31.8	6.9	17.7
3	34.8	20.4	91.0	39.7	32.9	78.5	462	128	116	26.5	14.2	15.8
4	27.3	20.1	64.4	39.8	42.3	57.4	412	107	96.3	21.4	12.6	15.1
5	31.9	79.4	66.0	50.0	42.5	49.4	396	199	76.9	18.0	10.4	13.3
6	19.3	72.0	57.8	134	43.2	40.5	371	335	92.0	15.4	9.7	12.6
7	27.6	40.9	51.3	119	41.8	27.7	465	334	146	15.1	13.3	12.0
8	25.9	48.3	43.5	102	35.1	20.0	374	267	128	6.3	13.4	13.1
9	10.0	31.0	45.9	86.5	34.0	13.4	290	213	99.6	9.1	12.1	12.2
10	6.6	28.2	54.4	81.1	36.7	7.9	231	145	96.0	15.8	22.6	13.2
11	6.3	35.1	46.3	61.0	33.4	11.6	183	126	210	40.8	15.0	11.8
12	10.0	22.6	54.6	42.6	33.6	15.2	190	106	321	48.1	10.8	11.4
13	10.4	32.6	51.3	63.1	34.6	23.5	174	108	219	28.0	12.0	10.8
14	24.8	22.6	37.0	479	35.2	23.5	152	88.0	167	31.0	10.4	8.8
15	19.6	33.0	31.4	289	35.1	27.7	149	82.9	172	20.1	10.3	8.3
16	1.2	18.3	35.7	159	35.8	31.5	145	74.7	119	19.0	10.3	10.2
17	5.0	20.8	39.4	118	35.9	45.8	135	51.6	107	21.7	10.6	10.5
18	8.3	19.0	47.8	97.0	28.6	57.4	158	47.0	82.9	28.9	9.5	10.5
19	20.4	19.0	43.9	87.2	26.1	45.3	188	45.6	73.3	34.3	9.2	10.0
20	40.7	18.1	33.8	62.4	25.9	38.0	216	42.9	58.1	18.9	8.4	10.1
21	101	25.3	33.7	51.8	25.9	40.2	242	41.6	39.4	17.2	9.2	11.7
22	48.4	18.1	146	50.3	23.7	93.8	374	62.7	39.6	13.5	8.8	10.5
23	46.2	97.4	154	38.0	25.6	142	310	204	35.3	14.7	12.6	6.4
24	28.7	241	121	35.5	40.8	291	199	136	31.1	17.4	17.6	7.0
25	24.5	109	104	35.0	32.4	281	142	112	28.4	20.8	10.1	6.8
26	19.8	88.3	80.2	31.4	36.6	375	124	86.6	27.7	16.5	8.3	6.6
27	19.1	57.1	76.2	34.2	229	880	125	107	48.1	16.0	12.2	6.5
28	19.6	47.0	65.7	33.9	272	639	117	134	35.7	11.6	11.7	7.2
29	18.6	64.0	47.7	32.8	.....	421	104	464	38.2	17.2	21.5	7.3
30	10.5	171	42.7	32.9	.....	291	99.7	268	56.7	12.9	28.2	8.6
31	19.4	.....	38.2	30.4	.....	174	.....	158	.....	11.1	24.0	.....

Monthly discharge of Westfield Little River near Westfield, Mass., for the year ending Sept. 30, 1917.

[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	101	1.2	26.6	0.554	0.64
November	241	18.1	51.9	1.08	1.20
December	160	31.4	66.9	1.39	1.60
January	479	30.4	83.9	1.75	2.02
February	272	23.7	49.6	1.03	1.07
March	880	7.9	142	2.96	3.41
April	651	99.7	259	5.39	6.01
May	464	41.6	147	3.06	3.53
June	321	27.7	99.4	2.07	2.31
July	48.1	6.3	21.2	.442	.51
August	28.2	6.9	12.9	.269	.31
September	19.8	6.4	10.9	.227	.25
The year	880	1.2	80.9	1.69	22.86

BORDEN BROOK NEAR WESTFIELD, MASS.

LOCATION.—At outlet of Borden Brook reservoir in town of Granville, 2 miles above 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, 1917.

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, 187 second-feet on March 27; 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.

1910–1917: 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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	.....	24.2	4.2	1.4	26.2	103	22.5	15.0	.....	.....	.....
2	10.8	9.3	9.7	2.8	1.2	11.8	103	22.5	20.4	.....	.....	.....
3	.....	.....	12.7	2.8	.5	15.6	59.4	22.5	18.5	.....	.....	.....
4	.....	.....	.....	2.6	.3	12.2	75.5	22.5	16.2	.....	.....	.....
5	10.8	23.2	7.4	1.7	.2	1.2	72.9	57.2	13.3	.....	.....	.....
6	.....	10.8	6.3	17.6	.2	8.6	72.9	63.3	14.5	.....	.....	.....
7	10.8	.....	3.3	14.5	.2	5.8	73.7	57.6	20.4	.....	.....	.....
8	.....	10.8	.....	12.2	.2	4.2	70.3	48.4	21.6	.....	.....	.....
9	3.4	.....	.....	10.5	.2	2.8	57.7	49.8	18.5	3.9	.....	.....
10	.....	.....	.....	10.5	.2	1.7	65.3	33.1	17.3	.....	.....	.....
11	.....	10.8	.....	.2	.1	.....	45.3	35.5	52.0	12.9	.....	.....
12	.....	.....	.....	7.6	.1	3.2	42.3	18.2	49.5	.....	.....	.....
13	.....	10.8	.....	20.2	.1	5.0	38.6	21.1	47.8	.....	.....	.....
14	.....	.....	.....	30.6	.1	5.0	24.9	9.4	44.7	9.3	.....	.....
15	.....	10.8	.....	26.2	.1	5.8	31.9	17.6	30.8	.....	.....	.....
16	.....	.....	.....	22.3	.2	6.7	28.6	6.6	23.1	.....	.....	.....
17	.....	.....	.....	7.0	.2	9.7	17.2	.....	18.5	.....	.....	.....
18	3.2	.....	.....	1.4	.2	12.2	25.6	.....	13.4	.....	.....	.....
19	.....	.....	.....	7.6	.2	9.6	24.6	.....	17.3	9.3	.....	.....
20	5.8	.....	.....	5.8	.2	8.1	65.9	.....	15.0	.....	.....	.....
21	10.8	10.8	.....	4.6	.1	8.6	74.8	.1	.4	.....	.....	.....
22	.....	.....	20.8	3.9	.1	19.9	54.5	14.1	6.2	.....	.....	.....
23	10.8	51.0	15.0	2.8	.1	30.1	50.2	35.1	5.4	.....	.....	.....
24	.....	27.8	17.3	2.2	.1	62.0	47.2	12.3	4.2	5.1	.....	.....
25	.....	.....	15.0	.....	.1	59.9	42.3	17.4	3.5	.....	.....	.....
26	.....	27.8	12.7	.....	9.3	79.7	39.2	3.0	3.1	.....	.....	.....
27	.....	9.3	11.6	.....	24.4	187	23.8	20.4	2.8	.....	.....	.....
28	.....	.....	.....	.....	28.9	136	17.9	44.3	3.5	.....	.....	.....
29	.....	18.6	6.0	.....	.....	89.5	23.3	37.9	3.5	.....	.....	.....
30	.....	19.0	5.9	.7	.....	62.0	22.5	20.4	.....	.....	.....	.....
31	7.5	.....	5.0	1.1	.....	37.0	.....	24.9	.....	.....	.....	.....

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, 1917.

[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	10.8	.....	2.38	0.298	0.34
November	51.0	.....	8.36	1.04	1.16
December	24.2	.....	5.58	.698	.80
January	30.6	.....	7.21	.901	1.04
February	28.9	.....	2.47	.309	.32
March	187	.....	29.9	3.74	4.31
April	103	17.2	39.8	4.98	5.56
May	63.3	.....	23.8	2.98	3.44
June	52.0	.....	17.3	2.16	2.41
July	12.9	.....	1.31	.164	.19
August	.....	.....	.....	.....	.....
September	.....	.....	.....	.....	.....
The year	187	.....	12.4	1.55	19.57

NOTE.—For months for which no minimum is given, see footnote to daily discharge table.

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, Berskhire County.

DRAINAGE AREA.—92.7 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 27, 1913, to September 30, 1917.

GAGES.—Barrett & Lawrence water-stage recorder on left bank, downstream side of bridge, referred to gage datum by a hook gage inside the well. Vertical staff on bridge abutment is used for auxiliary readings.

DISCHARGE MEASUREMENTS.—Made from from a cable or by wading.

CHANNEL AND CONTROL.—Bed rocky, covered 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, 6.5 feet at 11 p. m. March 27 (discharge, 1,900 second-feet); a stage of 7.9 feet was recorded at 4 p. m. January 14, but the water was held back by an ice jam; minimum stage during year, from water-stage recorder, 2.54 feet at 4 a. m. September 6 (discharge, 18 second-feet).

1913–1917: Maximum open-water stage from water-stage recorder, 7.64 feet on October 26, 1913 (discharge, by extension of rating curve, about 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; stage-discharge relation seriously affected. 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 using water power just above the station.

ACCURACY.—Stage-discharge relation practically permanent except when affected by ice. Rating curve well defined below 1,700 second-feet. Operation of water-stage recorder satisfactory except for short periods as shown in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting gage height graph, or, for days of considerable fluctuation, by averaging the means of 4-hour periods. Winter records only fair; those for open-water periods good.

The following discharge measurement was made by H. H. Khachadoorian:

January 26, 1917: Gage height, 6.14 feet; discharge, 170 second-feet; stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Farmington River near New Boston, Mass., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	75	93	302	98	105	300	840	197	141	81	48	20
2	62	102	197	90	105	160	980	224	131	65	49	21
3	55	98	141	78	120	130	710	197	141	63	50	22
4	53	94	120	78	140	110	575	162	122	60	93	22
5	52	141	108	120	160	98	525	224	102	54	107	20
6	52	162	104	185	160	120	455	356	131	49	131	19
7	65	131	93	240	150	110	500	375	238	41	131	27
8	141	122	80	185	140	130	415	320	238	36	131	65
9	141	122	82	140	120	220	375	286	185	36	151	107
10	141	112	88	140	105	120	286	238	131	36	173	99
11	141	60	84	130	90	98	238	210	162	42	98	102
12	141	48	93	120	78	130	254	197	455	70	131	102
13	141	60	87	120	64	140	238	185	415	54	131	100
14	141	131	86	300	60	130	238	162	269	46	122	102
15	141	141	86	500	64	130	224	151	302	50	120	116
16	151	131	76	460	78	140	210	151	286	73	118	116
17	151	122	76	240	64	150	185	141	224	55	114	114
18	141	122	74	120	60	140	238	141	185	94	104	112
19	141	122	68	54	110	130	254	108	162	85	77	112
20	197	122	70	64	98	120	337	99	131	94	122	110
21	173	122	84	160	78	140	395	91	110	75	122	114
22	63	120	105	185	64	130	435	94	94	63	122	112
23	41	300	195	140	98	170	395	173	82	68	122	112
24	100	269	175	140	120	435	320	173	71	94	131	118
25	104	173	130	160	50	575	238	141	63	77	75	122
26	105	112	105	160	120	625	197	116	60	58	64	122
27	105	99	105	160	340	945	197	116	63	49	102	120
28	102	82	105	140	400	1,310	197	141	91	44	107	118
29	98	131	105	120	.....	875	162	84	68	39	108	114
30	94	254	98	105	.....	600	162	269	81	36	122	87
31	98	.....	90	78	.....	480	.....	210	.....	44	31	.....

NOTE.—Stage-discharge relation affected by ice Dec. 15–Mar. 22; discharge determined from study of gage-height graph, one discharge measurement, weather records, and comparison with similar studies for nearby streams. Discharge Nov. 22 and 23 estimated by comparison with Housatonic River near Great Barrington.

Monthly discharge of Farmington River near New Boston, Mass., for the year ending Sept. 30, 1917.

[Discharge 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	197	41	110	1.19	1.37
November	300	48	130	1.40	1.56
December	302	68	110	1.19	1.37
January	500	54	162	1.75	2.02
February	400	50	119	1.28	1.33
March	1,310	98	293	3.16	3.64
April	980	162	359	3.87	4.32
May	375	84	185	2.00	2.31
June	455	60	164	1.77	1.98
July	94	36	59.1	.638	.74
August	173	31	107	1.15	1.33
September	122	19	88.2	.951	1.06
The year	1,310	19	157	1.69	23.03

HOUSATONIC RIVER BASIN.

HOUSATONIC RIVER NEAR GREAT BARRINGTON, MASS.

LOCATION.—At highway bridge about a quarter of a 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 (measured on topographic maps).

RECORDS AVAILABLE.—May 17, 1913, to September 30, 1917.

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, 6.9 feet from 8.30 a. m. March 28 to 8.30 a. m. March 29 (discharge, 4,200 second-feet); minimum stage recorded, 0.7 foot at 8 a. m. September 27 (discharge, 13 second-feet).

1913–1917: Maximum stage recorded, 8.0 feet on March 31, 1916 (discharge from extension of rating curve, about 5,300 second-feet). Zero flow recorded at various times caused by storage of water at dams above.

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

REGULATION.—Storage above dam of a paper mill about a mile above station causes low flow on Sundays and holidays.

ACCURACY.—Stage-discharge relation practically permanent since change during the high water of December 1, 1916; affected by ice for a few days in February. Rating curve used to November 30, fairly well defined by discharge measurements below 1,400 second-feet and by shape of old curve; rating curve used from December 1 to September 30 well defined below 2,000 second-feet. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

Discharge measurements of Housatonic River near Great Barrington, Mass., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 12	Hardin Thweatt	1.28	96	Aug. 9	M. R. Stackpole	1.84	274
Jan. 7	A. H. Davison	2.25	468	9	do	1.69	210
7	do	2.32	503				

Daily discharge, in second-feet, of Housatonic River near Great Barrington, Mass., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	220	205	1,270	335	335	1,130	1,810	570	570	485	92	175
2	260	190	1,060	380	380	720	2,740	458	512	540	160	85
3	260	190	485	295	315	570	2,830	720	315	380	190	155
4	300	220	512	335	205	430	2,380	720	315	98	175	138
5	190	62	430	405	430	815	1,890	690	380	205	63	190
6	175	112	540	570	295	600	1,650	630	540	220	135	158
6	160	160	380	458	315	275	1,650	850	720	190	92	190
8	132	205	512	540	358	405	1,200	815	990	135	87	160
9	116	300	485	630	150	570	1,200	850	660	255	190	83
10	140	280	335	660	135	458	920	780	430	255	175	132
11	190	140	295	630	135	190	920	600	690	190	83	160
12	150	190	600	405	190	630	780	600	815	205	58	175
13	120	175	570	485	135	720	720	458	750	255	135	175
14	150	190	358	780	160	660	690	458	660	255	175	125
15	116	280	380	1,530	220	600	570	540	720	255	175	92
16	190	260	405	1,240	380	660	630	485	630	175	108	69
17	140	240	190	1,100	160	750	600	358	485	160	160	122
18	130	220	295	920	87	720	600	458	430	295	160	122
19	160	73	405	750	512	660	600	295	485	380	85	105
20	175	205	335	458	295	512	815	155	380	458	85	101
21	205	220	405	160	205	600	990	275	380	295	175	115
22	160	220	335	458	190	750	1,060	238	380	358	71	75
23	140	190	720	238	315	690	990	358	275	295	81	98
24	160	240	540	315	600	1,490	815	430	255	275	138	79
25	160	550	430	255	122	1,890	720	485	275	255	135	130
26	175	365	512	238	335	2,290	600	380	295	190	71	145
27	175	240	512	190	720	2,650	570	190	335	238	112	29
28	150	175	540	77	1,340	4,200	570	295	405	145	130	205
29	57	365	458	358	.....	4,100	458	690	458	87	140	220
30	122	850	380	275	.....	3,190	485	750	380	220	130	69
31	160	.....	275	190	.....	2,130	.....	630	.....	190	145	.....

NOTE.—Stage-discharge relation affected by ice Feb. 10–18; discharge determined from study of gage heights, observer's notes, and weather records.

Monthly discharge of Housatonic River near Great Barrington, Mass., for the year ending Sept. 30, 1917.

[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	300	57	166	0.593	0.68
November	850	62	244	.871	.97
December	1,270	190	482	1.72	1.98
January	1,530	77	505	1.80	2.08
February	1,340	87	322	1.15	1.20
March	4,200	190	1,160	4.14	4.77
April	2,830	458	1,080	3.86	4.31
May	850	155	523	1.87	2.16
June	990	255	497	1.78	1.99
July	540	87	256	.914	1.05
August	190	58	126	.450	.52
September	220	29	129	.461	.51
The year	4,200	29	459	1.64	22.22

HOUSATONIC RIVER AT FALLS VILLAGE, CONN.

LOCATION.—About half a mile below power plant of Connecticut Power Co. at Falls Village, Litchfield County, 23 miles north of Gaylordsville.

DRAINAGE AREA.—644 square miles (authority, Stone & Webster).

RECORDS AVAILABLE.—July 11, 1912, to September 30, 1917.

GAGES.—Stevens continuous water-stage recorder on left bank; staff and hook gages 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 or from cable installed October 18, 1916, 150 feet above gage.

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, 10.40 feet at 10 a. m. March 29 (discharge, 6,000 second-feet); minimum stage, from water-stage recorder, 0.28 foot at 6.30 p. m. October 15 (discharge, practically zero).

1912–1917: 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 seriously affected by ice.

REGULATION.—Low-water flow completely regulated by the power plant at Falls Village.

ACCURACY.—Stage-discharge relation practically permanent, except when affected by ice. Rating curve for chain gage well defined between 200 and 3,000 second-feet; above 3,000 second-feet, curve is 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 correction for slope between the two gages. Operation of water-stage recorder satisfactory. Daily discharge ascertained by use of discharge integrator. Records excellent.

COOPERATION.—All discharge measurements and computations prior to March 1, 1916, furnished by Stone & Webster.

Discharge measurements of Housatonic River at Falls Village, Conn., during the year ending Sept. 30, 1017.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 14	Hardin Thweatt	1.97	404	Mar. 29	Hardin Thweatt	10.41	6,020
14	do	1.96	410	29	do	10.42	6,300
Jan. 6	A. H. Davison	[a] 4.49	1,380	31	do	9.02	4,830
28	H. H. Khachadoorian	[a] 2.13	299	Aug. 10	M. R. Stackpole	2.58	626
Mar. 5	A. H. Davison	[a] 5.38	1,320				

[a] Stage discharge relation affected by ice.

Daily discharge, in second-feet, of Housatonic River at Falls Village, Conn., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	530	315	2,050	600	660	2,100	4,000	1,300	1,340	690	360	500
2	580	305	1,960	660	700	1,700	4,050	1,300	960	920	415	310
3	540	400	1,520	630	540	1,300	4,300	1,420	530	740	330	122
4	580	380	1,320	420	180	860	4,200	1,320	1,040	350	280	245
5	500	270	990	670	520	880	3,750	1,260	710	680	70	305
6	445	405	1,060	940	560	720	3,350	2,050	830	570	335	330
7	540	500	820	1,100	470	880	3,330	1,880	1,110	460	325	290
8	250	420	840	1,150	360	820	3,150	1,700	1,480	220	345	290
9	315	370	850	890	490	1,150	2,700	1,660	1,600	400	320	72
10	310	435	530	840	600	1,000	2,250	1,560	1,440	400	310	320
11	350	445	870	760	350	880	2,000	1,440	1,440	385	270	330
12	345	240	770	1,100	540	1,350	1,820	1,280	1,400	560	67	315
13	365	430	830	940	490	1,400	1,660	1,200	1,560	510	295	365
14	380	360	760	1,350	480	1,450	1,540	1,380	1,420	550	305	265
15	125	480	670	2,500	300	1,400	1,440	1,140	1,460	295	310	250
16	345	440	650	2,200	420	1,400	1,520	1,020	1,360	810	345	66
17	270	360	660	2,000	490	1,380	1,300	970	1,200	630	345	255
18	290	480	630	1,700	215	1,540	1,220	960	1,280	720	275	240
19	360	255	550	1,300	390	1,740	1,260	810	1,020	810	70	230
20	440	350	580	1,200	370	1,500	1,340	325	960	900	325	215
21	600	420	560	760	430	1,320	1,460	940	790	990	275	180
22	285	360	580	940	400	1,280	1,840	790	790	440	275	112
23	475	445	840	880	400	1,600	1,760	620	665	820	255	60
24	440	910	1,250	820	560	2,550	1,580	810	210	550	245	192
25	435	1,180	1,150	780	320	3,550	1,480	870	600	530	235	186
26	335	650	1,200	720	480	4,100	1,280	830	660	560	40	188
27	340	730	900	780	2,500	4,210	1,240	385	710	470	215	215
28	430	670	860	410	2,500	4,750	1,200	1,020	850	425	250	200
29	265	640	840	660	.....	5,800	840	1,200	770	200	330	172
30	260	890	740	620	.....	5,700	1,360	1,300	850	540	465	98
31	290	.....	570	580	.....	4,750	.....	1,480	.....	385	570	.....

NOTE.—Stage-discharge relation affected by ice Dec. 17–Mar. 16; discharge determined from study of gage-height graph, discharge measurements, and weather records.

Monthly discharge of Housatonic River at Falls Village, Conn., for the year ending Sept. 30, 1917.

[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	600	125	388	0.602	0.69
November	1,180	240	485	.753	.84
December	2,050	530	916	1.42	1.64
January	2,500	410	997	1.55	1.79
February	2,500	180	597	.927	.97
March	5,800	720	2,100	3.26	3.76
April	4,300	840	2,140	3.32	3.70
May	2,050	325	1,170	1.82	2.10
June	1,600	210	1,030	1.60	1.78
July	990	200	565	.877	1.01
August	570	40	286	.444	.51
September	500	60	231	.359	.40
The year	5,800	40	911	1.41	19.19

POMPERAUG RIVER AT BENNETTS BRIDGE, CONN.

LOCATION.—About one-fifth mile above confluence of the Pomperaug with Housatonic River, a quarter of a mile north of Bennetts Bridge, New Haven County, and 1 mile east of Sandy Hook railroad station.

DRAINAGE AREA.—89.3 square miles (measured on topographic maps).

RECORDS AVAILABLE.—July 30, 1913, to December 15, 1916, when station was discontinued.

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 CONTROL.—Channel irregular; bed covered with gravel and boulders. Control is formed by large rocks about 100 feet below the gage, sharply defined.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, October 1 to December 15, 1916, 3.0 feet at 7 a. m. November 24 (discharge, 350 second-feet); minimum stage recorded, 1.00 foot several times in October (discharge, 23 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.—Stage-discharge relation affected by ice which forms on control and river below the gage.

REGULATION.—Operation of power plants at South Britain, 2½ miles above the station, cause a small diurnal fluctuation at low stages.

ACCURACY.—Control has been changed by obstructions at various times in previous years. 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. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Daily discharge, in second-feet, of Pomperaug River at Bennetts Bridge, Conn., for the period Oct. 1 to Dec. 15, 1916.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	61	30	118	11	23	31	52	21	60	29	.....
2	43	30	78	12	23	29	72	22	44	30	.....
3	36	29	64	13	25	29	103	23	38	39	.....
4	32	28	57	14	27	30	67	24	33	258	.....
5	30	32	56	15	30	29	60	25	31	83	.....
6	29	52	52	16	28	29	.....	26	30	57	.....
7	28	38	47	17	26	32	.....	27	29	47	.....
8	27	34	42	18	24	31	.....	28	28	46	.....
9	25	33	43	19	41	28	.....	29	28,	43	.....
10	25	32	70	20	95	27	.....	30	28	78	.....
								31	28	.....	.....

Monthly discharge of Pomperaug River at Bennetts Bridge, Conn., for the period Oct. 1 to Dec. 15, 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	95	23	34.0	0.381	0.44
November	258	27	44.8	.502	.56
December 1–15	118	42	65.4	.732	.41

HUDSON RIVER BASIN.

HUDSON RIVER NEAR INDIAN LAKE, N. Y.

LOCATION.—About a mile below mouth of Cedar River, 1½ miles above 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, 1916, to September 30, 1917.

GAGE.—Gurley printing water stage recorder on right bank. Inspected by John A. Bolton.

DISCHARGE MEASUREMENTS.—Made by wading or from cable about 100 yards below gage.

CHANNEL AND CONTROL.—Solid ledge overlain with coarse gravel; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water stage recorder, 9.87 feet at 11 a. m. June 12 (discharge, 13,500 second-feet); minimum stage from water stage recorder, 1.62 feet from 10 a. m. to 10 p. m. October 13 (discharge 109 second-feet).

ICE.—Stage-discharge relation affected by ice.

REGULATION.—Large diurnal fluctuation due to logging operations during spring months. Seasonal distribution of flow slightly affected by storage.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice from December to April and by backwater from logs June to September. Rating curve fairly well defined between 75 and 600 second-feet and well defined between 600 and 6,000 second-feet. Operation of water stage recorder satisfactory. Daily discharge ascertained by applying mean daily gage height to rating table except when fluctuation required mean of hourly discharge. Records good.

Discharge measurements of Hudson River near Indian Lake, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 3[a]	E. D. Burchard	2.64	280	May 5	E. D. Burchard	2.89	821
27	A. H. Davison	[a] 3.01	283	5	do	4.26	2,150
Feb. 20	E. D. Burchard	[a] 2.71	196	6	do	6.19	4,980
Mar. 17	A. H. Davison	[a] 3.47	270	6	do	5.48	3.730
Apr. 14	E. D. Burchard	2.98	856	7	do	4.49	2,450
14	do	2.97	840	June 22	O. W. Hartwell	[b] 4.19	1,880
May 4	do	5.48	3.960	23	do	[b] 3.78	1,440
4	do	5.36	3,690	Aug. 7	J. W. Moulton	[b] 1.72	130
4	do	4.91	3,020	8	do	[b] 1.69	111
4	do	3.07	958				

[a] Stage-discharge relation affected by ice.

[b] Logs on control.

Daily discharge, in second-feet, of Hudson River near Indian Lake, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	356	203	1,700	280	280	260	1,300	2,430	1,500	1,880	170	237
2	422	229	1,640	280	280	220	2,600	2,720	1,810	1,720	166	358
3	388	252	1,340	280	260	220	4,230	3,410	2,020	1,240	152	535
4	295	290	1,020	260	260	200	4,570	2,560	2,030	1,030	142	535
5	216	305	890	280	280	200	4,400	1,400	2,420	875	133	421
6	191	305	1,200	340	260	200	3,740	2,310	2,240	990	130	339
7	175	290	1,290	380	240	190	3,000	1,580	2,610	765	130	329
8	167	280	1,200	380	220	180	2,280	1,800	2,370	506	123	291
9	164	276	1,000	340	220	180	1,750	1,690	2,520	405	163	263
10	231	295	1,060	320	240	180	1,340	1,680	2,320	373	224	250
11	167	763	1,020	300	240	190	21,290	1,900	4,150	329	177	216
12	128	932	932	300	220	240	1,060	1,130	11,400	338	174	196
13	112	562	772	280	200	260	975	940	7,900	379	184	174
14	115	457	750	280	200	260	850	1,660	4,080	379	184	170
15	125	810	750	360	220	280	772	1,320	3,080	338	184	163
16	139	630	750	440	220	260	735	1,880	4,230	310	220	159
17	149	506	700	460	200	260	665	1,660	3,930	300	250	152
18	149	383	600	440	200	280	850	1,300	2,210	291	296	146
19	157	320	500	440	190	260	1,390	1,870	1,520	277	250	146
20	268	266	480	400	200	240	3,280	1,650	1,420	254	220	159
21	457	342	550	380	220	240	5,140	1,850	1,320	237	192	321
22	630	357	500	380	220	260	5,910	1,570	1,670	232	181	455
23	562	325	550	360	220	260	6,290	2,480	1,420	334	170	358
24	464	735	500	340	240	320	4,870	1,650	1,280	339	174	300
25	377	1,340	460	320	260	420	3,720	2,760	1,460	416	305	250
26	367	1,490	500	300	260	550	3,900	1,490	1,280	506	268	200
27	310	1,420	480	280	280	750	2,720	1,170	950	405	204	174
28	266	810	480	280	280	1,400	2,160	1,900	800	291	174	174
29	234	665	440	260	.....	1,700	2,300	1,430	800	216	170	177
30	216	1,170	460	260	.....	1,600	2,740	2,640	1,620	208	192	212
31	203	.....	340	260	.....	1,500	.....	3,030	.....	181	212	.....

NOTE.—Discharge Oct. 10, 20, 21, Nov. 11, 14, 21, 22, 27, 30, Apr. 19 to June 12, and Sept. 21 is mean of 24 hourly determinations. Discharge Dec. 14 to Apr. 2 determined, because of ice, from discharge measurements, weather records, and study of gage-height graph. Discharge June 13 to Sept. 30 determined from special rating because of log jam on control.

Monthly discharge of Hudson River near Indian Lake, N. Y., for the year ending Sept. 30, 1917.

[Drainage area, 418 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	630	112	265	0.634	0.73
November	1,490	203	567	1.36	1.52
December	1,700	340	802	1.92	2.21
January	460	260	331	.792	.91
February	280	190	236	.565	.59
March	1,700	180	437	1.05	1.21
April	6,290	665	2,690	6.45	7.20
May	3,410	940	1,900	4.55	5.25
June	11,400	800	2,610	6.22	6.94
July	1,880	181	527	1.26	1.45
August	305	123	191	.457	.53
September	535	146	262	.627	.70
The year	11,400	112	900	2.15	29.24

HUDSON RIVER AT NORTH CREEK, N. Y.

LOCATION.—At two-span steel highway bridge in village of North Creek, Warren County, immediately above mouth of North Creek.

DRAINAGE AREA.—804 square miles.

RECORDS AVAILABLE.—September 21, 1907, to September 30, 1917.

GAGE.—Chain at upstream side of left span of the bridge; read by William Alexander.

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

CHANNEL AND CONTROL.—Heavy gravel; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.6 feet, at noon June 12 (discharge about 21,000 second-feet); minimum stage recorded 2.35 feet, at 4.30 p. m. November 21 (discharge, 360 second-feet). Minimum discharge, of about 300 second-feet, occurred January 2, when stage-discharge relation was affected by ice.

1907–1917: Maximum stage recorded, 12.0 feet, during the evening of March 27, 1913 (discharge, about 30,000 second-feet); minimum stage, 2.05 feet, at 7.05 a. m. September 30, 1913 (discharge, 168 second-feet).

ICE.—Stage-discharge relation affected by ice.

REGULATION.—The numerous lakes and ponds in the basin of the upper Hudson have a decided effect on the low water flow, especially the reservoir at Indian Lake. Many of the reservoirs are used to make flood waves in the spring in connection with log driving.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice from December to March. Rating curve well defined between 250 and 6,000 second-feet. Gage read to half tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Open-water records good; winter records fair.

Discharge measurements of Hudson River at North Creek, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 6	E. D. Burchard	[a] 3.40	572	Apr. 13	E. D. Burchard	3.70	1,710
28	A. H. Davison	[a] 4.50	678	June 20	O. W. Hartwell	4.50	3,020
Feb. 21	E. D. Burchard	[a] 4.50	860	23	do	3.74	1,720
Mar. 16	A. H. Davison	[a] 4.60	785	Aug. 7	J. W. Moulton	2.74	619

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Hudson River at North Creek, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	700	790	2,870	320	750	900	2,870	2,870	6,600	2,870	790	990
2	790	790	2,700	300	900	950	5,600	4,220	1,350	2,530	790	1,040
3	940	790	2,210	420	1,000	900	7,400	3,610	2,870	2,700	700	990
4	1,040	890	1,690	650	1,000	900	7,400	4,890	2,700	1,910	655	990
5	940	940	1,480	550	1,000	900	6,860	3,050	2,700	1,550	610	890
6	890	890	1,980	460	1,000	800	6,340	3,610	2,870	1,480	655	840
7	890	790	2,060	480	950	800	4,890	2,870	2,700	1,420	655	610
8	890	700	1,910	480	950	800	3,610	2,870	2,530	1,160	890	460
9	890	700	1,620	500	950	800	2,870	1,760	3,050	840	940	404
10	890	700	1,620	550	900	750	2,530	3,050	2,370	790	1,220	530
11	840	1,100	1,690	500	900	800	1,690	1,420	3,810	745	1,100	530
12	790	1,420	1,550	550	800	750	1,910	1,350	16,900	790	990	530
13	1,040	1,160	1,350	460	750	750	1,760	2,870	14,100	790	990	610
14	790	890	100	500	750	750	1,480	2,530	9,400	745	990	655
15	655	1,350	790	420	850	750	1,350	4,010	6,860	655	990	700
16	390	1,220	550	1,000	850	800	1,160	3,610	6,860	530	1,160	745
17	390	1,100	420	1,000	750	750	1,160	1,160	7,130	495	1,040	890
18	390	840	420	950	750	700	1,910	1,100	5,600	570	1,160	890
19	700	570	500	900	800	700	1,220	1,040	4,660	745	790	890
20	790	446	650	850	850	750	5,840	3,810	3,230	890	700	890
21	890	404	650	850	850	750	9,700	1,220	3,420	790	700	990
22	990	446	650	850	850	850	10,900	2,370	3,230	655	790	1,220
23	890	700	600	900	750	900	9,400	2,530	2,700	570	890	1,100
24	790	2,060	550	850	700	1,000	7,680	3,420	2,370	570	990	1,040
25	610	2,870	550	800	750	1,300	5,120	1,690	1,980	610	1,100	990
26	610	2,210	480	700	700	1,800	5,600	4,440	3,230	1,100	990	890
27	530	1,690	440	650	800	2,600	3,050	2,060	1,840	1,840	700	940
28	460	1,620	420	650	850	4,440	2,700	1,840	1,980	940	700	890
29	610	1,620	380	650	.....	4,440	5,120	1,690	1,280	610	790	890
30	745	1,980	340	700	.....	3,420	4,660	4,440	2,140	495	890	890
31	700	.....	320	700	.....	3,050	.....	5,360	.....	460	890	.....

NOTE.—Discharge Dec. 16 to Mar. 27 estimated, because of ice, from discharge measurements, weather records, and study of gage-height graph.

Monthly discharge of Hudson River at North Creek, N. Y., for the year ending Sept. 30, 1917.

[Drainage area, 804 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,040	460	757	0.942	1.09
November	2,870	404	1,120	1.39	1.55
December	2,870	320	1,110	1.38	1.59
January	1,000	300	650	.808	.93
February	1,000	700	846	1.05	1.09
March	4,440	700	1,310	1.63	1.88
April	10,900	1,160	4,460	5.55	6.19
May	5,360	1,040	2,800	3.48	4.01
June	16,900	1,280	4,420	5.50	6.14
July	2,870	460	1,060	1.32	1.52
August	1,220	610	879	1.09	1.26
September	1,220	404	830	1.03	1.15
The year	16,900	300	1,680	2.09	28.40

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 13 miles above mouth of Sacandaga River.

DRAINAGE AREA.—1,550 square miles.

RECORDS AVAILABLE.—September 1, 1907, to September 30, 1917.

GAGE.—Chain at upstream side near center of left span; read by S. H. Spencer.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge.

CHANNEL AND CONTROL.—Bed composed of sand and gravel; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.45 feet, about 4 p. m., June 12 (discharge, 24,800 second-feet); minimum stage recorded, 2.08 feet, about 7 a. m., November 22 (discharge about 480 second-feet).

1907–1917: Maximum stage, 12.5 feet, during late evening, March 27, 1913, determined by leveling from flood marks (discharge about 46,000 second-feet); minimum stage recorded, 2.12 feet, at 8.55 a. m. and 6.20 p. m., September 30, 1913 (discharge about 290 second-feet).

ICE.—Stage-discharge relation seriously affected by ice. Winter discharge determined from records at North Creek and Riverbank.

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 hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good. Estimated discharge during ice period fair.

COOPERATION.—Gage heights furnished by the International Paper Co.

Discharge measurements of Hudson River at Thurman, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 11	W. A. James	[a] 4.76	5,130	June 16	E. D. Burchard	6.25	10,900
11	E. D. Burchard	[a] 4.72	5,190	16	do	6.22	11,100
May 8	do	4.74	5,370	Aug. 9	J. W. Moulton	3.12	1,650

[a] Stage-discharge relation affected by logging operations.

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

Day.	Oct.	Nov.	Dec.	Apr.	May.	June.	July.	Aug.	Sept.
1	805	850	3,860	9,500	5,290	8,100	4,140	1,150	1,380
2	905	850	3,860	11,400	8,100	4,140	3,860	1,080	1,460
3	1,080	960	3,200	12,100	6,780	4,710	4,710	1,150	1,380
4	1,380	1,080	2,720	12,500	4,140	4,560	3,330	1,020	1,300
5	1,080	960	2,370	12,100	4,710	4,420	2,960	960	1,640
6	1,080	1,020	2,840	11,400	5,580	5,000	2,960	960	1,640
7	1,020	1,020	2,840	10,200	3,860	5,290	2,960	960	1,460
8	960	905	2,840	9,140	5,000	4,140	2,150	1,080	1,380
9	1,020	805	2,600	7,760	4,140	4,710	2,150	1,300	960
10	960	850	2,600	6,470	6,780	4,140	1,940	1,740	1,220
11	1,020	850	2,480	5,870	5,580	4,710	1,460	1,550	1,220
12	905	1,460	2,370	5,580	5,000	22,600	1,460	1,380	1,220
13	1,220	1,460	2,260	5,000	2,720	19,800	1,460	1,380	1,220
14	905	1,080	1,740	4,420	3,590	13,700	1,220	1,300	1,150
15	760	1,150	1,740	4,140	2,370	11,000	1,150	1,550	1,080
16	720	1,460	1,300	3,860	4,420	11,000	1,080	1,640	1,150
17	610	1,220	1,150	3,590	2,720	11,000	1,020	1,460	1,380
18	578	1,080	.....	3,860	5,290	8,100	1,080	1,300	1,300
19	680	805	.....	4,710	2,150	6,780	1,150	1,300	1,460
20	1,150	720	.....	7,760	3,080	6,170	1,460	1,220	1,300
21	1,080	578	.....	12,100	1,840	5,870	1,460	960	1,460
22	1,380	515	.....	14,100	6,170	5,000	1,300	960	1,740
23	1,220	645	.....	13,700	1,940	5,000	1,150	1,150	1,640
24	960	2,150	.....	11,700	6,470	5,000	960	1,550	1,550
25	850	3,460	.....	10,200	2,840	3,590	1,150	1,380	1,550
26	720	2,840	.....	9,860	8,440	3,200	1,080	1,380	1,380
27	720	4,420	.....	7,430	3,330	2,960	1,740	1,150	1,300
28	680	2,150	.....	5,870	3,200	2,600	1,550	960	1,380
29	610	1,740	.....	6,470	4,140	2,600	1,020	1,150	1,150
30	850	2,370	.....	5,000	5,000	3,590	905	1,380	1,300
31	960	.....	.....	.....	5,000	.....	850	1,300	.....

NOTE.—Mean discharge Dec. 18–31, estimated because of ice, 1,350 second-feet from sum of flow at North Creek and Riverbank plus an estimated inflow.

Monthly discharge of Hudson River at Thurman, N. Y., for the year ending Sept. 30, 1917.

[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	1,380	578	931	0.601	0.69
November	4,420	515	1,380	.890	.99
December	3,860	.....	1,990	1.28	1.43
January	.....	.....	1,180	.761	.88
February	.....	.....	1,240	.800	.83
March	.....	.....	1,900	1.23	1.42
April	14,100	3,590	8,260	5.32	5.94
May	8,440	1,840	4,510	2.91	3.34
June	22,600	2,600	6,780	4.37	4.88
July	4,710	850	1,830	1.18	1.36
August	1,740	960	1,250	.806	.93
September	1,740	960	1,360	.877	.98
The year	22,600	515	2,710	1.75	23.67

NOTE.—Mean discharge for January, February, and March estimated, because of ice, from sum of flow at North Creek and Riverbank plus an estimated inflow. No correction has been made in this table for storage.

HUDSON RIVER AT SPIER FALLS, N. Y.

LOCATION.—Half a mile below Spier Falls dam, Saratoga County, and 11½ miles below mouth of Sacandaga River.

DRAINAGE AREA.—2,800 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 7, 1912, to June 30, 1917.

GAGE.—Gurley 2-day water stage recorder in brick shelter on the right bank. Recorder inspected by T. F. Malone, chief operator of power plant.

DISCHARGE MEASUREMENTS.—Made from a cable about 1,000 feet downstream from the gage.

CHANNEL AND CONTROL.—Bed composed of coarse gravel and boulders. Control probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water stage recorder, 12.82 feet, at 8.30 p. m. June 12 (discharge, 38,100 second-feet); minimum stage, minus 0.12 feet, at 4 p. m. September 23, observed during current meter measurement (discharge about 5.5 second-feet).

1912–1917: Maximum stage, from water stage recorder, 18.59 feet, at 12.25 a. m. March 28, 1913 (discharge about 89,100 second-feet); minimum stage, September 23, 1917.

ICE.—Stage-discharge relation not affected by ice except for a short time during extremely cold periods.

REGULATION.—Large diurnal fluctuation in discharge due to operation of the Spier Falls power plant. Seasonal flow affected by storage at Indian Lake and many small lakes and reservoirs in the upper part of the drainage basin.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice February 2 to 16. Rating curve well defined for all stages except about 9 feet (discharge 19,900 second-feet), where curve may be 4 per cent or 5 per cent large. Operation of the water stage recorder satisfactory throughout the year. Daily discharge ascertained by averaging the results obtained by applying gage heights for one-hour intervals to the rating table. Records good.

COOPERATION.—Water stage recorder inspected by an employee of the Adirondack Electric Power Corporation.

Discharge measurements of Hudson River at Spier Falls, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 24	E. D. Burchard	[a] 2.80	1,580
Apr. 10	do	7.77	14,200

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Hudson River at Spier Falls, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	513	1,400	9,310	1,430	2,350	2,790	18,000	12,000	12,100	8,490	1,360	1,930
2	1,470	1,450	9,840	1,700	2,340	3,070	22,800	13,200	7,830	8,640	1,810	906
3	1,160	1,460	8,890	1,990	1,790	2,800	27,800	13,400	7,670	8,330	2,260	1,220
4	1,540	1,740	7,540	1,820	1,840	2,020	29,400	13,600	7,600	6,140	1,150	2,740
5	2,120	1,320	6,530	2,550	2,440	3,280	28,600	11,900	7,280	5,220	506	2,060
6	1,590	1,950	6,490	2,670	2,260	2,290	26,200	11,600	8,450	4,420	1,950	2,260
7	1,110	1,680	7,100	1,330	2,180	2,460	23,500	11,000	7,450	4,050	1,330	2,670
8	674	1,560	6,720	2,950	1,950	2,490	20,400	10,900	7,210	3,520	831	2,500
9	1,550	1,910	6,020	2,640	2,410	2,290	17,600	9,930	8,300	3,720	1,500	1,010
10	1,320	1,690	6,170	2,600	2,290	2,390	15,100	9,820	8,250	2,720	2,240	1,240
11	1,040	2,140	6,350	2,660	1,260	1,330	12,900	8,770	9,800	2,230	2,200	947
12	958	1,480	5,700	2,520	2,010	2,290	11,600	8,360	31,900	2,630	1,650	1,480
13	1,440	2,930	5,050	2,190	1,980	2,300	10,600	7,480	36,000	2,490	2,240	1,500
14	1,620	1,830	4,230	1,440	1,550	2,460	9,580	6,680	30,400	2,520	1,660	1,440
15	1,080	1,920	3,090	3,450	1,880	2,500	8,860	5,530	24,400	2,420	1,930	1,720
16	959	2,040	3,180	3,620	2,090	2,840	8,230	6,620	21,500	2,870	1,980	1,050
17	1,190	2,160	1,380	4,020	1,850	2,430	7,610	5,180	20,300	2,250	2,290	1,540
18	810	1,550	2,460	4,050	2,000	1,660	7,940	5,520	15,200	2,000	1,980	1,500
19	991	1,190	2,360	4,030	2,090	3,970	9,570	4,200	12,900	2,000	1,260	1,500
20	1,600	1,900	2,440	3,490	1,970	2,600	14,600	6,380	10,400	2,330	1,900	1,940
21	2,570	1,220	2,380	2,820	1,950	2,730	22,700	4,570	9,320	2,000	1,320	1,700
22	2,520	1,150	2,700	3,550	1,730	2,880	26,000	4,850	8,220	2,060	1,360	2,360
23	3,370	848	2,970	2,620	2,080	3,060	28,300	4,000	7,630	2,720	1,560	909
24	2,750	2,510	1,300	2,410	1,630	2,890	26,700	7,250	5,810	1,900	2,220	970
25	2,170	6,450	2,040	2,530	1,460	5,340	23,100	6,090	6,070	1,530	2,550	1,710
26	1,540	6,690	2,540	2,440	2,420	8,300	20,000	9,480	6,070	1,560	1,010	1,490
27	1,600	5,370	1,890	1,870	1,940	12,200	17,600	6,140	4,940	2,080	2,620	1,890
28	1,520	5,500	1,850	1,510	2,320	18,100	15,100	5,200	4,310	2,770	1,560	1,720
29	1,020	5,140	2,390	2,040	.....	18,400	13,800	6,290	4,630	1,420	1,360	1,320
30	1,570	5,770	2,530	1,800	.....	19,000	12,600	9,390	7,670	1,490	2,000	1,000
31	1,670	.....	1,400	2,140	.....	18,400	.....	11,100	.....	1,160	2,250	.....

NOTE.—Daily discharge Feb. 2-16, computed, because of ice, by comparison with the discharge determined from power house records at the Spier Falls plant. Discharge Sept. 8 estimated.

Monthly discharge of Hudson River at Spier Falls, N. Y., for the year ending Sept. 30, 1917.

[Drainage area, 2,800 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	3,370	513	1,520	0.543	0.63
November	5,770	848	2,530	.904	1.01
December	9,840	1,300	4,350	1.55	1.79
January	4,050	1,330	2,540	.907	1.05
February	2,440	1,260	2,000	.714	.74
March	19,000	1,330	5,210	1.86	2.14
April	29,400	7,610	17,900	6.40	7.14
May	13,600	4,000	8,270	2.95	3.40
June	36,000	4,310	12,000	4.27	4.76
July	8,640	1,160	3,220	1.15	1.33
August	2,620	506	1,740	.621	.72
September	2,740	906	1,610	.575	.64
The year	36,000	506	5,230	1.87	25.35

HUDSON RIVER AT MECHANICVILLE, N. Y.

LOCATION.—At Duncan dam of West Virginia Pulp & Paper Co., in Mechanicville, Saratoga County, 3,700 feet above mouth of Anthony Kill, 1¼ miles below mouth of Hoosic River, and about 19 miles above mouth of Mohawk River.

DRAINAGE AREA.—4,500 square miles.

RECORDS AVAILABLE.—1888 to September 30, 1917.

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 coefficients derived by United States Geological Survey for dams of ogee section. Discharge through turbines computed from records of their operation. Discharge at lock and through Barge Canal turbines at lock computed from records of the number of lockages per day.

EXTREMES OF DISCHARGE.—Maximum daily discharge during year 36,300 second-feet, June 13; minimum daily discharge 899 second-feet, Sunday, September 30.

1888–1917: 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 occasionally becomes practically zero.

COOPERATION.—Discharge over the spillway and through turbines of the West Virginia Pulp & Paper Co. furnished by Mr. W. J. Barnes, engineer of the company.

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,560	2,230	12,100	3,250	3,260	6,820	26,000	13,800	12,900	10,400	1,430	2,950
2	1,750	2,350	13,100	3,170	2,930	5,440	30,300	14,200	10,100	11,900	1,570	1,610
3	1,680	2,160	11,700	3,570	2,120	5,520	34,900	15,000	9,630	10,900	1,400	1,400
4	1,650	2,210	10,700	3,690	1,470	5,070	35,500	14,600	9,990	8,040	2,100	2,480
5	1,790	2,020	9,860	3,870	1,730	4,780	34,200	14,900	9,110	7,960	1,310	3,380
6	2,500	2,940	9,160	5,120	2,080	5,050	32,400	14,200	9,200	6,410	1,250	2,850
7	2,060	3,400	9,480	5,650	2,020	4,520	29,900	13,900	10,100	5,040	1,600	2,460
8	1,630	2,980	9,560	4,930	2,260	4,120	26,300	12,400	10,800	4,630	1,290	2,470
9	1,550	2,880	9,040	4,780	2,120	4,750	23,300	12,500	10,300	4,840	1,680	1,490
10	1,670	2,630	8,440	5,010	2,060	4,640	18,200	11,900	11,300	4,100	1,520	1,670
11	1,810	2,850	9,010	4,640	1,150	5,700	15,500	10,800	13,600	2,380	1,790	1,570
12	1,810	2,600	8,360	4,360	1,850	6,570	14,200	10,400	30,100	2,650	1,720	1,260
13	1,560	3,140	7,500	3,610	1,830	8,050	13,100	10,500	36,300	3,690	1,960	1,240
14	1,440	3,740	6,420	4,400	1,930	6,570	11,800	8,760	33,100	3,370	2,540	1,480
15	1,330	3,090	5,220	5,680	1,900	6,090	11,700	7,910	26,900	2,730	2,050	1,420
16	1,960	2,920	4,440	6,860	1,960	7,310	10,800	7,480	23,700	3,340	2,970	963
17	2,120	3,000	4,000	7,370	1,820	8,710	9,640	7,860	22,300	3,460	2,150	1,230
18	2,060	3,220	4,030	7,380	1,270	9,040	9,350	6,420	18,900	2,810	2,500	1,710
19	2,010	2,580	3,870	6,740	2,050	5,950	11,200	6,260	16,000	3,450	1,870	1,600
20	2,150	3,270	3,770	5,760	2,070	7,140	16,000	6,120	13,300	4,120	1,800	1,640
21	3,990	3,440	3,380	6,000	2,080	5,680	23,700	7,810	12,100	3,890	2,310	1,880
22	4,130	2,830	3,880	4,830	2,120	7,390	28,500	5,400	10,800	2,990	1,680	1,370
23	4,140	2,760	5,620	4,720	2,150	9,230	30,300	6,810	9,790	3,370	1,520	1,380
24	3,890	4,670	5,490	4,090	1,760	24,900	28,900	7,010	9,010	3,850	1,570	1,940
25	3,520	7,580	4,300	3,490	1,220	17,200	24,900	8,780	9,180	2,680	2,380	1,980
26	3,150	8,770	5,530	3,260	3,110	18,000	22,100	9,140	8,790	2,170	1,780	1,770
27	2,070	8,120	5,320	3,000	16,000	22,800	19,500	9,650	7,680	1,660	1,830	1,830
28	2,200	7,660	4,520	2,100	8,640	31,800	16,600	7,790	6,760	1,940	2,670	1,710
29	1,820	7,380	3,870	2,520	.....	28,200	15,300	8,180	6,350	2,180	1,940	1,400
30	2,380	11,300	3,310	2,730	.....	26,600	14,400	10,100	8,410	1,820	1,610	899
31	2,060	.....	3,840	3,060	.....	24,600	.....	13,100	.....	2,270	2,030	.....

[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 United States Board of Engineers on on Deep Waterways, pt. 1, pp. 377–388.

Monthly discharge of Hudson River at Mechanicville, N. Y., for the year ending Sept. 30, 1917.

[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	4,140	a 1,330	2,240	0.498	0.57
November	11,300	a 2,020	4,020	.893	1.00
December	13,100	3,310	6,740	1.50	1.73
January	7,380	a 2,100	4,500	1.00	1.15
February	16,000	a 1,150	2,750	.611	.64
March	31,800	4,120	10,900	2.42	2.79
April	35,500	9,350	21,300	4.73	5.28
May	15,000	5,400	10,100	2.24	2.58
June	36,300	6,350	14,200	3.16	3.53
July	11,900	1,660	4,360	.969	1.12
August	2,970	1,250	1,870	.416	.48
September	3,380	a 899	1,770	.393	.44
The year	36,300	a 899	7,060	1.57	21.31

a Sunday.

NOTE.—Figures in this table do not include diversion into Champlain canal.

CEDAR RIVER NEAR INDIAN LAKE, N. Y.

LOCATION.—At steel highway bridge 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 mouth of river.

DRAINAGE AREA.—85 square miles (measured on topographic maps).

RECORDS AVAILABLE.—July 15, 1911, to November 30, 1917, when station was discontinued.

GAGE.—Chain at downstream side of bridge; read by Chauncy Hill.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Gravel and large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 18.7 feet about midnight June 11 from watermarks observed by Mr. F. E. Wood (discharge not computed); minimum stage, 2.5 feet, October 12, 13, 14, and September 27 (discharge 20 second-feet).

1911–1917: Maximum stage recorded June 11, 1917; maximum discharge recorded, 3,700 second-feet, at 6 p. m., May 17, 1916 (gage height, 12.15 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 fairly permanent. 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. Records good except for periods of log-driving operations in the spring.

Discharge measurements of Cedar River near Indian Lake, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 19	C. C. Covert	2.79	40.7	Apr. 15	E. D. Burchard	3.60	145
20	do	3.39	112	May 7	do	4.57	360
Jan. 25	A. H. Davison	[a] 4.76	67	June 21	O. W. Hartwell	4.29	262
Feb. 20	E. D. Burchard	[a] 4.35	55.3	21	do	4.26	270
Mar. 18	A. H. Davison	[a] 5.12	51.9	Aug. 8	J. W. Moulton	2.75	47.2
Apr. 15	E. D. Burchard	3.60	144	9	do	2.75	37.5

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Cedar River near Indian Lake, N. Y., for the period Oct. 1, 1916, to Nov. 30, 1917.

Day.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.	Sept.
1916–17.								
1	34	47	1,040	738	332	538	30	68
2	62	42	2,210	810	396	478	36	74
3	146	54	2,900	668	422	422	33	62
4	130	52	2,160	422	370	370	34	50
5	68	62	1,690	226	396	320	34	42
6	62	62	1,600	478	422	215	30	50
7	74	54	1,040	634	370	184	27	42
8	54	52	848	810	422	80	34	36
9	74	62	810	450	450	86	62	42
10	68	57	738	508	272	62	68	42
11	50	810	602	478	1,550	80	42	36
12	24	634	668	478	4,250	100	36	42
13	24	634	702	478	1,730	80	27	38
14	21	422	164	602	810	68	33	34
15	28	478	130	668	738	62	34	34
16	27	478	114	848	602	62	27	38
17	34	450	138	226	478	60	42	34
18	28	146	204	370	308	52	42	34
19	42	130	478	2,650	184	44	36	34
20	86	114	1,640	570	422	57	34	40
21	114	100	1,640	1,460	237	62	27	42
22	86	86	634	194	702	62	28	36
23	74	100	810	1,210	296	62	36	30
24	62	1,040	848	184	508	80	42	27
25	62	1,000	924	1,210	344	86	36	27
26	80	570	1,000	174	296	57	33	24
27	86	478	848	237	248	42	27	20
28	74	478	738	1,920	215	33	42	26
29	52	508	450	344	370	36	50	27
30	44	1,040	1,000	344	523	34	52	34
31	40	.....	.....	237	.....	34	40	.....

Day.	Oct.	Nov.	Day.	Oct.	Nov.	Day.	Oct.	Nov.
1917.			1917.			1917.		
1	38	1,640	11	27	204	21	174	184
2	33	774	12	44	155	22	130	47
3	27	538	13	93	130	23	146	34
4	33	215	14	93	114	24	164	62
5	44	184	15	86	100	25	226	42
6	122	164	16	107	86	26	215	33
7	42	164	17	86	74	27	164	27
8	54	215	18	62	130	28	344	27
9	38	226	19	80	155	29	396	25
10	28	226	20	155	422	30	1,460	25
						31	2,010	.....

NOTE.—Discharge not determined because of ice, Dec. 1, 1916, to Mar. 31, 1917. Discharge Nov. 29 and 30, 1917, estimated because of ice.

Monthly discharge of Cedar River near Indian Lake, N. Y., for the period Oct. 1, 1916, to Nov. 30, 1917.

[Drainage area, 85 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1916.					
October	146	21	61.6	0.725	0.84
November	1,040	42	341	4.01	4.47
1917.					
April	2,900	114	959	11.28	12.59
May	2,650	174	665	8.06	9.29
June	4,250	184	622	7.32	8.17
July	538	33	129	1.51	1.74
August	68	27	37	.434	.50
September	74	20	39	.457	.51
October	2,010	27	217	2.55	2.94
November	1,640	25	214	2.52	2.81

NOTE.—No correction for storage.

INDIAN LAKE RESERVOIR AT INDIAN LAKE, N. Y.

LOCATION.—At masonry storage dam at outlet of Indian Lake, 2 miles south of Indian Lake village, Hamilton County, and 7½ miles above 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 crest of spillway (measured on topographic maps.

RECORDS AVAILABLE.—Records of stage and gate openings from July, 1900, to September 30, 1917.

GAGES.—Elevation of water surface in reservoir is determined by chain gage on the crest of dam near gate house. Gage installed November 17, 1911, to replace staff gage previously maintained at the same point; datum unchanged. Widths of sluice gate openings determined by gage scales at sides of gate stems inside gate house. Gages read by Lester Savarie.

EXTREMES OF STAGE.—Maximum elevation of water surface in reservoir, 37.55 feet June 13; minimum elevation, 8.7 feet March 25.

1900–1917: Maximum elevation recorded, 38.8 feet March 28, 1913; Minimum stage recorded, 2.0 feet March 9 to 18, 1907, and January 3 to 17, 1910.

REGULATION.—At ordinary stages the discharge is completely regulated by the operation of the sluice gates. Water is held in storage until needed to supplement the flow of the upper Hudson during the low-water period. This storage capacity of about 4.7 billion cubic feet provides for a discharge of approximately 600 second-feet for a period of 90 days.

For record of discharge see "Indian River near Indian Lake, N. Y." (p. 126).

Daily gage height, in feet, of Indian Lake reservoir at Indian Lake, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	17.05	13.95	16.3	18.55	17.55	13.4	10.3	27.2	35.1	34.5	32.35	24.9
2	17.0	13.8	16.7	18.5	17.4	13.2	11.0	27.8	35.15	34.55	32.1	24.85
3	16.7	13.7	17.05	18.4	17.3	13.0	12.0	28.3	35.2	34.5	31.9	24.75
4	16.4	13.6	17.25	18.2	17.2	12.85	13.0	28.75	35.2	34.4	31.7	24.65
5	16.1	13.5	17.5	18.15	17.1	12.7	13.7	29.0	34.8	34.3	31.45	24 55
6	15.8	13.4	17.9	18.3	17.0	12.5	14.35	29.3	34.55	34.2	31.2	24.5
7	15.5	13.3	18.15	18.4	16.9	12.3	14.75	29.6	34.5	34.1	30.9	24.6
8	15.2	13.2	18.4	18.6	16.8	12.1	15.05	29.9	34.65	34.05	30.6	24.6
9	14.95	13.15	18.85	18.5	16.7	11.9	15.4	30.2	34.7	34.0	30.4	24.5
10	14.6	13.1	18.95	18.45	16.75	11.7	15.7	30.55	34.8	33.95	30.2	24.3
11	14.35	13.05	19.05	18.4	16.65	11.5	15.9	30.8	35.4	33.9	29.9	24.1
12	14.05	13.0	19.2	18.35	16.6	11.3	16.05	31.1	37.4	33.9	29.6	23.9
13	13.8	12.95	19.3	18.2	16.5	11.1	16.2	31.3	37.55	33.9	29.2	23.7
14	13.65	12.9	19.4	18.1	16.35	10.9	16.35	31.6	37.2	33.85	28.9	23.45
15	13.55	12.85	19.45	18.0	16.2	10.7	16.5	31.9	36.65	33.85	28.55	23 2
16	13.45	12.8	19.55	17.85	16.0	10.5	16.7	32.2	36.3	33.75	28.3	22.85
17	13.35	12.75	19.65	17.7	15.8	10.3	16.85	32.4	36.00	33.7	28.15	22.5
18	13.25	12.75	19.75	17.55	15.6	10.1	17.1	32.55	35.6	33.55	28.0	22.15
19	13.2	12.8	19.6	17.4	15.4	9.9	17.5	32.8	35.2	33.35	27.9	21.8
20	13.5	12.9	19.5	17.35	15.2	9.7	18.65	33.0	34.85	33.15	27.75	21.5
21	13.75	12.9	19.4	17.3	15.0	9.5	20.0	33.2	34.4	33.1	27.55	21.15
22	14.05	12.85	19.3	17.3	14.9	9.3	21.45	33.5	34.3	33.1	27.3	20.8
23	14.25	13.0	19.2	17.35	14.6	9.1	22.65	33.7	33.9	33.05	27.0	20.5
24	14.35	13.4	19.1	17.4	14.4	8.9	23.5	33.9	33.85	33.05	26.7	20.15
25	14.5	13.95	19.0	17.55	14.2	8.7	24.25	34.15	33.8	33.0	26.4	19.8
26	14.6	14.2	18.9	17.5	14.0	8.9	24.85	34.3	33.8	33.0	26.3	19.45
27	14.65	14.5	18.8	17.65	13.8	9.2	25.35	34.4	33.8	32.95	26.15	19.15
28	14.6	14.7	18.75	17.6	13.6	9.4	25.7	34.45	33.6	32.9	25.8	18.85
29	14.45	14.85	18.7	17.75	.....	9.6	26.15	34.6	33.9	32.85	25.6	18.55
30	14.25	15.55	18.65	17.75	.....	9.9	26.6	34.9	34.35	32.85	25.35	18.25
31	14.1	.....	18.6	17.7	.....	10.1	.....	35.05	.....	32.6	25.1	.....

Gate openings, in inches, at Indian Lake reservoir at Indian Lake, N. Y., for the year ending Sept. 30, 1917.

Dates (inclusive).	Sluice gate *A* open.	Sluice gate *B* open.
	Inches.	*Inches.*
Oct. 1, 12 a. m., to Oct. 19, 5 p. m.	60	.....
Oct. 2, 5 p. m., to Oct. 14, 7 a. m.	.....	60
Oct. 17, 6 p. m., to Oct. 19, 3 p. m.	.....	60
Oct. 28, 1 p. m., to Nov. 6, 6 p. m.	.....	60
Nov. 6, 6 p. m., to Nov. 18, 6 p. m.	.....	30
Nov. 21, 1 p. m., to Nov. 23, 6 a. m.	60	.....
Nov. 23, 6 a. m., to Nov. 26, 2 p. m.	.....	60
Dec. 18, 4 p. m., to Jan. 5, 11 a. m.	60	.....
Jan. 2, 6 p. m., to Jan. 4, 1 p. m.	.....	30
Jan. 8, 7 p. m., to Mar. 27, 9 a. m.	60	.....
Jan. 31, 6 p. m., to Feb. 13, 6 p. m.	.....	30
Feb. 13, 6 p. m., to Feb. 14, 6 p. m.	.....	48
Feb. 14, 6 p. m., to Mar. 26, 3 p. m.	.....	54
June 28, 6 a. m., to 5 p. m.	60	.....
July 17, 7 p. m., to July 21, 11 a. m.	30	.....
July 30, 7 p. m., to Sept. 1, 7 p. m.	60	.....
Aug. 7, 7 a. m., to Aug. 15, 6 p. m.	.....	30
Aug. 21, 4 p. m., to Aug. 25, 7 p. m.	.....	30
Aug. 28, 6 a. m., to Sept. 6, 6 p. m.	.....	30
Sept. 8, 7 p. m., to Sept. 12, 6 a. m.	.....	24
Sept. 12, 6 a. m., to Sept. 30, 12 p. m.	.....	48
Sept. 15, 5 p. m., to Sept. 30, 12 p. m.	60	.....

NOTE.—Main logway open 15 feet during the following periods: June 5, 5 a. m. to June 6, 9 a. m.; June 14, 5 a. m. to 5 p. m; June 15, 8 a. m. to 3 p. m.; June 19, 8 a. m. to 1 p. m.; June 20, 8 a. m. to 5. p. m.; June 21, 4 a. m. to 5.30 p. m.; June 22, 5 a. m. to 11 a. m; June 23, 7 a. m. to 7 p. m.

INDIAN RIVER NEAR INDIAN LAKE, N. Y.

LOCATION.—About three-fourths of a mile below dam at outlet of Indian Lake, 2 miles south of Indian Lake village, Hamilton County, 1 mile above mouth of Big Brook, and 6½ miles above mouth of Indian River.

DRAINAGE AREA.—132 square miles (measured on topographic maps).

RECORDS AVAILABLE.—July 1, 1912, to June 30, 1914; June 5, 1915, to September 30, 1917; also miscellaneous measurements in 1911.

GAGE.—Gurley repeating-hydrograph water-stage recorder; installed August 30, 1916, in a standard wooden shelter on the right bank three-fourths mile below dam, at same datum as staff gage previously used. The staff gage is still in place and used for checking the recorder. Recorder inspected by Lester Savarie.

DISCHARGE MEASUREMENTS.—Made from cable or by wading at the head of the rapids about 150 feet below the gage.

EXTREMES OF DISCHARGE.—Maximum stage, from water-stage recorder, 6.38 feet at 10.30 a. m., June 19 (discharge 2,410 second-feet); minimum stage, from water-stage recorder, 0.13 foot from 10 a. m. to 2 p. m., November 21 (discharge about 1.3 second-feet).

1912–1917: 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.

CHANNEL AND CONTROL.—The gage is at the side of a pool about 500 feet wide, called the "lower frog pond." The reef of coarse gravel at the outlet of this pool forms the control and is permanent.

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

REGULATION.—Discharge at this station is regulated by the operation of gates at the dam. (See Indian Lake Reservoir at Indian Lake, N. Y.)

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 15 and 1,500 second-feet. Daily discharge ascertained by applying mean daily gage height to rating table for days when there have been no changes in the sluice gate openings at Indian Lake dam. Mean daily gage height determined by inspection of the hydrograph record. Discharge for days when gate openings are changed is mean of 24 hourly discharge values.

The following discharge measurement was made by O. W. Hartwell:

June 21, 1917: Gage height 4.76 feet; discharge 1,400 second-feet.

Daily discharge, in second-feet, of Indian River near Indian Lake, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	220	372	7	242	471	453	4	5	281	418	545	573
2	286	372	4	296	471	453	14	7	292	453	526	316
3	623	372	4	489	471	453	15	7	298	418	526	313
4	623	326	3	375	471	436	8	7	286	392	526	307
5	623	372	4	142	453	436	7	8	1,320	363	508	304
6	623	338	4	6	453	436	5	9	691	331	508	252
7	603	211	3	4	453	422	4	5	319	301	716	9
8	603	213	3	30	453	408	3	4	298	281	810	65
9	603	217	3	237	453	394	3	4	316	250	810	284
10	584	214	4	237	436	379	2	4	331	237	810	271
11	584	214	3	234	436	375	2	4	468	227	788	275
12	564	214	2	234	436	371	2	5	1,100	224	767	389
13	545	214	2	232	443	367	2	5	1,510	224	767	453
14	299	214	2	232	545	363	2	6	1,880	217	746	453
15	170	214	2	230	545	359	2	6	1,800	207	746	535
16	172	217	2	230	526	356	2	7	1,430	196	482	725
17	168	217	2	227	526	353	2	8	1,320	252	415	725
18	409	147	69	227	526	334	4	9	1,180	489	385	704
19	392	4	259	224	508	328	6	10	1,230	471	385	704
20	7	2	259	224	508	322	12	10	1,360	453	382	704
21	5	53	259	222	489	322	9	9	1,220	288	448	684
22	3	148	259	222	489	318	7	23	796	129	664	684
23	2	277	261	220	489	314	147	267	997	131	664	684
24	2	369	256	220	489	310	5	266	526	133	664	684
25	2	375	253	220	471	310	3	79	369	135	664	684
26	2	225	253	224	471	269	3	108	240	137	462	664
27	2	5	253	222	471	63	3	133	212	135	341	664
28	164	3	250	222	453	15	3	352	424	133	547	643
29	375	3	247	220	.....	8	3	295	212	131	623	643
30	375	11	244	220	.....	3	4	222	348	182	623	623
31	372	.....	242	261	.....	3	.....	264	.....	564	623	.....

Monthly discharge of Indian River near Indian Lake, N. Y., for the year ending Sept. 30, 1917.

[Drainage area, 132 square miles.]

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
October	623	2	323
November	375	2	204
December	261	2	110
January	489	4	220
February	545	436	479
March	453	3	314
April	147	2	9.60
May	352	4	69.3
June	1,880	212	768
July	564	131	274
August	810	341	596
September	725	9	501
The year	1,880	2	321

NOTE.—Figures showing monthly discharge in second-feet per square mile and run-off depth in inches are not published for this station on account of the effect of storage in Indian Lake Reservoir, for which no correction has been made.

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 above Warrensburg.

DRAINAGE AREA.—534 square miles.

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

GAGE.—Chain, on upstream side of bridge; read by J. H. Roberts.

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

CHANNEL AND CONTROL.—Gravel; occasionally shifting. Logs become lodged on the control at times nearly every year.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.5 feet from 4 p. m. April 4 to 4 p. m. April 6 (discharge about 4,630 second-feet); minimum stage recorded, 1.31 feet at 4 p. m. October 18 and 19 (discharge, 122 second-feet).

1907–1917: 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 year. Affected by ice for much of the period from December to March and by logs on the control for short periods in April, May, and June. Rating curve fairly 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. Records good for periods when stage-discharge relation was not affected by ice or logs; fairly good for other periods.

Discharge measurements of Schroon River at Riverbank, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 8	E. D. Burchard	[a]2.26	391	Apr. 28	E. D. Burchard	4.73	2,230
29	A. H. Davison	[a]2.60	450	May 9	do	3.73	1,370
Feb. 22	E. D. Burchard	[a]2.35	273	9	do	3.75	1,380
Mar. 15	A. H. Davison	[a]2.30	286	June 15	do	5.91	3,680
Apr. 12	E. D. Burchard	4.94	2,400	15	do	5.89	3,670
12	W. A. James	4.91	2,270	Aug. 6	C. C. Covert	1.72	245

[a] Stage-discharge relation affected by ice.

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	232	201	468	380	400	260	2,150	1,840	1,500	990	264	264
2	186	216	512	380	360	260	2,600	1,840	1,400	1,130	264	281
3	186	201	512	360	360	260	3,210	1,840	1,200	1,060	248	298
4	172	216	512	360	360	260	4,470	1,740	1,200	990	248	407
5	186	201	535	420	400	280	4,630	1,640	1,100	920	232	232
6	186	201	585	420	360	280	4,630	1,550	1,100	920	201	718
7	172	201	585	400	360	280	4,200	1,550	1,000	860	232	585
8	148	201	610	400	340	280	3,800	1,550	1,200	800	248	585
9	172	216	635	380	340	280	3,400	1,370	1,200	800	264	512
10	169	201	535	380	320	280	3,000	1,370	1,200	662	248	512
11	153	201	560	380	300	280	2,800	920	2,000	388	264	490
12	186	186	585	360	280	280	2,400	920	2,600	388	232	468
13	150	201	585	420	300	280	2,200	920	4,020	369	248	468
14	156	201	585	500	280	280	2,000	920	4,020	369	248	427
15	132	186	585	460	280	280	1,900	920	3,880	369	248	351
16	158	186	585	440	300	280	1,700	800	3,470	351	248	369
17	145	186	550	440	300	280	1,500	800	3,080	333	264	351
18	140	186	550	460	240	260	1,300	800	2,840	333	264	333
19	128	201	500	500	280	260	1,600	920	2,370	351	264	333
20	201	186	500	460	300	280	2,000	772	2,040	316	281	316
21	232	172	500	460	260	300	2,400	662	1,840	316	264	316
22	232	172	550	420	280	320	2,800	635	1,640	316	264	298
23	248	172	600	500	260	333	3,000	800	1,370	333	264	264
24	232	201	550	480	260	388	3,000	1,100	1,370	316	281	258
25	216	333	500	460	280	447	3,000	1,300	1,130	298	281	248
26	216	264	460	460	280	585	2,600	1,400	990	298	281	248
27	201	281	500	460	300	860	2,400	1,300	990	316	281	232
28	216	333	500	420	300	1,290	2,200	1,200	990	316	264	232
29	172	351	460	460	.....	1,370	1,940	1,200	990	248	248	216
30	201	388	420	420	.....	1,740	1,840	1,200	990	264	264	216
31	201	.....	400	400	.....	2,040	.....	1,500	.....	264	298	.....

NOTE.—Discharge, Dec. 17 to Mar. 22, Apr. 7–28, and May 24 to June 12; estimated, because of ice or logs on the control, from discharge measurements, weather records, and study of gage-height graph.

Monthly discharge of Schroon River at Riverbank, N. Y., for the year ending Sept. 30, 1917.

[Drainage area, 534 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	248	128	185	0.346	0.40
November	388	172	331	.620	.69
December	635	400	533	.998	1.15
January	500	360	428	.802	.92
February	400	240	310	.581	.60
March	2,040	260	489	.916	1.06
April	4,630	1,300	2,690	5.04	5.62
May	1,840	635	1,200	2.25	2.59
June	4,020	990	1,820	3.41	3.80
July	1,130	248	516	.966	1.14
August	298	201	258	.483	.56
September	718	216	361	.676	.75
The year	4,630	128	749	1.40	19.28

SACANDAGA RIVER NEAR HOPE, N. Y

LOCATION.—About 1½ miles below junction of east and west branches, 3½ miles above Hope post office, Hamilton County, and 12 miles above Northville.

DRAINAGE AREA.—494 square miles (measured on topographic maps).

RECORDS AVAILABLE.—September 15, 1911, to September 30, 1917.

GAGE.—Staff in two sections, the lower inclined, the upper vertical; read by Melvin Willis.

DISCHARGE MEASUREMENTS.—Made from a cable about 100 feet below the gage or by wading

CHANNEL AND CONTROL.—Rocky; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 8.35 feet at 6.20 p. m. June 11 (discharge 15,200 second-feet); minimum stage recorded, 1.49 feet at 6 p. m. September 29 (discharge 69 second-feet).

1911–1917: Maximum stage recorded, 10.0 feet at 5.30 p. m. March 27, 1913 (discharge, 24,800 second-feet); minimum stage recorded, 1.17 feet at 7.55 a. m. September 30, 1913 (discharge about 20 second-feet).

ICE.—Stage-discharge relation affected by ice.

ACCURACY.—Stage-discharge relation permanent; affected by ice during much of the period December to March, inclusive. Rating curve well defined between 60 and 10,000 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good for periods when the stage-discharge relation is not affected by ice; fair for other periods.

Discharge measurements of Sacandaga River near Hope, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 9	A. H. Davison	2.44	421	Mar. 22	E. D. Burchard	[a] 4.75	622
9	do	2.43	431	June 7	do	3.37	1,230
Jan. 15	E. D. Burchard	[a] 6.84	951	7	do	3.33	1,190
Feb. 20	A. H. Davison	[a] 3.25	274	8	do	3.81	1,740

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Sacandaga River near Hope, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	421	320	1,810	320	360	2,000	3,330	4,230	1,440	1,940	190	454
2	335	360	1,810	300	320	1,900	6,930	4,230	1,680	1,560	182	477
3	255	432	1,680	300	300	1,800	8,160	3,760	1,680	1,280	164	360
4	230	410	1,560	300	300	1,700	6,930	3,330	1,680	1,010	144	287
5	213	.....	1,680	340	320	1,600	6,070	2,930	1,560	820	122	255
6	190	.....	2,080	400	340	1,300	4,230	3,130	1,440	660	101	205
7	168	.....	1,940	600	340	950	3,760	2,740	1,220	590	91	175
8	154	.....	1,560	700	320	700	3,540	2,560	1,680	558	147	168
9	144	.....	1,560	700	320	600	2,930	2,390	1,560	525	495	158
10	135	.....	1,680	600	280	550	2,560	2,230	2,230	495	525	154
11	128	.....	1,440	550	280	550	2,230	1,940	10,600	495	465	144
12	138	.....	1,160	500	260	750	2,080	1,810	12,700	558	400	135
13	164	.....	910	480	240	850	1,940	1,680	6,350	590	273	128
14	158	.....	700	600	260	800	1,680	1,560	5,790	590	186	119
15	150	.....	600	950	260	850	1,680	1,440	4,480	525	202	111
16	147	.....	500	1,200	280	800	1,440	1,330	2,930	495	335	104
17	138	.....	460	950	300	800	1,440	1,160	2,230	443	360	101
18	128	.....	420	650	280	950	2,080	910	1,810	390	255	96
19	380	.....	400	550	280	800	1,940	820	1,560	370	242	94
20	1,680	.....	380	500	280	750	8,490	820	1,440	340	217	91
21	1,940	.....	400	550	260	650	9,900	780	1,280	320	198	89
22	1,110	.....	400	550	240	600	9,180	740	1,110	301	182	87
23	865	.....	420	550	240	650	7,530	1,160	910	264	168	87
24	700	.....	420	550	220	950	6,640	1,560	910	255	221	85
25	590	.....	420	550	200	2,200	5,790	1,440	1,010	255	264	83
26	558	3,540	420	480	320	4,400	4,730	1,330	910	230	225	81
27	495	2,930	440	460	2,200	7,530	3,990	1,220	820	217	198	79
28	443	2,560	440	440	2,200	6,640	3,540	1,110	740	209	175	75
29	416	1,810	400	440	.....	5,250	3,330	1,330	1,680	205	182	75
30	385	1,810	380	400	.....	3,990	3,760	1,440	2,560	198	221	154
31	350	.....	340	380	.....	3,170	.....	1,440	.....	190	301	.....

NOTE.—Mean discharge Nov. 5-25, estimated 416 second-feet. Discharge Dec. 15 to Mar. 26, inclusive, estimated because of ice, from discharge measurements, weather records, study of gage-height graph, and comparison with similar study for the station at Hadley.

Monthly discharge of Sacandaga River near Hope, N. Y., for the year ending Sept. 30, 1917.

[Drainage area 494 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,940	128	429	0.868	1.00
November	3,540	.....	764	1.55	1.73
December	2,080	340	929	1.88	2.17
January	1,200	300	544	1.10	1.27
February	2,200	200	421	.852	.89
March	7,530	550	1,840	3.72	4.29
April	9,900	1,440	4,390	8.89	9.92
May	4,230	740	1,890	3.83	4.42
June	12,700	820	2,600	5.26	5.87
July	1,940	190	544	1.10	1.27
August	525	91	240	.486	.56
September	477	75	157	.318	.35
The year	12,700	75	1,230	2.49	33.74

SACANDAGA RIVER AT HADLEY, N. Y.

LOCATION.—About half a mile west of railroad station at Hadley, Saratoga County, 1 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, 1917. September 13, 1907, to December 31, 1910, at upper bridge station; September 24, 1909, to August 31, 1911, at lower bridge station.

GAGE.—Gurley graph water-stage recorder on the left bank, installed January 6, 1916, replacing a Barrett and Lawrence recorder. Recorder inspected by J. F. Kelly.

DISCHARGE MEASUREMENTS.—Made from a cable about 30 feet above the gage, or by wading.

CHANNEL AND CONTROL.—Very rough but permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, from water stage recorder, 8.53 feet from noon until 10 p. m. April 4 (discharge, 12,800 second-feet); minimum stage, from water stage recorder, 2.58 feet at midnight September 27 (discharge, 169 second-feet).

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

ACCURACY.—Stage-discharge relation permanent; affected by ice during a large part of period from December to March. Rating curve well defined between 150 and 20,000 second-feet. Operation of water stage recorder satisfactory throughout the year. Daily discharge ascertained by applying to the rating table mean daily gage height determined by inspecting gage-height graph. Records excellent for periods when the stage-discharge relation was not affected by ice; fairly good for other periods.

Discharge measurements of Sacandaga River at Hadley, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 9	E. D. Burchard	[a] 5.04	1,500	Apr. 16	E. D. Burchard	5.49	3,640
30	A. H. Davison	[a] 4.25	891	May 10	do	5.90	4,340
Feb. 23	E. D. Burchard	[a] 3.96	543	June 14	do	8.38	12,300
Mar. 20	A. H. Davison	[a] 4.97	1,460	14	do	8.33	12,100
Apr. 9	E. D. Burchard	6.93	7,480	Aug. 6	J. W. Moulton	2.81	278
11	do	6.37	5,740				

[a] Stage-discharge relation affected by ice.

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

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	587	552	4,840	550	850	3,600	9,030	5,340	3,770	4,100	323	455
2	615	559	5,080	550	800	4,000	8,700	5,470	3,350	3,660	307	499
3	499	615	4,600	500	800	3,600	10,800	5,730	2,960	3,060	361	622
4	430	601	3,900	500	750	3,400	12,600	5,600	2,960	2,430	366	573
5	383	594	3,270	500	750	3,600	12,200	5,340	2,780	1,880	312	486
6	350	645	3,370	700	700	3,400	11,100	5,340	2,350	1,450	273	412
7	307	660	3,470	1,100	700	3,000	9,710	5,210	2,350	1,220	250	366
8	288	690	3,180	1,400	700	2,200	8,700	5,080	2,430	1,040	232	350
9	268	698	2,710	1,500	650	1,800	7,430	4,820	3,250	882	227	328
10	263	690	2,710	1,300	650	1,500	6,410	4,460	3,460	821	312	302
11	254	722	2,800	1,200	600	1,300	5,600	4,100	4,370	838	630	278
12	250	722	2,460	1,100	600	1,200	5,080	3,770	9,030	956	526	263
13	250	698	1,980	1,000	600	1,500	4,700	3,350	11,500	1,120	424	254
14	283	690	1,380	1,300	600	1,900	4,340	3,060	12,200	1,140	361	227
15	436	714	1,100	1,300	600	1,900	3,990	2,690	10,000	1,040	339	236
16	499	683	900	1,700	600	1,800	3,660	2,430	8,050	986	350	227
17	455	652	850	2,400	600	1,700	3,350	2,110	6,550	910	443	214
18	407	675	750	2,600	600	1,700	3,660	1,950	5,340	847	526	205
19	407	714	700	2,300	550	1,600	4,460	1,680	4,460	847	486	197
20	552	706	650	2,000	550	1,400	6,000	1,450	3,560	830	401	184
21	1,360	637	650	1,700	500	1,300	8,370	1,370	2,960	770	339	184
22	1,980	519	650	1,500	550	1,200	10,800	1,290	2,430	690	307	189
23	1,590	532	700	1,400	500	1,300	11,900	1,390	1,950	615	273	189
24	1,280	1,520	700	1,300	450	1,700	11,900	1,950	1,800	559	455	189
25	1,070	3,580	700	1,170	650	2,800	10,800	2,350	2,030	532	608	180
26	938	3,580	700	1,100	450	4,000	9,370	2,430	1,880	539	545	176
27	830	3,270	650	1,100	700	5,500	8,050	2,190	1,700	499	480	172
28	746	2,620	600	1,000	1,800	6,980	6,980	1,880	1,490	455	412	172
29	675	2,620	600	1,000	.....	8,700	6,140	2,170	1,570	395	378	172
30	615	3,080	550	850	.....	9,370	5,600	3,770	3,520	366	372	184
31	566	.....	550	850	.....	9,710	.....	4,220	.....	344	424	.....

NOTE.—Discharge Dec. 15 to Mar. 27, estimated because of ice, from discharge measurements, weather records, and study of gage-height graph.

Monthly discharge of Sacandaga River at Hadley, N. Y., for the year ending Sept. 30, 1917.

[Drainage area, 1,060 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	1,980	250	627	0.592	0.68
November	3,580	519	1,170	1.10	1.23
December	5,080	550	1,860	1.75	2.02
January	2,600	500	1,240	1.17	1.35
February	1,800	450	673	.635	.66
March	9,710	1,200	3,180	3.00	3.46
April	12,600	3,350	7,710	7.27	8.11
May	5,730	1,290	3,350	3.16	3.64
June	12,200	1,490	4,200	3.96	4.42
July	4,100	344	1,150	1.08	1.24
August	630	227	388	.366	.42
September	622	172	283	.267	.30
The year	12,600	172	2,150	2.03	27.53

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, 1917. September 25, 1903, to December 31, 1908, at Buskirk, 4 miles below present station.

GAGE.—Inclined staff on left bank near the farm house of James Russell. Prior to August 17, 1914, chain gage, 400 feet above present site; gage read by Mrs. Vashti Russell, Mrs. Viola Davis, and Mrs. Volney 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, 9.7 feet at 7.30 a. m., February 27 (discharge about 8,040 second-feet); minimum stage recorded, 2.68 feet at 6 a. m., September 24 (discharge about 44 second-feet).

1910–1917: 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; affected by ice during much of period December to March, inclusive. 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 height to rating table. Records good except for periods of low water, when semi-daily gage heights may not indicate the true mean, and during periods when the stage-discharge relation is affected by ice; fair for the latter periods.

Discharge measurements of Hoosic River near Eagle Bridge, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 9	E. D. Burchard	3.22	209	Jan. 31	A. H. Davison	[a] 4.61	678
13	do	3.14	144	Feb. 24	do	[a] 4.19	290
13	do	3.08	127	Mar. 21	E. D. Burchard	4.30	734
13	do	2.99	98.6	21	do	4.33	760
13	do	2.94	95.9	June 6	do	4.74	1,090
Jan. 12	do	[a] 4.25	378				

[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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	395	264	3,070	650	600	1,390	2,700	1,060	678	420	165	420
2	395	302	1,290	800	420	1,020	4,930	1,160	585	370	130	348
3	208	216	1,200	600	400	780	3,880	1,200	745	395	216	325
4	208	470	1,160	600	340	645	2,820	940	745	325	165	348
5	149	420	1,290	550	600	710	2,580	1,290	710	370	79	276
6	186	525	1,390	1,300	550	445	2,230	1,690	780	280	116	232
7	149	420	1,060	2,000	600	645	2,460	1,390	980	244	149	216
8	103	325	1,020	1,100	220	645	1,900	1,390	1,900	159	146	179
9	159	348	1,020	800	360	1,110	1,690	1,590	1,160	244	136	111
10	180	525	2,340	650	320	900	1,390	1,490	1,020	240	272	220
11	200	525	1,020	500	280	860	1,200	1,390	1,160	260	240	186
12	172	370	1,020	420	440	3,330	1,200	1,490	1,290	256	127	182
13	172	470	860	480	500	1,590	1,110	1,290	1,110	224	105	193
14	325	525	780	800	440	1,160	940	1,200	900	280	220	179
15	276	525	710	2,200	500	940	1,390	1,110	1,020	240	165	149
16	276	420	600	1,700	400	980	940	1,020	900	325	193	111
17	244	420	600	1,400	360	1,200	780	860	780	216	420	93
18	224	420	550	1,400	280	1,150	940	745	645	244	302	146
19	208	348	550	1,000	320	860	1,060	710	585	280	165	119
20	498	470	550	900	340	678	2,580	615	525	325	100	122
21	585	395	600	800	420	678	2,700	645	470	240	172	149
22	325	325	940	700	320	1,020	3,330	585	445	172	165	133
23	395	325	2,010	650	320	1,200	2,700	645	370	232	152	52
24	280	3,330	1,490	550	280	4,020	2,010	745	370	204	146	73
25	260	1,590	1,290	500	380	2,820	1,590	745	585	196	204	111
26	240	1,020	1,020	480	1,790	2,700	1,390	645	470	182	95	105
27	232	860	1,020	420	7,270	3,330	1,240	615	445	193	172	95
28	232	860	940	400	2,460	6,910	1,200	615	302	172	149	122
29	165	745	860	420	.....	3,600	1,060	820	395	168	182	152
30	236	2,340	585	650	.....	2,460	1,160	1,020	325	193	302	81
31	244	.....	498	750	.....	1,900	.....	820	.....	168	678	.....

NOTE.—Discharge Dec. 16–21 and Jan. 9 to Feb. 25, estimated because of ice from discharge measurements, weather records and study of gage-height graph.

Monthly discharge of Hoosic River near Eagle Bridge, N. Y., for the year ending Sept. 30, 1917.

[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	585	103	256	0.500	0.58
November	3,330	216	670	1.31	1.46
December	3,070	498	1,080	2.11	2.43
January	2.200	400	844	1.65	1.90
February	7,270	220	768	1.50	1.56
March	6,910	445	1,670	3.26	3.76
April	4,930	780	1,900	3.71	4.14
May	1,690	585	1,020	1.99	2.29
June	1,900	302	746	1.46	1.63
July	420	159	252	.492	.57
August	678	79	194	.379	.44
September	420	73	174	.340	.38
The year	7,270	73	796	1.56	21.12

Daily discharge, in second-feet, of Mohawk River at Vischer Ferry dam, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,750	1,460	18,200	3,380	4,670	14,200	16,200	7,670	6,870	11,400	2,260	3,480
2	1,960	1,190	12,500	3,380	5,120	10,100	30,000	11,000	7,310	8,920	2,240	2,960
3	2,150	881	9,840	4,220	4,670	7,520	32,400	11,800	5,920	7,140	1,420	2,510
4	1,320	952	7,330	5,120	3,780	6,020	25,400	10,400	5,910	5,780	2,030	1,730
5	1,200	1,760	10,100	5,120	3,380	5,120	21,700	10,200	4,360	4,530	2,550	2,520
6	1,500	2,420	11,700	5,930	3,380	4,220	18,200	16,400	4,680	3,510	1,330	2,120
7	2,090	3,130	10,600	6,720	3,380	4,220	20,300	13,500	4,830	3,720	1,430	2,310
8	1,280	3,700	8,070	7,520	3,380	4,220	17,000	12,300	11,800	3,550	1,730	2,040
9	1,130	2,590	8,320	7,120	3,380	4,220	13,600	10,500	13,300	3,430	1,930	1,520
10	1,440	3,040	10,300	6,820	2,580	4,670	10,500	9,570	12,100	4,590	3,380	2,050
11	1,090	3,560	10,000	6,620	2,580	4,670	8,920	8,690	13,600	5,120	3,260	2,020
12	955	2,400	7,800	6,120	2,580	4,220	8,520	8,370	48,300	7,570	1,850	2,120
13	977	2,230	7,030	6,220	2,580	11,800	8,620	7,540	36,600	6,350	2,020	2,250
14	1,120	3,570	5,390	5,840	2,580	10,600	8,620	6,810	23,800	4,940	2,400	2,220
15	1,570	3,720	5,450	5,700	2,580	9,020	7,420	5,620	17,400	6,790	2,830	1,520
16	919	3,720	7,030	7,620	2,580	8,020	6,720	5,040	11,500	8,020	1,980	2,460
17	1,440	2,950	3,160	7,020	2,580	7,520	5,660	7,090	10,400	4,730	2,060	1,600
18	907	3,390	2,690	5,840	2,220	8,020	5,930	5,480	8,380	4,320	2,390	1,770
19	1,170	2,980	3,460	4,940	1,870	8,020	6,610	5,100	5,910	5,330	1,660	2,100
20	2,270	3,310	3,540	4,580	1,870	6,520	10,200	5,270	6,340	4,130	1,630	1,360
21	4,780	3,860	3,860	4,040	1,870	5,570	17,100	4,780	9,740	4,150	1,720	1,990
22	5,760	3,300	4,270	3,780	1,870	6,020	18,700	4,930	7,520	3,350	1,640	1,590
23	3,780	2,670	4,760	3,780	1,870	9,900	17,700	4,910	5,240	3,280	1,620	1,510
24	2,380	8,060	5,480	3,780	1,870	20,800	14,900	4,660	6,880	2,630	2,590	1,470
25	2,820	14,300	5,300	3,700	1,870	39,200	11,600	4,770	7,640	2,430	6,760	1,660
26	1,790	9,740	4,040	3,380	1,870	41,000	9,120	4,890	6,110	2,080	4,230	1,440
27	2,160	6,720	4,130	3,140	2,220	47,400	8,320	4,830	7,880	2,790	2,780	1,640
28	2,020	5,520	4,580	3,140	16,200	46,400	6,670	5,130	7,370	2,350	2,230	1,560
29	1,320	5,840	4,400	2,580	.....	30,800	5,350	9,430	7,200	2,180	6,140	1,490
30	1,000	15,100	4,220	2,980	.....	22,400	5,650	15,900	14,900	1,700	2,520	1,860
31	1,070	.....	4,220	4,220	.....	16,500	.....	10,400	.....	2,120	2,790	.....

NOTE.—See "Diversions" in station description.

Monthly discharge of Mohawk River at Vischer Ferry dam, N. Y., for the year ending Sept. 30, 1917.

[Drainage area, 3,400 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	5,760	907	1,870	0.550	0.63
November	15,100	881	4,270	1.26	1.41
December	18,200	2,690	6,830	2.01	2.32
January	7,620	2,580	4,980	1.46	1.68
February	16,200	1,870	3,260	.959	1.00
March	47,400	4,220	13,800	4.06	4.68
April	32,400	5,350	13,300	3.91	4.36
May	16,400	4,660	8,160	2.40	2.77
June	48,300	4,360	11,300	3.32	3.70
July	11,400	1,700	4,610	1.36	1.57
August	6,760	1,330	2,500	.735	.85
September	3,480	1,360	1,960	.576	.64
The year	48,300	881	6,420	1.89	25.61

MOHAWK RIVER AT VISCHER FERRY DAM, N. Y.

LOCATION.—At Vischer Ferry dam of Barge Canal (Lock No. 7), 1 mile above Stony Creek and Vischer Ferry, 7 miles below Schenectady, Schenectady County, and 11 miles above mouth.

DRAINAGE AREA.—3,400 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 24, 1913, to September 30, 1917.

GAGE.—Stevens water-stage recorder (showing head on crest of spillway) in the southerly corner of the basin near upper end of Barge Canal lock, installed August 18, 1916; 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. Inclined staff gage 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. Water-stage recorder inspected by engineers from the Albany office of the 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.

CONTROL.—The control is the crest of the spillway.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 4.07 feet at 9 a. m. June 12 (discharge, 51,500 second-feet); minimum stage, from water-stage recorder, 0.32 foot at 9 a. m. September 20 (discharge 800 second-feet).

1913–1917: Maximum stage recorded, 7.6 feet just before noon March 28, 1914, determined by leveling from flood marks (discharge not determined). This stage lasted but a few minutes and was caused by the breaking of an ice jam near Schenectady. Minimum stage from water-stage recorder, 0.18 foot from 4 a. m. to 5 a. m. and 4 p. m. to 6. p. m. October 31, 1914 (discharge about 290 second-feet).

DIVERSIONS.—Water was diverted into Erie canal at temporary lock in north end of dam prior to December, 1914. Measurements of this diversion were made at bridge 48, about a mile downstream, but no allowance for the diversion was made in computing the flow.

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 lock and water wheels.

REGULATION.—Flow affected by operation of dams upstream.

ACCURACY.—Stage-discharge relation practically permanent. Probably not affected by ice. Rating curve fairly well defined by discharge measurements between 350 and 2,500 second-feet; above 2,500 second-feet, based on theoretic coefficients. Gage in lock read to tenths twice daily January 29 to March 23; operation of water-stage recorder satisfactory for the remainder of year. Daily discharge ascertained from staff gage record by applying mean daily gage height to rating table; daily discharge for remainder of year determined by use of discharge integrator. Records fair.

Daily discharge, in second-feet, of East Branch of Delaware River at Fish Eddy, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	300	408	3,050	950	440	2,400	5,260	1,690	1,500	3,320	590	1,500
2	281	480	2,320	900	400	2,200	14,000	1,500	1,890	3,050	505	1,320
3	262	455	2,000	800	380	1,300	11,800	1,320	1,690	2,550	480	1,160
4	245	430	1,700	750	380	1,000	8,180	1,320	1,590	2,210	408	1,000
5	228	590	1,400	700	380	1,000	5,260	1,320	1,500	1,690	385	920
6	228	590	1,200	800	380	700	5,260	2,550	1,500	1,590	385	745
7	228	530	1,000	900	440	700	5,440	2,670	3,610	1,500	385	710
8	228	480	900	1,000	500	600	5,260	2,670	3,910	1,410	385	745
9	228	480	900	1,200	550	900	5,080	2,670	4,230	1,240	505	710
10	228	480	1,100	1,200	550	1,100	4,900	2,550	5,440	1,500	1,320	710
11	228	480	900	1,100	480	1,000	4,730	2,320	11,800	2,550	710	680
12	228	480	800	1,100	380	1,300	4,900	1,990	9,040	3,050	590	650
13	245	480	750	1,200	380	3,600	3,610	1,500	8,390	2,550	590	650
14	300	480	700	1,600	340	3,600	3,320	1,590	7,560	1,990	530	560
15	300	455	650	4,800	300	3,800	2,320	1,500	6,570	2,100	505	480
16	300	455	600	2,800	340	3,200	1,990	1,500	5,260	2,100	1,160	480
17	300	455	550	2,400	380	2,800	1,790	1,160	3,320	1,590	1,890	430
18	245	430	500	1,900	300	2,400	1,690	1,160	2,550	1,160	1,160	430
19	245	430	480	1,500	220	2,200	2,100	1,000	2,320	1,040	1,000	408
20	455	430	480	1,300	200	2,000	3,610	1,080	2,320	1,000	815	362
21	1,500	430	480	1,200	200	2,200	3,320	1,160	2,100	1,000	650	300
22	1,160	430	650	1,000	140	2,200	3,050	1,000	1,990	1,000	530	300
23	850	455	4,000	850	120	2,000	3,050	920	2,100	920	480	300
24	815	2,430	2,600	800	95	1,800	2,320	850	2,100	920	2,100	262
25	780	1,590	1,700	700	95	3,000	2,100	780	1,790	920	2,320	262
26	620	1,410	1,300	650	120	5,000	1,890	780	8,180	920	1,590	262
27	530	1,240	1,300	600	550	9,260	1,790	850	6,000	780	1,160	262
28	480	1,080	1,200	550	2,600	18,100	1,500	780	4,070	680	1,080	262
29	480	1,080	1,000	550	.....	8,600	1,320	1,160	3,760	680	4,070	300
30	430	3,760	800	500	.....	4,730	1,320	1,320	3,320	1,160	2,210	390
31	430	.....	650	460	.....	9,260	.....	1,320	.....	710	1,890	.....

NOTE.—Discharge Dec. 3 to 22 and Dec. 25 to Mar. 26, estimated, because of ice, from discharge measurements, weather records, study of gage height graph, and comparison with similar studies for near-by stations.

Monthly discharge of East Branch of Delaware River at Fish Eddy, N. Y., for the year ending Sept. 30, 1917.

[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	1,500	228	432	0.547	0.63
November	3,760	408	780	.987	1.10
December	4,000	480	1,210	1.53	1.76
January	4,800	460	1,190	1.51	1.74
February	2,600	95	416	.526	.55
March	18,100	600	3,360	4.25	4.90
April	14,000	1,320	4,070	5.15	5.75
May	2,670	780	1,480	1.87	2.16
June	11,800	1,500	4,050	5.13	5.72
July	3,320	680	1,580	2.00	2.31
August	4,070	385	1,040	1.32	1.52
September	1,500	262	582	.736	.82
The year	18,100	95	1,690	2.14	28.96

DELAWARE RIVER BASIN.

EAST BRANCH OF DELAWARE RIVER AT FISH EDDY, N. Y.

LOCATION.—At railway bridge in village of Fish Eddy, Delaware County, about 4 miles below mouth of Beaver Kill and 5½ miles above confluence of East and West Branches.

DRAINAGE AREA.—790 square miles (measured on post-route map).

RECORDS AVAILABLE.—November 19, 1912, to September 30, 1917. 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. Lyon.

DISCHARGE MEASUREMENTS.—Made by wading or from the highway bridge about 200 feet above the gage.

CHANNEL AND CONTROL.—Coarse gravel; occasionally shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 12.3 feet at 8 a. m. March 28 (discharge about 18,100 second-feet); minimum stage recorded, 2.0 feet October 5 to 12 (discharge, 228 second-feet); minimum discharge, 95 second-feet, February 24 and 25 (stage-discharge relation affected by ice).

1912–1917: 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, 15, 1914 (discharge 97 second-feet).

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

ACCURACY.—Stage-discharge relation apparently permanent; affected by ice during much 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 October 1 to December 31 and July 1 to September 30; to tenths once daily, January 1 to June 30. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except for periods when the stage-discharge relation was affected by ice, for which they are fair.

COOPERATION.—Gage-height record January 1 to June 30 furnished by United States Weather Bureau.

Discharge measurements of East Branch of Delaware River at Fish Eddy, N. Y., during the year ending Sept. 30, 1917.

[Made by E. D. Burchard.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Dec. 27	[a] 4.01	1,300
Jan. 24	[a] 6.06	798
Feb. 15	[a] 5.97	333
Mar. 10	[a] 5.33	860
Mar. 28	11.48	15,900
28	10.63	13,400

[a] Stage-discharge relation affected by ice.

DELAWARE RIVER AT PORT JERVIS, N. Y.

LOCATION.—At 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, 1917.

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; read by Mrs. Bella Fuller. Prior to June 20, 1914, a chain gage on the bridge was used.

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

CHANNEL AND CONTROL.—Gravel; occasionally shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11.3 feet at 8 a. m. March 28 (discharge, 53,400 second-feet); minimum stage recorded, 1.6 feet, September 27–30 (discharge 780 second-feet).

1904–1917: Maximum stage recorded, 16.0 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 practically permanent; affected by ice during large part of January and February. Rating curve well defined between 1,000 and 30,000 second-feet. Gage read to hundredths twice daily from October 1 to December 31 and to tenths once daily, January 1 to September 30. Daily discharge ascertained by applying mean daily gage height to rating table. Records good for periods when the stage-discharge relation was not affected by ice and fairly good for other periods.

COOPERATION.—Gage-height record January 1 to September 30 furnished by United States Weather Bureau.

Discharge measurements of Delaware River at Port Jervis, N. Y., during the year ending Sept. 30, 1917.

[Made by E. D. Burchard.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Feb. 16	[a] 5.28	1,490
Mar. 11	[a] 6.13	3,840
30	7.92	26,600

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Delaware River at Port Jervis, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,720	1,720	12,100	3,650	1,900	12,000	23,200	4,460	5,680	9,840	2,260	4,460
2	2,070	1,720	9,010	3,650	3,200	15,000	27,500	4,180	6,010	8,200	1,890	3,160
3	1,890	1,800	6,700	3,650	4,200	6,500	24,600	5,360	6,700	7,060	1,550	2,690
4	1,890	1,890	6,010	3,910	3,000	4,800	23,900	5,050	6,350	6,010	1,720	2,470
5	1,470	1,890	5,050	3,910	1,900	4,600	17,400	4,750	6,010	5,360	1,550	2,260
6	1,240	1,720	5,050	6,010	1,200	6,000	14,600	5,050	5,680	4,750	1,390	2,070
7	1,720	1,720	4,460	8,200	1,400	4,000	17,400	5,360	7,060	4,460	1,550	1,890
8	1,240	2,070	3,910	7,430	1,700	4,000	14,100	4,460	13,600	3,910	1,390	1,720
9	1,110	1,720	3,650	6,010	2,600	4,000	13,600	8,200	13,100	3,400	3,400	1,720
10	1,110	1,720	4,180	6,010	1,900	4,600	11,200	7,810	10,700	3,650	4,460	1,550
11	990	1,800	4,180	5,360	2,400	4,200	9,010	7,430	9,420	5,360	4,180	1,550
12	880	2,260	3,910	4,180	1,900	4,600	8,200	7,060	32,700	7,430	3,160	1,550
13	935	2,070	3,400	3,400	1,700	11,000	7,810	6,350	25,300	8,600	2,470	1,390
14	990	1,720	3,160	5,680	1,600	26,000	7,060	5,050	16,800	7,060	1,890	1,240
15	1,110	1,720	3,160	36,500	1,600	29,700	6,700	4,750	16,800	5,680	1,720	1,110
16	1,180	1,720	2,690	21,800	1,700	23,900	6,700	4,750	13,100	5,360	1,550	1,110
17	1,240	1,800	2,690	14,600	1,600	20,500	6,010	4,460	11,200	4,750	1,890	990
18	1,110	1,640	2,260	9,420	1,600	15,100	5,360	4,460	9,840	5,680	2,470	990
19	1,050	1,640	2,260	6,010	1,400	13,600	5,050	3,910	9,840	4,460	2,920	990
20	4,750	1,550	2,920	5,000	1,200	10,700	5,680	3,650	9,010	4,180	2,260	990
21	3,650	1,550	3,160	4,600	1,400	9,840	7,060	3,400	7,430	3,650	1,890	880
22	5,360	1,390	4,460	4,200	1,200	10,700	7,430	3,160	8,200	3,400	1,720	880
23	4,180	1,390	5,360	4,000	1,000	9,840	7,810	3,160	7,060	2,920	1,550	880
24	3,400	1,550	8,200	3,400	1,200	14,100	6,010	3,400	7,810	3,160	1,720	880
25	2,920	2,070	7,430	3,200	1,100	45,200	5,360	2,920	7,060	3,160	3,910	880
26	2,470	3,910	5,360	2,800	1,400	33,500	5,050	2,920	6,010	3,650	4,750	880
27	2,260	3,160	5,050	2,600	1,700	37,300	5,050	2,690	6,010	3,160	3,650	780
28	2,070	2,690	4,750	2,400	7,500	53,400	4,460	3,160	15,100	3,160	2,920	780
29	1,980	3,400	4,750	2,200	.....	38,900	3,910	3,650	10,700	2,690	2,260	780
30	1,720	3,910	3,910	2,000	.....	26,000	3,650	7,430	11,200	2,260	2,070	780
31	1,720	.....	3,650	1,900	.....	20,500	.....	6,350	.....	2,070	6,010	.....

NOTE.—Discharge Jan. 20 to Mar. 14, inclusive, estimated, because of ice, from discharge measurements, weather records, study of gage-height graph and comparison with similar studies for stations upstream.

Monthly discharge of Delaware River at Port Jervis, N. Y., for the year ending Sept. 30, 1917.

[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	5,360	880	1,980	0.610	0.70
November	3,910	1,390	2,030	.625	.70
December	12,100	2,260	4,740	1.46	1.68
January	36,500	1,900	6,380	1.96	2.26
February	7,500	1,000	2,010	.618	.64
March	53,400	4,000	16,900	5.20	6.00
April	27,500	3,650	10,400	3.20	3.57
May	8,200	2,690	4,800	1.48	1.71
June	32,700	5,680	10,700	3.29	3.67
July	9,840	2,070	4,790	1.47	1.70
August	4,460	1,390	2,520	.776	.89
September	4,460	780	1,480	.456	.51
The year	53,400	780	5,750	1.77	24.03

DELAWARE RIVER AT RIEGELSVILLE, N. J.

LOCATION.—At 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, 1917.

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 to July 1, 1917, and after that date by Herbert J. Bernholz.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Large bowlders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 18.1 feet at 4 p. m. March 28 (discharge, 88,400 second-feet); minimum stage recorded, 2.3 feet, September 30 (discharge, 1,990 second-feet).

1906–1916: Maximum stage [1] recorded, 25 feet March 28, 1913 (discharge, 144,000 second-feet); minimum stage recorded, 1.78 feet November 6, 1914 (discharge 1,170 second-feet).

ICE.—Discharge relation affected by ice, during severe winters only.

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.—Stage 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 mean daily gage heights to rating table. Records good.

The following discharge measurement was made by H. J. Jackson:

September 14, 1917: Gage height, 2.80 feet; discharge, 2,890 second-feet. Canal was measured also and discharge found to be 230 second-feet.

Daily discharge, in second feet, of Delaware River at Riegelsville, N. J., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,940	3,280	10,900	6,850	8,820	9,500	29,300	7,170	10,900	15,000	4,420	8,150
2	3,160	3,390	16,300	6,850	8,820	10,500	35,100	7,490	10,500	12,400	5,010	6,850
3	3,390	3,390	11,600	6,850	5,610	11,600	47,700	8,480	13,100	11,200	5,610	6,230
4	3,160	3,160	10,200	7,490	5,310	9,500	42,500	7,820	12,000	11,600	3,880	5,310
5	2,940	3,280	8,820	8,820	6,540	8,150	31,000	8,480	11,200	9,840	3,390	4,710
6	2,730	3,280	8,150	16,700	4,420	6,230	31,600	10,900	10,500	8,150	3,390	4,140
7	2,530	3,160	7,490	15,800	5,310	6,230	30,400	13,900	11,600	7,490	3,390	3,880
8	2,530	3,160	6,850	17,100	5,310	7,170	29,300	13,500	14,200	6,850	3,880	4,140
9	2,630	3,390	6,230	14,600	5,610	8,820	23,500	13,100	18,400	6,850	9,840	7,170
10	2,250	3,160	6,850	13,100	3,880	9,500	21,600	13,900	16,300	8,480	11,200	3,880
11	2,160	3,050	6,850	12,000	4,420	11,600	18,800	13,100	17,100	9,840	9,500	3,630
12	2,160	2,940	6,850	7,490	3,880	19,700	16,700	12,000	28,800	13,100	8,480	3,390
13	2,080	3,390	6,850	6,850	3,880	16,300	15,800	10,500	47,000	15,000	8,150	3,280
14	2,080	3,390	5,610	14,600	4,140	16,300	15,400	9,840	30,400	12,700	7,170	3,160
15	2,160	3,160	5,310	22,100	4,140	18,000	14,200	9,500	27,700	13,500	5,920	2,940
16	2,080	2,940	4,140	23,500	4,710	15,800	13,100	8,480	28,800	12,000	7,170	2,730
17	2,160	3,050	3,630	20,700	3,880	15,400	12,000	7,820	23,000	10,500	7,820	2,530
18	2,250	3,160	3,390	15,400	3,880	17,100	10,900	7,820	19,300	11,600	6,230	2,630
19	2,440	2,840	3,880	13,900	4,420	13,900	10,500	7,490	15,800	8,820	5,610	2,340
20	5,010	2,840	3,630	11,200	4,420	12,000	11,200	6,850	14,200	7,820	5,310	2,440
21	9,840	2,840	4,140	10,200	4,420	11,200	11,200	6,540	15,000	7,170	4,710	2,340
22	7,490	2,730	5,310	12,700	4,710	10,900	13,100	6,230	13,900	6,850	4,710	2,340
23	8,480	2,730	8,820	12,700	3,880	11,600	12,700	5,610	12,000	7,490	4,140	1,990
24	6,850	3,630	10,900	9,840	10,200	15,400	11,200	5,920	10,900	7,170	5,920	2,080
25	5,610	5,310	12,400	9,500	8,480	45,700	10,500	5,610	12,700	6,850	5,610	1,990
26	5,010	6,850	10,900	7,490	6,230	56,000	9,500	5,610	11,600	6,850	9,840	1,990
27	4,420	6,540	9,840	6,540	6,230	58,100	8,820	5,310	10,900	6,230	7,820	2,080
28	4,140	5,010	9,160	7,170	8,150	86,100	8,480	5,310	18,800	6,920	5,920	1,990
29	3,880	4,710	9,500	6,850	.....	78,600	8,150	7,490	19,300	5,610	5,010	2,080
30	3,630	6,230	8,150	9,500	.....	51,800	7,820	11,200	15,400	5,010	5,010	1,990
31	3,630	.....	6,850	10,900	.....	39,300	.....	12,700	.....	4,710	5,610	.....

[1] It has been estimated that the flood of October 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, 1917.

[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	9,840	2,080	3,740	0.617	0.71
November	6,850	2,730	3,670	.607	.68
December	16,300	3,390	7,730	1.22	1.41
January	23,500	6,540	11,800	1.84	2.12
February	10,200	3,880	5,490	.854	.89
March	86,100	6,230	22,800	3.58	4.13
April	47,700	7,820	18,700	2.95	3.29
May	13,900	5,310	8,890	1.42	1.64
June	47,000	10,500	17,400	2.74	3.06
July	15,000	4,710	9,120	1.45	1.67
August	11,200	3,390	6,120	.988	1.14
September	8,150	1,990	3,480	.577	.64
The year	86,100	1,990	9,940	1.57	21.38

NOTE.—To allow for water diverted by the canal, 230 second-feet was added to the daily discharge, Oct. 1 to Dec. 20 and Mar. 17 to Sept. 30, before computing discharge per square mile; first three columns of table therefore indicate actual quantity of water flowing 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 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, 1917.

GAGE.—Vertical staff, in two sections, bolted to rock on left bank under the bridge; read by J. L. Rosa and Ralph Rosa.

DISCHARGE MEASUREMENTS.—Made from the bridge or by wading a short distance downstream.

CHANNEL AND CONTROL.—Coarse gravel, boulders, and solid ledge; practically permanent.

EXTREMES OF DISCHARGE.—1913–1917: Maximum stage, determined from water marks on gage, 11.0 feet, some time during the night of March 27–28, 1917 (discharge about 7,870 second-feet); minimum stage recorded, 0.70 foot from 7 a. m. October 12 to 7 a. m. October 13, 1916 (discharge, 26 second-feet).

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

ACCURACY.—Stage-discharge relation practically permanent; affected by ice during portions of the period 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 height to rating table. Records good for periods when the stage-discharge relation was not affected by ice; fair for other periods.

Discharge measurements of Beaver Kill at Cooks Falls, N. Y., during the year ending Sept. 30, 1917.

[Made by E. D. Burchard.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Jan. 24	[a] 2.03	257	Mar. 10	[a] 2.85	317
Feb. 15	[a] 4.04	147	29	6.00	2,570

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Beaver Kill at Cooks Falls, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	130	154	1,140	296	260	750	3,950	705	455	755	232	805
2	92	124	1,020	256	190	440	4,550	705	420	1,200	232	530
3	78	92	805	232	160	240	3,310	615	420	910	256	455
4	65	75	755	296	150	280	2,720	805	355	615	244	455
5	59	164	705	387	140	400	2,240	910	855	530	232	371
6	48	208	660	755	130	300	2,020	855	1,590	455	232	296
7	46	175	530	570	130	300	1,800	805	1,020	387	220	256
8	38	164	455	455	150	400	1,330	805	805	355	232	256
9	36	150	455	387	240	340	1,140	805	855	660	660	256
10	31	244	455	387	260	300	910	705	755	2,720	455	269
11	28	208	387	282	220	300	855	615	1,460	3,310	387	256
12	26	175	371	256	170	650	965	570	3,220	2,960	244	232
13	31	154	355	220	160	700	1,020	530	1,660	1,870	208	208
14	154	154	340	1,520	150	650	910	490	1,400	805	186	186
15	130	150	296	1,140	140	550	805	455	1,020	615	175	175
16	100	134	280	755	110	480	705	455	1,520	530	910	164
17	118	124	240	530	90	420	705	455	1,200	530	1,140	164
18	70	114	200	455	80	400	855	371	965	530	530	144
19	78	144	180	400	75	380	1,200	340	755	530	355	134
20	805	134	170	360	90	355	1,590	325	615	455	310	124
21	705	134	175	320	75	455	1,460	310	660	420	282	114
22	530	154	530	360	90	420	1,330	310	420	340	387	114
23	325	1,020	805	300	110	570	1,020	296	530	855	2,320	124
24	256	2,480	530	260	220	2,400	855	282	420	660	1,080	114
25	220	1,020	371	320	260	2,160	705	269	355	490	755	124
26	197	755	387	300	320	3,140	615	244	387	420	455	114
27	175	615	420	260	900	4,150	615	296	1,940	282	282	114
28	175	570	387	240	1,300	4,650	570	325	1,400	256	1,520	164
29	138	1,020	355	260	.....	2,560	530	705	855	340	2,880	144
30	114	1,400	325	280	.....	1,940	615	530	1,140	310	910	186
31	98	.....	296	220	.....	2,020	.....	490	.....	256	1,080	.....

NOTE.—Discharge Dec. 16–20 and Jan. 19 to Mar. 19, both inclusive, estimated because of ice, from discharge measurements, weather records, study of gage height graph, and comparison with similar studies from near-by stations.

Monthly discharge of Beaver Kill at Cooks Falls, N. Y., for the year ending Sept. 30, 1917.

[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	805	26	164	0.695	0.80
November	2,480	75	407	1.72	1.92
December	1,140	170	464	1.97	2.27
January	1,520	220	421	1.78	2.05
February	1,300	75	228	.966	1.01
March	4,650	240	1,070	4.53	5.22
April	4,550	530	1,400	5.93	6.62
May	910	244	528	2.24	2.58
June	3,220	355	982	4.16	4.64
July	3,310	256	818	3.47	4.00
August	2,880	175	626	2.65	3.06
September	805	114	235	.996	1.11
The year	4,650	26	613	2.60	35.28

WEST BRANCH OF DELAWARE RIVER AT HALE EDDY, N. Y.

LOCATION.—At highway bridge in village of Hale Eddy, Delaware County, 8 miles below power dam of Deposit Electric Co. and 8½ miles above junction with East Branch of Delaware River.

DRAINAGE AREA.—611 square miles (measured on Post-Route map).

RECORDS AVAILABLE.—November 15, 1912, to September 30, 1917. Records obtained at Hancock, about 7 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; read by William Seeley.

DISCHARGE MEASUREMENTS.—Made from the cable, installed in July, 1916, about 400 feet below the gage. 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, 10.7 feet at 8 a. m., March 28 (discharge, 11,800 second-feet); minumum stage recorded, 1.7 feet, September 29 and 30 (discharge, 105 second-feet). Minimum discharge, about 65 second-feet, February 23 and 24 (stage-discharge relation affected by ice.)

1912–1917: Maximum stage recorded,[1] 15.3 feet at 5 p. m. March 27, 1913 (discharge about 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 height to rating table. Records good for periods when the stage-discharge relation was 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, 1917.

[Made by E. D. Burchard.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Dec. 28	[a] 4.08	992	Feb. 14	[a] 6.40	202	Mar. 31	5.90	3,090
Jan. 23	[a] 9.10	829	Mar. 9	[a] 6.40	736	31	5.88	3,060

[a] Stage-discharge relation affected by ice.

[1] The observer states that on Oct. 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 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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	720	365	2,620	480	440	1,900	4,280	785	1,330	1,870	410	720
2	480	480	2,050	480	380	1,100	7,240	720	1,780	2,620	410	605
3	410	388	1,780	550	320	700	6,520	720	1,690	2,050	365	530
4	388	855	1,690	500	100	550	5,680	720	1,510	1,510	388	432
5	325	365	1,600	500	110	480	3,140	1,000	1,160	1,420	285	395
6	305	505	1,330	2,200	140	360	3,030	1,870	1,330	1,240	285	325
7	232	432	1,160	2,400	200	460	3,740	1,870	4,580	1,000	285	325
8	215	388	1,000	1,700	220	420	2,620	1,960	5,200	855	232	325
9	215	345	925	1,500	300	700	2,520	2,420	4,000	720	432	530
10	185	455	1,330	1,400	260	850	1,870	1,960	3,030	855	720	365
11	200	505	925	950	170	850	1,600	1,870	4,000	1,000	530	285
12	179	432	700	650	160	2,200	1,690	1,690	6,180	1,870	365	250
13	170	410	600	1,100	110	4,200	1,600	1,510	4,140	1,160	305	285
14	305	410	500	2,400	200	2,600	1,510	1,330	3,250	1,160	285	250
15	325	555	460	3,800	95	2,000	1,330	1,160	3,250	785	388	215
16	250	455	380	2,800	120	1,600	1,160	925	2,620	720	388	250
17	215	432	340	2,400	70	1,900	1,160	1,000	2,320	720	388	200
18	215	388	320	2,000	75	2,000	1,000	785	1,870	660	480	200
19	232	388	300	1,700	95	1,700	925	720	2,230	855	410	185
20	285	455	300	1,500	90	1,800	1,240	720	1,690	855	325	155
21	1,510	432	360	1,300	85	1,900	1,160	605	2,420	855	268	185
22	1,330	325	440	1,100	65	2,000	1,420	605	1,690	855	285	185
23	855	285	1,200	900	65	3,400	1,240	605	1,420	605	268	185
24	720	1,510	1,200	700	90	7,500	1,160	555	1,600	580	530	170
25	605	1,330	1,300	600	85	6,010	1,000	505	1,330	1,160	1,330	142
26	580	785	1,000	500	160	6,180	855	530	1,160	785	660	142
27	505	720	900	260	1,100	8,000	855	505	5,520	605	505	155
28	455	855	900	100	3,600	10,500	720	660	3,030	530	410	142
29	410	1,000	650	300	.....	5,680	720	1,690	3,030	480	345	130
30	365	2,620	440	380	.....	4,000	720	1,870	2,520	720	720	105
31	345	.....	380	420	.....	3,030	.....	1,420	.....	555	925	.....

NOTE.—Discharge, Dec. 12 to Mar. 24, estimated, because of ice, from discharge measurements, weather records, study of gage-height graph, and comparison with similar studies for near-by stations.

Monthly discharge of West Branch of Delaware River at Hale Eddy, N. Y., for the year ending Sept. 30, 1917.

[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	1,510	170	436	0.714	0.82
November	2,620	285	629	1.03	1.15
December	2,620	300	939	1.54	1.78
January	3,800	100	1,210	1.98	2.28
February	3,600	65	318	.520	.54
March	10,500	360	2,790	4.57	5.27
April	7,240	720	2,120	3.47	3.87
May	2,420	505	1,140	1.87	2.16
June	6,180	1,160	2,700	4.42	4.93
July	2,620	555	1,020	1.67	1.93
August	1,330	232	449	.735	.85
September	720	105	278	.455	.51
The year	10,500	65	1,180	1.93	26.09

SUSQUEHANNA RIVER BASIN.

SUSQUEHANNA RIVER AT CONKLIN, N. Y.

LOCATION.—At 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, 1917. 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. Water-stage recorder inspected by Mrs. Cora Ames.

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

CHANNEL AND CONTROL.—Coarse gravel and boulders; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 13.55 feet at 3 a. m. March 28 (discharge, 28,700 second-feet); minimum stage, from water-stage recorder, 2.45 feet September 27 and 30 (discharge 500 second-feet).

ICE.—Stage-discharge relation affected by ice.

ACCURACY.—Stage-discharge relation practically permanent. Affected by ice for a large portion of the period from January to March, inclusive. Rating curve well defined between 250 and 55,000 second-feet. Operation of water-stage recorder fairly satisfactory, except December 9–22, April 30 to May 12 and June 27 to July 17; staff gage read to hundredths twice daily December 9–22 and July 4 to 17. Daily discharge ascertained by applying mean daily gage height to rating table, except for days when the mean gage height would not give the true discharge within 1 per cent. For such days the discharge is the mean of 24 hourly determinations. Gage heights obtained by inspecting gage-height graph or by taking mean of two observations per day. Records good except for periods when the stage-discharge relation was affected by ice, for which they are fair.

Discharge measurements of Susquehanna River at Conklin, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 3	E. D. Burchard	3.89	1,800	Mar. 9	E. D. Burchard	[a] 7.06	2,180
Dec. 28	do	[a] 4.69	2,780	31	do	8.22	11,000
Jan. 20	do	[a] 5.70	3,620	May 14	C. C. Covert	5.38	4,260
Feb. 13	do	[a] 5.84	1,180	June 2	E. D. Burchard	5.99	5,300
Mar. 6	do	[a] 7.56	2,140				

[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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,910	1,230	7,330	2,200	2,600	10,000	11,500	2,830	4,760	8,760	2,210	1,750
2	2,280	1,400	6,400	1,800	2,400	7,000	13,400	2,830	5,940	8,280	1,880	1,520
3	1,810	1,750	4,840	2,000	2,000	4,600	12,300	2,830	5,060	9,500	1,750	1,880
4	1,570	1,520	4,140	2,200	1,800	2,600	14,300	2,830	4,230	7,330	2,070	1,520
5	1,400	1,460	3,860	3,000	1,600	2,400	10,800	2,910	3,500	5,940	1,750	1,280
6	1,300	1,570	4,040	6,000	1,500	2,200	9,500	5,940	3,240	4,640	1,520	1,150
7	1,170	1,940	3,950	7,500	1,400	2,200	11,000	5,940	9,180	3,860	1,400	1,050
8	1,100	1,750	3,500	5,500	1,300	1,900	9,740	5,940	10,000	2,670	1,350	1,080
9	1,020	1,570	2,990	4,200	1,400	2,200	8,040	5,940	10,800	3,420	3,580	1,150
10	970	1,630	3,420	3,800	1,400	2,600	7,100	5,940	8,760	2,990	7,240	1,350
11	930	1,880	3,860	3,800	1,300	2,800	5,940	5,940	7,800	2,830	5,560	1,180
12	882	2,070	3,330	3,000	1,300	8,500	5,500	5,940	10,800	3,860	3,240	1,060
13	826	1,880	2,990	1,800	1,200	12,000	5,500	4,530	12,800	4,640	2,280	946
14	946	1,750	2,800	2,200	1,100	12,000	5,280	4,230	10,200	3,860	2,360	882
15	1,090	2,250	2,400	3,800	950	9,500	4,640	3,680	9,000	4,230	1,940	810
16	1,250	2,830	2,200	6,500	900	6,500	4,140	3,240	8,760	5,720	1,880	747
17	1,040	2,360	2,200	5,500	850	5,500	3,860	3,080	7,800	5,720	2,910	754
18	938	2,140	2,000	4,400	850	5,000	3,500	3,160	6,400	4,950	2,360	691
19	997	2,070	2,000	4,000	800	4,200	3,330	2,830	6,400	5,060	1,810	649
20	2,360	2,000	1,900	3,600	800	3,200	3,420	2,510	7,020	6,700	1,460	600
21	4,040	2,000	1,800	3,200	800	3,000	4,230	2,510	10,800	6,860	1,300	600
22	3,240	2,000	2,200	3,200	800	3,200	4,230	2,440	9,000	5,720	1,150	579
23	2,590	1,750	3,000	3,000	800	12,000	3,680	2,440	6,400	4,530	1,060	530
24	2,210	2,740	3,800	2,800	800	11,000	3,420	2,670	5,940	4,040	1,570	500
25	1,940	5,940	3,400	2,400	800	20,000	3,080	2,590	6,860	3,240	1,860	518
26	1,810	4,740	3,800	2,200	800	21,000	2,750	2,440	6,630	3,590	2,300	512
27	1,630	3,080	3,200	2,000	900	24,800	2,750	2,360	11,400	2,830	1,520	500
28	1,570	2,910	2,800	1,900	4,400	27,600	2,750	2,670	11,400	2,360	1,210	506
29	1,350	2,910	2,600	1,800	.....	24,400	2,590	6,450	11,400	2,280	1,180	506
30	1,350	4,480	2,200	1,800	.....	16,800	2,510	7,800	11,400	2,280	1,630	500
31	1,300	.....	2,000	2,200	.....	12,100	.....	5,940	.....	2,990	2,070	.....

NOTE.—Discharge Dec. 14 to Mar. 26, estimated, because of ice, from discharge measurements, weather records and study of gage-height graph.

Monthly discharge of Susquehanna River at Conklin, N. Y., for the year ending Sept. 30, 1917.

[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	4,040	826	1,610	0.685	0.79
November	5,940	1,230	2,320	.987	1.10
December	7,330	1,800	3,260	1.39	1.60
January	7,500	1,800	3,330	1.42	1.64
February	4,400	800	1,340	.571	.59
March	27,600	1,900	9,120	3.88	4.47
April	14,300	2,510	6,120	2.60	2.90
May	7,800	2,360	3,980	1.69	1.95
June	.....	3,240	8,120	3.46	3.86
July	9,500	2,280	4,700	2.00	2.31
August	7,240	1,060	2,170	.924	1.07
September	1,880	500	910	.387	.43
The year	27,600	500	3,940	1.68	22.71

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, 1917. 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.

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, 11.16 feet at 4 a. m. March 28 (discharge, 23,600 second-feet); minimum stage, from water stage recorder, 2.74 feet at 2 a. m. October 13 (discharge, 345 second-feet).

1901–1917: Maximum stage recorded, 12.18 feet from noon until 1 p. m. April 2, 1916 (discharge, 27,900 second-feet); minimum stage recorded, 4.6 feet at the former station in Binghamton at 8 a. m. August 29, 1909 (discharge about 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 at head of Tioughnioga River is stored in reservoirs and, except for discharge over the spillways, is diverted out of the drainage area through the Erie Canal. The above-mentioned drainage area for Chenango River does not include these two areas.

ACCURACY.—Stage-discharge relation practically permanent; 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 water-stage recorder fairly satisfactory throughout the 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. Records good except for periods when stage-discharge relation was affected by ice, for which they are fair.

Discharge measurements of Chenango River near Chenango Forks, N. Y., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 29	E. D. Burchard	[a] 6.39	1,290	Apr. 2	E. D. Burchard	8.28	12,400
Jan. 22	do	[a] 5.12	1,670	May 14	C. C. Covert	4.30	2,280
Feb. 12	do	[a] 4.39	605	June 4	E. D. Burchard	4.54	2,680
Mar. 8	do	[a] 5.33	1,550				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Chenango River near Chenango Forks, N. Y., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,640	872	3,520	650	1,900	4,000	8,830	1,740	3,650	5,800	1,030	1,880
2	1,070	1,230	2,610	850	1,500	3,000	12,100	1,940	4,170	8,420	915	2,360
3	838	1,050	2,180	700	900	2,400	12,700	1,940	3,350	9,200	1,250	1,940
4	700	959	2,020	1,000	850	2,200	9,610	1,860	2,790	5,920	1,180	1,520
5	593	1,070	2,360	2,400	900	1,900	6,830	2,240	2,360	4,390	915	1,280
6	521	1,430	2,520	6,000	850	1,900	2,180	5,550	2,440	3,650	816	1,260
7	454	1,280	2,180	5,000	850	1,600	8,210	4,840	6,390	3,450	750	1,450
8	430	1,120	1,940	3,800	850	1,500	6,440	3,860	8,500	2,610	732	1,750
9	406	1,010	1,720	3,000	850	1,600	5,430	3,750	8,800	2,440	7,670	1,860
10	398	1,450	2,100	2,800	700	1,600	4,280	3,350	7,370	2,610	6,100	1,430
11	390	1,680	1,780	2,000	650	1,800	3,650	2,790	10,800	2,700	2,840	1,230
12	368	1,270	1,570	900	600	1,900	3,750	2,520	14,600	3,060	1,940	1,090
13	368	1,120	1,500	1,200	550	6,000	3,860	2,440	10,600	3,060	1,540	970
14	642	1,580	1,420	2,600	550	5,500	3,350	2,270	7,930	2,880	2,650	915
15	882	2,100	1,270	5,500	550	4,000	2,970	1,940	7,370	4,590	2,770	840
16	690	1,640	1,140	4,400	550	3,200	2,790	1,660	7,370	3,960	3,610	760
17	593	1,450	1,100	3,200	550	3,200	2,520	1,720	6,180	2,790	2,670	740
18	584	1,390	1,000	2,600	600	3,200	2,270	1,660	4,960	3,160	1,860	710
19	546	1,420	950	2,200	600	2,400	2,180	1,520	5,920	4,070	1,430	660
20	829	1,460	900	1,800	600	2,000	2,700	1,490	5,820	3,060	1,220	930
21	3,580	1,410	950	1,700	600	3,200	3,060	1,700	11,500	3,790	1,090	840
22	2,930	1,120	1,100	1,600	550	4,000	2,610	1,740	8,500	2,700	970	720
23	1,860	1,080	1,600	1,500	550	8,000	2,270	2,180	7,100	2,190	926	650
24	1,450	4,080	1,900	1,400	550	13,000	2,100	1,940	9,200	1,740	6,800	631
25	1,190	3,980	2,100	1,400	550	19,000	1,780	1,940	8,900	1,660	6,420	612
26	1,040	2,360	2,000	1,200	600	19,000	1,630	1,940	5,920	1,390	3,030	574
27	937	2,100	1,700	900	1,900	21,000	1,780	1,860	12,900	1,250	2,020	538
28	838	1,860	1,600	1,060	4,400	22,200	1,780	2,700	11,300	1,130	1,680	521
29	761	1,940	1,200	900	.....	15,000	1,690	7,510	7,980	1,340	2,100	538
30	700	3,500	900	1,200	.....	9,730	1,600	6,960	8,510	1,690	2,270	564
31	670	.....	700	2,000	.....	7,730	.....	4,610	.....	1,270	2,020	.....

NOTE.—Discharge Dec. 17 to Mar. 24, estimated because of ice, from discharge measurements, weather records and study of gage-height graph. Discharge June 21 to 23 estimated by comparison with record at Conklin. See "Diversions" in station description.

Monthly discharge of Chenango River near Chenango Forks, N. Y., for the year ending Sept. 30, 1917.

[Drainage area, 1,380 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	3,580	368	932	0.675	0.78
November	4,080	872	1,670	1.21	1.35
December	3,520	700	1,660	1.20	1.38
January	6,000	650	2,170	1.57	1.81
February	4,400	550	916	.664	.69
March	22,200	1,500	6,350	4.60	5.30
April	12,700	1,600	4,230	3.07	3.42
May	7,510	1,490	2,780	2.01	2.32
June	12,900	2,360	7,440	5.39	6.01
July	9,200	1,130	3,290	2.38	2.75
August	7,670	732	2,360	1.71	1.97
September	2,360	521	1,060	.768	.86
The year	22,200	368	2,660	1.93	28.64

CHEMUNG RIVER AT CHEMUNG, N. Y.

LOCATION.—At highway bridge about midway between Chemung, Chemung County, N. Y., and Willawana, Pa., half a mile upstream from State line and about 10 miles above mouth.

DRAINAGE AREA.—2,440 square miles.

RECORDS AVAILABLE.—September 11, 1903, to September 30, 1917.

GAGE.—Tape gage at the upstream side of the right span of the bridge; 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 year, 11.7 feet at 4.45 p. m. March 12 (discharge, 27,600 second-feet); minimum stage recorded 1.91 feet at 6 a. m. October 14 (discharge 260 second-feet); minimum discharge 220 second-feet February 15–16 (stage-discharge relation affected by ice).

1903–1917: 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 about 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 probably permanent; affected by ice for a large portion 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 height to rating table. Records good, except for periods when 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, 1917.

[Made by E. D. Burchard.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Dec. 30	[a] 2.52	318	Feb. 11	[a] 2.88	351	Apr. 4	6.01	6,290
Jan. 20	[a] 3.53	640	Mar. 7	[a] 2.79	770	June 1	5.06	4,070

[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, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,360	438	1,200	460	380	3,460	5,080	870	4,440	3,460	2,440	3,100
2	790	451	1,050	340	700	2,440	7,850	915	3,460	11,000	1,730	5,080
3	581	511	870	380	750	2,000	9,060	870	3,100	13,100	1,360	5,530
4	477	504	790	380	800	1,480	7,010	790	2,440	6,240	1,150	6,000
5	432	477	710	460	700	1,200	4,240	870	2,000	4,040	960	2,600
6	383	438	623	1,500	600	870	4,860	4,650	2,290	3,100	870	2,140
7	348	419	630	3,600	600	830	7,850	5,080	12,400	2,440	790	2,000
8	332	413	595	2,000	500	915	7,280	4,440	18,000	2,440	790	1,860
9	310	389	560	1,600	500	915	5,530	4,440	13,800	3,100	11,000	3,280
10	332	389	560	1,400	440	790	4,040	4,040	8,750	3,460	5,300	2,140
11	277	389	546	1,000	360	1,480	3,100	3,280	13,100	4,040	2,440	1,730
12	277	451	518	800	340	23,400	3,100	2,440	8,440	4,650	1,600	1,480
13	277	464	451	700	340	8,750	3,460	2,140	5,300	4,650	1,250	1,300
14	277	458	420	950	280	5,080	2,930	1,860	3,840	3,280	7,560	1,150
15	288	504	360	1,400	220	3,650	2,440	1,540	3,100	4,860	15,300	1,050
16	343	567	320	1,200	220	2,760	2,140	1,300	2,760	3,460	9,380	960
17	360	595	300	950	280	5,080	1,860	1,250	2,440	2,440	5,530	870
18	321	560	280	700	280	5,300	1,730	1,250	2,000	2,290	3,460	790
19	310	532	280	550	360	2,930	1,540	1,100	2,000	2,930	2,440	750
20	389	511	300	550	600	2,000	1,420	1,100	3,100	3,280	1,860	790
21	1,250	490	280	480	1,000	3,650	1,480	1,300	5,300	2,600	1,540	1,860
22	1,730	504	320	340	1,000	3,460	1,480	1,250	3,100	2,600	1,300	1,250
23	1,150	518	340	420	850	4,240	1,250	1,860	2,140	2,290	1,420	960
24	870	532	380	550	800	7,850	1,150	2,290	11,000	2,000	6,000	790
25	710	750	280	340	800	9,380	1,050	1,860	7,560	2,000	4,440	750
26	630	960	420	550	1,200	7,280	1,000	1,600	4,240	1,600	2,290	670
27	553	750	360	550	3,200	7,280	960	1,480	6,750	2,600	1,730	630
28	532	750	300	440	7,010	11,700	870	1,730	5,300	2,290	1,360	616
29	477	750	320	460	.....	7,010	870	11,400	4,650	1,540	1,860	574
30	451	760	320	300	.....	5,530	830	11,000	5,300	13,800	3,460	574
31	432	.....	380	340	.....	4,040	.....	6,240	.....	4,240	4,440	.....

NOTE.—Discharge Dec. 14 to Feb. 27, estimated, because of ice, from discharge measurements, weather records, and study of gage height graph.

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

[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	1,730	277	556	0.228	0.26
November	960	389	547	.224	.25
December	1,200	280	486	.199	.23
January	3,600	300	829	.340	.39
February	7,000	220	896	.367	.38
March	23,400	790	4,730	1.94	2.24
April	9,060	830	3,250	1.33	1.48
May	11,400	790	2,780	1.14	1.31
June	18,000	2,000	5,740	2.35	2.62
July	13,800	1,540	4,060	1.66	1.91
August	15,300	790	3,460	1.42	1.64
September	6,000	574	1,780	.730	.81
The year	23,400	220	2,430	.996	13.52

PATUXENT RIVER BASIN.

PATUXENT RIVER NEAR BURTONSVILLE, MD.

LOCATION.—At 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, 1917.

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 and Arthur Beall.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Banks are lined with trees and brush and overflow 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 shifted during the flood of July 12–13, 1917.

EXTREMES OF DISCHARGE.—Maximum stage during year, 10.45 feet at 8 a. m. July 13 (discharge, 3,060 second-feet); minimum stage, from water-stage recorder, 1.93 feet September 23 (discharge, 47 second-feet). A stage of 1.70 feet occurred at 3 a. m. February 3 and was probably caused by freezing at headwaters.

1911–1917: Maximum stage recorded, 14.6 feet 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.—Stage-discharge relation affected by ice during severe winters only.

ACCURACY.—Stage-discharge relation changed during the high water of July 12–13; affected by ice February 3–20. Rating curve well defined between 50 and 2,000 second-feet, used October 1 to July 12; curve well defined between 50 and 200 second-feet and fairly well defined above 200 second-feet used July 13 to September 30. Operation of water-stage recorder satisfactory throughout the year, except for period December 20–24. Daily discharge ascertained by use of discharge integrator, by hourly method, and by use of mean daily gage heights obtained by inspecting recorder graph. Records excellent.

Discharge measurements of Pautuxent River near Burtonsville, Md., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 14	G. C. Stevens	[a] 2.36	64.5
June 2	Stevens and Hoyt	2.10	85.8

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Patuxent River near Burtonsville, Md., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	62	68	108	124	136	162	126	120	89	60	69	72
2	63	63	80	125	100	145	120	127	90	70	83	58
3	61	61	68	280	90	145	116	128	82	236	69	54
4	59	58	65	200	90	318	112	135	78	85	59	51
5	61	62	61	172	80	584	139	162	75	72	54	51
6	59	62	62	225	80	330	358	160	202	68	51	51
7	60	63	58	157	80	249	170	156	787	64	50	50
8	60	62	53	139	70	810	140	153	158	74	53	133
9	61	62	60	130	70	805	150	149	201	223	165	94
10	60	63	76	126	70	386	180	146	414	538	296	76
11	59	63	65	121	65	358	150	142	251	594	76	66
12	59	67	81	102	60	313	140	129	182	360	65	58
13	61	87	86	125	60	219	134	128	128	1,200	62	53
14	61	75	71	264	65	262	132	129	236	200	59	49
15	59	70	78	150	70	264	125	126	137	144	105	56
16	59	70	98	149	80	188	120	123	120	133	100	65
17	63	69	129	123	90	232	115	123	101	153	69	62
18	60	64	112	123	140	216	114	123	92	102	63	55
19	126	61	106	121	250	168	114	127	87	124	55	49
20	117	57	.....	112	450	154	115	123	123	115	54	48
21	79	55	.....	119	220	154	115	120	116	92	55	48
22	67	53	.....	510	110	152	115	120	82	84	67	49
23	64	54	.....	196	135	142	113	118	78	81	56	48
24	61	86	.....	130	211	224	112	114	74	78	69	48
25	61	67	115	106	124	180	113	110	69	75	68	51
26	59	57	104	97	96	155	122	106	67	72	63	53
27	58	54	96	88	163	195	123	103	65	69	55	54
28	59	52	202	97	196	215	118	213	70	69	53	55
29	56	56	205	194	.....	155	118	377	68	69	52	55
30	58	282	124	419	.....	136	119	117	64	69	94	55
31	60	.....	129	216	.....	130	.....	90	.....	69	65	.....

NOTE.—Mean discharge Dec. 20–24 estimated 200 second-feet. Discharge Feb. 3 to 20 estimated as in table, because of ice, from discharge measurement study of gage-height graph and weather records.

Monthly discharge of Patuxent River near Burtonsville, Md., for the year ending Sept. 30, 1917.

[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	126	56	64.9	0.511	0.59
November	282	52	70.8	.557	.62
December	205	53	113	.890	1.03
January	510	88	169	1.33	1.53
February	450	60	123	.969	1.01
March	810	130	263	2.07	2.39
April	358	112	135	1.06	1.18
May	377	90	139	1.09	1.26
June	787	64	146	1.15	1.28
July	1,200	60	176	1.39	1.60
August	296	50	75.9	.598	.69
September	133	48	58.9	.464	.52
The year	1,200	48	128	1.01	13.70

POTOMAC RIVER BASIN.

POTOMAC RIVER AT POINT OF ROCKS, MD.

LOCATION.—At 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, 1917.

GAGE.—Chain, attached to downstream side of left span of bridge; read 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, 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, 17.9 feet at 1.30 p. m., March 13 (discharge 121,000 second-feet); minimum stage recorded, 0.43 foot at 9 a. m., September 29 (discharge 643 second-feet).

1895–1916: Maximum stage recorded, 29 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 seldom 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; affected by ice gorge about a mile below from February 13 to 21. 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. Records excellent except those for extremely low stages, which are fair.

The following discharge measurement was made by G. C. Stevens and B. L. Hopkins:

August 23, 1917: Gage height, 1.04 feet; discharge, 2,040 second-feet.

Daily discharge, in second-feet, of Potomac River at Point of Rocks, Md., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,800	1,840	2,250	9,070	10,000	14,600	10,000	4,500	16,300	2,800	1,990	1,290
2	3,090	2,120	1,860	9,070	10,000	14,900	9,530	4,010	14,600	2,970	1,890	2,090
3	3,540	1,760	1,610	8,180	9,530	15,200	8,180	3,860	11,000	2,970	2,070	2,200
4	2,800	1,660	1,460	7,750	8,620	15,200	7,330	4,500	10,500	3,120	2,020	1,890
5	2,380	1,480	3,860	8,180	8,180	24,200	6,130	6,130	13,500	2,940	2,660	1,660
6	1,990	1,290	3,540	9,070	9,530	26,800	10,000	6,520	8,620	2,550	2,300	1,290
7	1,840	1,190	3,240	11,000	8,180	22,300	16,300	6,920	17,400	2,450	2,170	1,190
8	1,560	1,060	2,940	11,000	6,920	27,500	19,800	6,520	19,800	2,450	1,940	1,030
9	1,410	966	2,800	12,000	6,520	36,300	24,800	5,750	20,400	2,250	5,420	1,540
10	1,290	1,640	2,120	11,500	5,750	90,500	22,300	5,750	9,070	4,880	4,500	1,260
11	1,100	1,510	1,910	11,000	5,750	53,200	19,800	5,380	13,500	5,200	4,200	1,540
12	1,190	1,760	1,610	5,750	5,750	80,500	16,300	4,840	14,600	4,980	3,510	1,190
13	1,340	1,940	1,910	5,380	5,400	118,000	15,200	5,750	8,620	6,640	3,090	1,350
14	1,680	1,990	1,960	5,380	5,200	100,000	14,600	6,130	6,520	5,940	2,860	1,290
15	1,840	1,890	1,890	6,520	5,100	65,600	14,100	6,130	6,130	4,430	3,510	1,680
16	1,660	1,610	1,640	6,520	5,000	64,700	13,500	5,750	5,020	6,640	3,700	1,810
17	1,790	1,680	1,680	4,330	4,900	57,200	9,530	5,380	4,670	3,980	3,700	2,020
18	1,840	1,790	1,360	3,860	5,100	56,400	9,070	5,380	4,500	3,730	2,940	1,790
19	2,250	1,680	1,260	3,700	5,300	55,600	8,620	5,380	3,090	3,090	2,720	1,660
20	2,660	1,540	2,250	3,240	5,500	40,700	7,750	5,020	2,800	4,430	2,380	1,310
21	2,250	1,190	2,800	4,170	5,700	32,800	6,520	4,840	3,860	3,790	2,330	1,220
22	2,250	1,060	2,380	4,670	5,750	22,900	6,130	4,500	3,090	3,180	2,220	1,050
23	2,380	966	3,390	14,600	5,380	20,400	6,130	4,330	2,800	2,806	2,200	1,140
24	2,660	1,340	2,940	29,400	5,020	16,300	5,380	4,330	2,800	2,940	2,040	1,360
25	3,540	1,220	2,800	21,700	9,070	14,100	5,020	2,520	2,520	3,180	1,940	1,440
26	3,390	1,710	2,380	15,700	12,000	23,600	5,020	2,380	2,120	2,660	1,940	944
27	2,940	1,580	2,380	9,070	15,200	21,100	6,130	3,090	2,250	6,320	2,040	769
28	2,380	1,540	2,660	7,750	19,200	19,800	5,750	3,700	2,120	5,750	2,170	834
29	2,120	1,390	10,000	7,330	.....	14,100	5,750	6,520	1,990	4,430	1,990	643
30	1,990	1,990	16,300	7,750	.....	14,100	5,750	13,000	1,990	4,200	1,840	900
31	1,940	.....	9,530	9,530	.....	12,000	.....	14,600	.....	2,940	1,030	.....

NOTE.—Discharge Feb. 13–21 estimated because of ice gorge below station, by comparison with records on adjacent streams.

Monthly discharge of Potomac River at Point of Rocks, Md., for the year ending Sept. 30, 1917.

[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	3,540	1,100	2,190	0.227	0.26
November	2,120	966	1,550	.161	.18
December	16,300	1,260	3,250	.337	.39
January	29,400	3,240	9,170	.950	1.10
February	19,200	4,900	7,630	.791	.82
March	118,000	12,000	38,400	3.98	4.59
April	24,800	5,020	10,700	1.11	1.24
May	14,600	2,380	5,590	.579	.67
June	20,400	1,990	7,870	.816	.91
July	6,640	2,250	3,890	.403	.46
August	5,420	1,030	2,620	.272	.31
September	2,200	643	1,380	.143	.16
The year	118,000	643	7,880	.817	11.09

MONOCACY RIVER NEAR FREDERICK, MD.

LOCATION.—At Ceresville bridge on toll road leading from Frederick, Frederick County, to Mount Pleasant, about 3,000 feet below Tuscarora Creek (entering from right), 2,000 feet above Israel Creek (entering from left), and 3 miles northeast of Frederick.

DRAINAGE AREA.—660 square miles.

RECORDS AVAILABLE.—August 4, 1896, to September 30, 1917.

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.—Bed composed of gravel and boulders; shifting during very high floods. Control not well defined. Banks lined with trees and brush; subject to overflow at high stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year, 20.4 feet at 9.30 a. m. March 13 (discharge, 12,700 second-feet); minimum stage recorded, 4.25 feet October 10 (discharge, 122 second-feet).

1896–1917: 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 several days in October, 1910 (discharge, 15 second-feet).

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

ACCURACY.—Stage-discharge relation changed during high water in March, 1917; not affected by ice during the year. Rative curves well defined between 200 and 15,000 second-feet used before and after March 15. Discharge measurements made during high water of March, 1917, indicate that rating curves used prior to 1916 gave results about 20 per cent too large at high stages. Gage read to half-tenths once daily; oftener during high water. Daily discharge ascertained by applying gage height to rating table. Records good.

Discharge measurements of Monocacy River near Frederick, Md., during the year ending Sept. 30, 1917.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 26	Stevens and Hoyt	4.68	230	Mar. 13	G. C. Stevens	10.90	4,220
Mar. 12	G. C. Stevens	19.22	[a] 11,800	13	do	10.00	3,400
12	do	18.21	[a] 10,500	Aug. 22	Stevens and Hopkins	4.52	210

[a] Surface velocities observed and coefficients between 0.80 and 0.88 used to reduce to mean velocity.

Daily discharge, in second-feet, of Monocacy River near Frederick, Md., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	286	158	750	465	850	1,230	784	415	1,260	204	218	294
2	171	158	485	445	850	850	736	396	1,640	204	204	262
3	171	158	335	638	900	800	644	396	736	294	218	247
4	158	146	302	1,170	950	705	600	396	434	262	191	232
5	146	146	212	1,610	950	750	578	454	343	232	178	204
6	134	158	171	3,060	900	1,230	7,550	556	882	204	165	204
7	146	171	171	1,480	850	1,290	2,630	474	4,230	204	1,090	204
8	134	146	158	1,350	485	1,540	2,480	454	1,570	204	178	690
9	122	134	198	1,000	445	6,740	2,340	434	882	1,260	4,900	1,840
10	122	134	184	750	405	5,500	1,910	415	690	1,260	2,840	600
11	122	134	198	615	405	5,660	1,380	396	784	690	1,090	396
12	146	134	335	405	335	9,750	1,140	360	2,480	1,140	535	294
13	134	134	445	425	302	4,480	982	360	1,030	667	378	262
14	134	134	370	2,320	270	3,440	882	326	736	556	343	232
15	134	134	302	1,610	270	3,060	784	310	622	326	982	1,090
16	134	122	302	1,420	270	2,340	736	294	600	556	310	2,410
17	122	134	286	2,320	255	3,220	667	278	578	644	232	784
18	134	134	270	1,890	240	2,990	600	262	434	1,380	278	600
19	134	134	270	1,420	240	1,510	578	262	396	2,480	262	360
20	7,010	134	240	950	335	1,380	644	262	360	1,140	232	294
21	950	134	226	950	405	1,320	600	247	343	535	232	278
22	682	134	240	3,290	525	1,640	644	247	326	454	204	262
23	465	134	1,610	2,610	750	1,380	556	262	310	434	204	247
24	352	198	1,110	950	1,290	1,710	514	262	294	396	1,710	232
25	226	171	728	850	1,420	1,570	514	262	294	2,840	1,140	232
26	226	184	705	705	1,420	1,140	535	247	294	1,320	278	232
27	226	146	1,230	425	1,420	1,510	514	232	262	556	232	218
28	198	146	2,610	405	1,350	2,050	474	396	232	396	204	204
29	184	146	1,890	405	.....	1,140	454	2,050	232	326	204	204
30	171	525	900	1,420	.....	982	434	832	218	294	326	204
31	171	.....	615	1,350	.....	832	.....	784	.....	262	360	.....

Monthly discharge of Monocacy River near Frederick, Md., for the year ending Sept. 30, 1917.

[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	7,010	122	440	0.667	0.77
November	525	122	158	.239	.27
December	2,610	158	576	.873	1.01
January	3,290	405	1,250	1.89	2.18
February	1,420	240	682	1.03	1.07
March	9,750	705	2,380	3.61	4.16
April	7,550	434	1,130	1.71	1.91
May	2,050	232	430	.652	.75
June	4,230	218	783	1.19	1.33
July	2,840	204	701	1.06	1.22
August	4,900	165	643	.974	1.12
September	2,410	204	460	.697	.78
The year	9,750	122	805	1.22	16.57

RAPPAHANNOCK RIVER BASIN.

RAPPAHANNOCK RIVER NEAR FREDERICKSBURG, VA.

LOCATION.—At rear of McWhirt farm, 1½ miles above dam of Spottsylvania Power Co. and 3½ miles above Fredericksburg, Spottsylvania County.

DRAINAGE AREA.—1,590 square miles.

RECORDS AVAILABLE.—September 19, 1907, to September 30, 1917.

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 three gages at practically the same location and referred to same datum. Gage read by Charles Perry.

DISCHARGE MEASUREMENTS.—Made from cable at gage. At extremely low water measurements can be made by wading or from a bridge over the power canal below the dam.

CHANNEL AND CONTROL.—Bed composed of boulders; somewhat rough. One channel. Banks wooded; water overflows right bank at stage about 15 feet and left bank at about 12 feet. Current sluggish at extremely low water. Control is a rocky section a few hundred feet below the gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during the year, 8.5 feet March 5, determined from flood marks at gage (discharge, 23,100 second-feet); minimum stage recorded, 0.78 foot, October 10 and 13 (discharge, 212 second-feet).

1907–1917: Maximum stage recorded, 11.0 feet January 13, 1915, determined by leveling from flood marks (discharge, 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 to affect stage-discharge relation.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice during year. Rating curve well defined except for extremely high and low stages. Gage read to hundredths twice daily; readings reported during the winter of 1916–17 not entirely reliable. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except for winter months. Comparison with records for other stations indicates that the winter records of the Rappahannock are not subject to large errors.

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

March 9, 1917: Gage height, 3.44 feet; discharge, 3,890 second-feet.

Daily discharge, in second-feet, of Rappahannock River near Fredericksburg, Va., for the year ending Sept. 30, 1917.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	455	494	1,350	1,560	1,770	2,740	1,420	1,700	1,160	550	645	1,700
2	418	550	1,070	1,220	1,480	4,610	1,420	1,480	2,240	486	569	729
3	418	518	598	1,770	1,220	7,070	1,350	1,420	1,700	518	860	588
4	336	448	470	1,480	1,100	16,800	1,280	1,480	1,420	1,350	1,700	1,560
5	288	478	510	1,620	1,220	19,600	1,350	2,000	1,280	860	1,100	860
6	288	455	448	2,570	975	8,010	20,600	1,770	1,220	626	708	518
7	288	448	432	1,280	1,220	3,700	5,910	1,420	1,220	518	569	1,350
8	288	448	432	1,160	805	2,920	3,490	1,480	1,100	550	542	1,220
9	280	470	502	975	860	3,920	3,100	1,480	1,160	626	550	1,420
10	212	448	440	918	860	2,740	3,700	1,480	2,920	455	4,140	805
11	288	362	534	918	750	2,920	2,570	1,220	3,100	9,760	1,700	588
12	245	470	805	729	645	3,490	2,400	1,160	1,920	3,700	918	486
13	212	518	918	502	550	4,140	2,240	1,100	1,620	1,220	656	455
14	288	470	805	588	645	5,910	2,920	1,040	1,420	918	550	750
15	288	510	1,040	2,570	750	5,100	2,240	1,040	5,910	656	550	455
16	260	470	860	2,240	805	4,140	1,920	975	3,490	510	542	486
17	260	432	470	2,740	918	4,850	1,770	860	1,480	1,480	534	860
18	317	462	395	1,770	750	3,920	1,620	698	1,350	1,620	534	687
19	542	448	395	1,160	1,100	3,290	1,560	616	1,040	860	687	470
20	2,570	329	432	860	1,100	3,100	1,700	588	918	687	550	448
21	1,040	362	918	860	1,420	2,920	1,620	534	805	750	470	440
22	805	329	5,100	918	1,160	2,920	1,620	550	1,220	708	462	382
23	676	375	8,680	1,480	1,350	2,740	1,350	666	918	645	1,350	645
24	598	432	2,400	1,280	1,220	2,570	1,280	698	750	708	2,570	478
25	578	455	1,920	1,620	2,000	2,740	1,220	636	645	1,480	1,420	342
26	494	550	1,350	1,100	1,700	2,080	1,350	626	750	5,100	1,160	305
27	494	510	1,100	860	1,350	2,240	1,280	698	510	3,490	729	329
28	418	440	1,280	1,350	1,700	2,920	1,480	1,040	805	2,240	550	336
29	440	550	3,290	1,920	.....	2,080	2,000	2,570	740	1,420	462	395
30	418	626	1,620	3,100	.....	1,770	2,000	2,920	676	975	860	329
31	323	.....	1,620	2,440	.....	1,620	.....	1,560	.....	750	1,840	.....

Monthly discharge of Rappahannock River near Fredericksburg, Va., for the year ending Sept. 30, 1917.

[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	2,570	212	478	0.301	0.35
November	626	329	462	.291	.32
December	8,680	395	1,360	.855	.99
January	3,100	502	1,470	.925	1.07
February	2,000	550	1,120	.704	.73
March	19,600	1,620	4,500	2.83	3.26
April	20,600	1,220	2,660	1.67	1.86
May	2,920	534	1,210	.761	.88
June	5,910	510	1,520	.956	1.07
July	9,760	455	1,490	.937	1.08
August	4,140	462	983	.618	.71
September	1,700	305	682	.429	.48
The year	20,600	212	1,500	.943	12.80

MISCELLANEOUS MEASUREMENTS.

The following table gives the results of measurements of flow of streams of the north Atlantic slope at points other than those at which gaging stations are maintained:

Miscellaneous discharge measurements in north Atlantic slope basins during the year ending Sept. 30, 1917.

Date.	Stream.	Tributary to or diverting from—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Aug. 22	Cobbosseecontee stream	Kennebec River	Gardiner, Me.	134.74	255
30	do	do	do	135.25	362
Sept. 4	do	do	do	135.88	305
5	do	do	do	136.00	296
10	do	do	do	135.81	278
Aug. 25	Contoocook River	Merrimack River	Hillsboro, N. H.	[a] 19.04	245
Sept. 6	do	do	do	[a] 19.02	266
9	do	do	do	[a] 19.38	153
Aug. 24	Contoocook Canal	Contoocook River	do	8.24	61
25	do	do	do	7.14	6.6
25	do	do	do	8.56	90
Sept. 5	do	do	do	8.51	82
6	do	do	do	7.14	6.2
8	do	do	do	7.69	27.3
June 14	Diversion to Packard Pond.	East Branch of Tully River.	Near Athol, Mass.	.....	13.0

[a] Distance to water surface from reference point on bridge.

INDEX.

STREAM-GAGING STATIONS

AND

PUBLICATIONS RELATING TO WATER RESOURCES

PART I. NORTH ATLANTIC SLOPE BASINS

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:
A, Pacific slope basins in Washington and upper Columbia River basin.
B, Snake River basin.
C, Lower Columbia River basin and Pacific slope basins in Oregon.

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., 704 Journal Building.
Atlanta, Ga., Post Office Building.
Madison, Wis., c/o Railroad Commission of Wisconsin.
Topeka, Kans., 25 Federal Building.
Austin, Tex., Capitol Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 403 New Post Office Building.
Tucson, Ariz., University of Arizona.
Salt Lake City, Utah, 421 Federal Building.
Boise, Idaho, 615 Idaho Building.
Tacoma, Wash., 406 Federal Building.
Portland, Oreg., 606 Post Office Building.
San Francisco, Cal., 328 Customhouse.
Los Angeles, Cal., 619 Federal Building.
Honolulu, Hawaii, 14 Capitol Building.

A list of the Geological Survey's publications may be obtained by applying to the Director, United States Geological Survey, Washington, D. C.

STREAM-FLOW REPORTS.

Stream-flow records have been obtained at more than 4,240 points in the United States, and the data obtained have been published in the reports 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.

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

Report.	Character of data.	Year.
W 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
W 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
W 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
W 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
W 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
W 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
W 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
W 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
W 75	Monthly discharge	1901.
W 82 to 85	Complete data	1902.
W 97 to 100	do	1903.
W 124 to 135	do	1904.
W 165 to 178	do	1905.
W 201 to 214	do	1906.
W 241 to 252	do	1907–8.
W 261 to 272	do	1909.
W 281 to 292	do	1910.
W 301 to 312	do	1911.
W 321 to 332	do	1912.
W 351 to 362	do	1913.
W 381 to 394	do	1914.
W 401 to 414	do	1915.
W 431 to 444	do	1916.
W 451 to 464	do	1917.

NOTE—No 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 1917. The data for any particular station will be found in the reports covering the years during which the station was maintained. For example, data for 1902 to 1917 for any station in the area covered by Part III are published in Water-Supply Papers 83, 98, 128, 169, 205, 243, 263, 283, 303, 323, 353, 383, 403, 433, and 453 which contain records for the Ohio River basin for those years.

Numbers of water-supply papers containing results of stream measurements, 1899–1917.

Year.	I North Atlantic slope basins (St. John River to York River).	II South Atlantic 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 basins.	VI Missouri River basin.	VII Lower Mississippi River basin.	VIII Western Gulf of Mexico basins.	IX Colorado River basin.	X Great Basin.	XI Pacific slope basins in California.	XII North Pacific slope basins.		
												Pacific slope basins in Washington and upper Columbia River.	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
1917	451	452	453	454	455	456	457	458	459	460	461	462	463	464

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water Supply Paper 39. Tables of monthly discharge for 1899 in Twenty-first Annual Report, Part IV.
[b] James River only.
[c] Gallatin River.
[d] Green and Gunnison rivers and Grand River above junction with Gunnison.
[e] Mohave River only.
[f] Kings and Kern rivers and south Pacific slope basins.
[g] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52. Tables of monthly discharge for 1900 in Twenty-second Annual Report, Part IV.
[h] Wissahickon and Schuylkill rivers to James River.
[i] Scioto River.
[j] Loup and Platte rivers near Columbus, Nebr., and all tributaries below junction with Platte.
[k] Tributaries of Mississippi from east.
[l] Lake Ontario and tributaries to St. Lawrence River.
[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, 1917. 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 Whitney, 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.
Kennebec River at Waterville, Maine, 1892–1916.
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 Forks, 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; 1866–1916.
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., 1901–1916.
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 First Lake, near Pittsburg, N. H., 1917–
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 Mountains, N. H., 1903–1907.
Little River at Twin Mountain, N. H., 1904–5.
White River at Sharon, Vt., 1903–4; 1909–1913.
White River at West Hartford, Vt., 1915–
Ashuelot River at Winchester, N. H., 1903–4.
Ashuelot River at Hinsdale, N. H., 1907–1909; 1914–
Millers River at Wendell Depot, 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., 1916–17.
East Branch Tully River near Athol, Mass., 1916–
Moss Brook at Wendell Depot, 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 Ware, 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., 1913–1916.

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., 1911–1916.
Batten Kill at Battenville, N. Y., 1908.
Fish Creek at Burgoyne, N. Y., 1905; 1908.
Hoosic River near Eagle Bridge, N. Y., 1910

PASSAIC RIVER BASIN.

Passaic River at Millington, N. J., 1903–1906.
Passaic River near Chathan, 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 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–

Potomac River tributaries—Continued.
Passage Creek at Buckton, Va., 1905–6.
Monocacy River near Frederick, Md., 1896–
Goose Creek near Leesburg, Va., 1909–1912.
Rock Creek at Zoological Park, D. C., 1897–1900.
Rock Creek at Lyons Mill, D. C., 1892–1894.
Occoquan Creek near Occoquan, Va., 1913–1916.

RAPPAHANNOCK RIVER BASIN.

Rappahannock River near Fredericksburg, Va., 1907–

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.

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.

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[1] For stream-measurement reports see tables on pages IV–V and VI.

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.

*103. A review of the laws forbidding pollution of inland waters in the United States, by E. B. Goodell. 1904. 120 pp. Superseded by 152.

Cites statutory restrictions of water pollution.

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 quadrangles, 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.

*122. Relation of the law to underground waters, by D. W. Johnson. 1905. 55 pp. 5c.

Cites legislative acts relating to ground waters in New Jersey.

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. 32 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 normas 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.

*152. A review of the laws forbidding pollution of inland waters in the United States (second edition), by E. B. Goodell. 1905. 149 pp. 10c.

Cites statutory restrictions of water pollution.

*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 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 areas:

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. 1893. (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.

364. Water analyses from the laboratory of the United States Geological Survey, tabulated by F. W. Clarke, chief chemist. 1914. 40 pp.

Contains analyses of spring and well waters in Maine, District of Columbia, and Virginia.

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. Slitcher, 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 requsite 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 geological 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 follows 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.

*531. Contributions to economic geology, 1911, Part II, Mineral fuels; M. R. Campbell, geologist in charge. 1913. 361 pp., 24 pls. 45c.

Issued also in separate chapters. The following papers contain information on ground water:

*(d) Geologic structure of the Punxsutawney, Curwensville, Houtzdale, Barnesboro, and Patton quadrangles, central Pennsylvania, by G. H. Ashley, and M. R. Campbell (pp. 69–89, Pls. VII–VIII). Discusses the geologic structure of the five quadrangles named and includes a map showing structure contours. It contains a brief statement in regard to shallow and deep wells and artesian prospects (pp. 88–89). The ground water in the Barnesboro and Patton quadrangles is also briefly described in Geologic Folio 189, and the ground water in these two quadrangles and in the Curwensville quadrangle is briefly described in Water Supply Paper 110.

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

[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.

maps and description of each quadrangle are issued in the form of a folio. When all the folios are completed they will constitute the Geologic Atlas of the United States.

A folio is designated by the name of the principal town or of a prominent natural feature within the quadrangle. Each folio includes maps showing the topography, geology, underground structure, and mineral deposits of the area mapped and several pages of descriptive text. The text explains the maps and describes the topographic and geologic features of the country and its mineral products. The topographic map shows roads, railroads, waterways, and, by contour lines, the shapes of the hills and valleys and the height above sea level of all points in the quadrangle. The areal-geology map shows the distribution of the various rocks at the surface. The structural-geology map shows the relations of the rocks to one another underground. The economic-geology map indicates the location of mineral deposits that are commercially valuable. The artesian-water 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 fnture 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 suppy; 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-Grantville, 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.
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 springs and shallow and deep wells; discusses also water supply at Ithaca.

170. Mercersburg-Chambersburg, Pennsylvania.[2] 1909. 5c.
Describes springs and wells and mentions sources of water supplies of principal towns.

179. Pawpaw-Hancock, West Virginia-Maryland-Pennsylvania. 1912. 5c.
Gives analysis of water of Berkeley Springs.

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.

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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.

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 Main 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.

Underground-water resources of the Coastal Plain province of Virginia, by Samuel Stanford: Virginia Geol. Survey Bull. 5, 1913.

Surface water supply of Virginia, by G. C. Stevens: Virginia Geol. Survey Bull. 19, 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 experiment 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.

93. Proceedings of first conference of engineers of the Reclamation Service, with accompanying papers, compiled by F. H. Newell, chief engineer. 1904. 361 pp. 25c. [Requests for this report should be addressed to the U. S. Reclamation Service.]
Contains the following papers of more or less general interest:
Limits of an irrigation project, by D. W. Ross.
Relation of Federal and State laws to irrigation, by Morris Bien.
Electrical transmission of power for pumping, by H. A. Storrs.
Correct design and stability of high masonry dams, by Geo. Y. Wisner.
Irrigation surveys and the use of the plane table, by J. B. Lippincott.
The use of alkaline waters for irrigation, by Thomas H. Means.

*94. Hydrographic manual of the United States Geological Survey, prepared by E. C. Murphy, J. C. Hoyt, and G. B. Hollister. 1904. 76 pp., 3 pls. 10c.
Gives instruction for field and office work relating to measurements of stream flow by current meters. See also No. 95.

*95. Accuracy of stream 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 Unites States, by E. B. Goodell. 1940. 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 as 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, descripes 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 stocks, water-bearing formations, recovery of water by springs, well, 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 survey 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, Calif., and on Long Island, N. Y.; gives results of tests of wells and pumping plants, and describes stovepipe method of well construction.

143. Experiments on steel-concrete pipes on a working scale, by J. H. Quinton. 1905. 61 pp., 4 pls.
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 season, 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 effluent 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., 1 pl. 10c.
Describes manufacture of sulphite pulp, the waste liquors, and the experimental work leading to suggestions as to methods of preventing stream pollution.

*229. The disinfection of sewage and sewage filter effluents, with a chapter on the putrescibility and stability of sewage effluents, by E. B. Phelps. 1909. 91 pp., 1 pl. 15c.
Scope indicated by title.

*234. Papers on the conservation of water resources. 1909. 96 pp., 2 pls. 15c.
Contains the following papers, whose scope is indicated by their titles: Distribution of rainfall, by Henry Gannett; Floods, by M. O. Leighton; Developed water powers, compiled under the direction of W. M. Steuart, with discussion by M. O. Leighton; Undeveloped water powers by M. O. Leighton; Irrigation, by F. H. Newell; Underground waters, by W. C. Mendenhall, Denudation, by R. B. Dole and Herman Stabler; Control of catchment areas, by H. N. Parker

*235. The purification of some textile and other factory wastes, by Herman Stabler and G. H. Pratt. 1909. 76 pp. 10c.
Discusses waste waters from wool scouring, bleaching and dyeing cotton yarn, bleaching cotton piece goods, and manufacture of oleomargine, fertilizer, and glue.

236. The quality of surface waters in the United States, Part I.—Analyses of waters east of the one hundredth meridian, by R. B. Dole. 1909. 123 pp. 10c.
Describes collection of samples, methods of examination, preparation of solutions, accuracy of 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 method 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 C. H. 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.

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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 various 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 constructung 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. Daven port, 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 underground water.

425. Contributions to the hydrology of the United States, 1917, N. C. Grover, chief hydraulic engineer. 1918. Contains:

(c) Hydraulic conversion tables and convenient equivalents, pp. 71–94. 1917.

427. Bibliography and index of the publications of the United States Geological Survey relating to ground water, by O. E. Meinzer. 1918. 169 pp., 1 pl.

Includes publications prepared, in whole or part, by the Geological Survey that treat any phase of the subject of ground water or any subject directly applicable to ground water. Illustrated by map showing reports that cover specific areas more or less thoroughly.

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, Calif., and was undertaken for the purpose of learning "the laws which control the movement of bed load and especially to determine how the quantity of load is related to the stream'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 areas 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 artisian flow, and typical artisian 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.

616. The data of geochemistry (third edition), by F. W. Clarke. 1916. 821 pp. 45c.

Earlier editions were published as Bulletins 330 and 491. Contains a discussion of the statement and terpretation of water analyses and a chapter on "Mineral wells and springs" (pp. 179–216). Discusses the definition and classification of mineral waters, changes in the composition of water, deposits of calcareous, ocherous and siliceous materials made by water, vadose and juvenile waters, and thermal springs in relation to volcanism. Describes the different kinds of ground water and gives typical analyses. Includes a brief bibliography of papers containing water analyses.

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. 101–349, 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 filteration 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 abstracts.

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